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Preface

In 2019, the European Seminar on Extension and Education celebrated its 24th edition, an important milestone, matching a renewed interest towards extension across the world and especially in Europe.

The 24th European Seminar on Extension and Education, which was held in June 2019 in Acireale, Sicily (Italy), focused on the importance of agricultural education and extension to foster and enhance innovation processes, a theme that shaped from the growing importance of innovation for achieving sustainable development goals.

Furthermore, this seminar edition came at a five-year distance since the implementation of multi-actor approaches in European agricultural innovation policies (the European Innovation Partnership for Agricultural productivity and Sustainability (EIP-AGRI)) and there was great interest in dealing with this issue.

Within this framework, the main goals of ESEE 2019 were to gather experiences from multi-actor innovation processes, analyse the skills and capacities needed to strengthen links between farmers and researchers, identify approaches, methods and tools to improve the effectiveness and impacts of innovation processes, explore experiences, both in policy implementation and governance, to support an “enabling environments” for innovation.

The conference was articulated in four themes: 1) Education and Extension: roles, functions and tools for boosting interactive approaches to innovation, 2) New skills and capabilities for Extension to achieve innovation policies objectives, 3) Enabling policies for R&I: governance, frameworks and pathways, 4) The changing role of monitoring and evaluation: approaches, methods and instruments.

This volume provides a collection of the valuable contributions that were presented and discussed during the Seminar.

Acknowledgements

We thank the director of CREA Centre for olive, citrus and tree fruit, Dr. Paolo Rapisarda, who kindly hosted the ESEE 2019 conference in the beautiful location in Acireale, and the director of CREA Centre for Policy and Bioeconomy, Dr. Roberto Henke, who provided us with managerial and secretarial assistance to organise the Seminar.

We are grateful to the members of the ESEE International Scientific Committee for their warm and significant support.

Our further thanks go to all the colleagues of the National Committee for their efforts and valuable work in organizing the event and entertaining us with excellent food in a memorable landscape setting. A special thanks to Anna Vagnozzi who chaired the national committee and to Giovanni Dara Guccione who provided us a lot of invaluable support in loco, especially in identifying the inspiring case studies on research and innovation which we visited in Sicily.

Furthermore, we thank the Distretto Produttivo Agrumi di Sicilia (<https://www.distrettoagruidisicilia.it/>) and the Associazione Limone dell'Etna, Marchio geografico collettivo (<https://www.facebook.com/limonedelletna>) for their financial support, and the farms that hosted our field visits: Ente di Sviluppo Agricolo della Regione Siciliana - BioFabbrica Ramacca (www.entesviluppoagricolo.it/servizi/servizi-allo-sviluppo/biofabbrica/), O.P. Bio Sikelia (www.biosikelia.com/), Azienda agricola Marco Lorenzo Frasson, Aziende Agricole Planetas.s. - Planeta Vini (www.planeta.it/), Piante Faro SS Agricola di Venerando Faro & C. (www.piantefaro.com/)

We wish to thank all participants for their stimulating contributions and for enjoying the networking moments and the wonderful field visits.

A final word of thanks goes to the keynote speakers, Laurence Klerkx and Kristin Davis, for the time and effort they spent to share their thoughts and experiences with the ESEE community, providing inspiring remarks for the future of agricultural extension and education and for the extension research agenda.

Introduction

Over the last decades, agriculture has faced new challenges, climate change, degradation of natural resources, market globalisation, food security, rural livelihoods, new pests and diseases, advancements in digital technologies, etc., that have been calling for a deep transformation of agricultural systems and rural areas.

Innovation has been put on the top of the policy agenda as the main driver to react these challenges. Key elements include strengthening knowledge exchange and bridging the gap between research and practice.

The new paradigms of innovation are built on systemic, multi-actor, user-centric approaches, which are expected to catalyse transformative forms of innovation, able to promote more sustainable and resilient development pathways by virtue of bottom-up processes and local strategies' implementation, cross-fertilization of ideas between actors, co-creation and generation of co-ownership.

Extension and education are responsible for supporting agriculture and rural areas in shifting towards new development models that meet the different requirements for the sustainability of agri-food systems.

At the same time, the new trends have triggered a reframing (enlarging the scope /reorganizing) of the role of extension/advisory services and the approaches and methods of provision. Today, the term Extension – or, interchangeably, advisory services – is used to describe a range of services provided by a plurality of actors and focusing on a variety of issues which entails agriculture, but also rural areas, communities and urban areas.

Traditional and emerging topics (e.g. digitization, agroecology, circular economy, climate-smart agriculture and forestry, social farming, etc.) ask for a holistic approach to advice, combining technical advice with farm management, marketing and transdisciplinary issues.

New capacities and skills of advisors include technical expertise, functional competencies (e.g. organizing or strengthening networks and improving the relationships between key actors; enhancing/supporting access to resources; supporting niche innovations from the ground, etc.), managerial and organisational competencies, methodological competencies (being able to facilitate, to mediate among actors/objectives/perspectives, etc.), soft skills (e.g. critical thinking, complex problem solving, empathy, emotional intelligence, open mindedness, creativity, etc.).

Educational solutions also need to be adapted to change. Curricula need to be focused on inter-disciplinary contents aimed at training both future innovation advisors and innovator entrepreneurs (agripreneurs) able to combine technical skills, entrepreneurial competencies and ideas to develop new business opportunities. The main challenge for education is to drive the development of personal competencies (soft skills) going beyond the learning of standardized and impersonal knowledge and skills. Innovative approaches of designing and teaching educational and vocational courses to enhance experiential and peer learning are needed.

The reorganisation of Extension and Education rely, to a great extent, on the capacity of the system, in terms of policies, strategies, mindsets and attitudes and practices, to support changes, fostering inclusion of the different AKIS actors and smoothing relationships between them. Therefore, it is relevant to investigate and understand if and how institutions, infrastructures, policies and governance models are able to give effectiveness to multi-actor approaches, enhancing the role of extension and education in stimulating innovation in the agriculture and forestry sectors.

The above issues are getting increasingly important in the scientific and political debate and, therefore, interesting insights may be developed in this direction. In this respect, the 24th European Seminar on Extension and Education provided an international platform to exchange research findings and practices on these topics, but also a discussion and learning forum, opening interesting opportunities for future extension research.

Workshop Themes

Theme 1: Education and Extension: roles, functions and tools for boosting interactive approaches to innovation

Lead convenor: *Pierre Labarthe*

Co-convenors: *Maria Gerster-Bentaya, Andrea Knierim, Alexandros Koutsouris*

Rationale and objectives of the session

Innovation Support Services/ ISS (found in the literature under different labels such as extension/ advisory services, intermediary organizations, etc.) and agricultural education/ AGRED play a primary role in stimulating the transition towards sustainable farming systems.

ISS and AGRED also play an important role in speeding up the reflection and decision-making of farming families, as well as in capturing grassroots needs and ideas. This demands the provision of a more 'systemic' and interactive advice, brokering functions, facilitation, networking, consultancy and backstopping services able to bridge the gap between research and practice, enable knowledge flows and collaboration, connect networks and tailor the information to the farming system and the local context, thus facilitating the co-construction of solutions.

The paradigm shift from 'transfer' to 'intermediation' entails the renewal of relationships between practitioners and research and new roles of ISS and AGRED deemed necessary in order to enhance the interfaces between research/advisors/farmers as well as a wide variety of other stakeholders. A variety of actors and organisations, that traditionally didn't play an advisory role (e.g. LAGs, Thematic Networks, farmers' associations, etc.), are nowadays supporting these processes and play a more active roles alongside traditional public sector providers, dealing with a wide range of farmers' needs. Private companies, non-governmental organizations, producer organizations, etc., can provide for tailored, different and market-oriented services, based on multiple knowledge sources and delivery approaches.

Among the future challenges, ISS will have to facilitate and support farmers in orienting themselves in the digital landscape. ICT tools, digital information and data are more and more used to support farming decision-making and convey new knowledge. However, their uptake and adaptation to the specific farm circumstances require a qualified support. On the other hand, ICT tools and digitalisation can support ISS and AGRED, through IT knowledge platform, e-learning modules, etc., allowing for multi-level communication.

Theme 2. New skills and capabilities for Extension to achieve innovation policies objectives

Lead convenor: *Eelke Wielinga*

Co-convenors: *Michael Küegler, Orhan Özçatalbaş, Tom Kelly*

Rationale and objectives of the session

A knowledgeable technician is not automatically a good advisor, let alone a skilful group facilitator. Some advisors appear to be natural talents in communication, but proper training and guidance on communication skills can contribute considerably to the quality of services for advice and innovation support to farmers and other rural stakeholders.

This has been true for individual advice ever since ESEE was created, but the world has changed since internet and social media came into appearance. Furthermore, working with groups has received a new dimension since the European Commission puts emphasis on Operational Groups as key vehicle for stimulating innovations at farm level in its EIP program (European Innovation Partnerships), in line with an international trend of using a systemic approach in dealing with complex problems and transitions.

The organization of innovative knowledge actions is also needed on results from OGs and research (H2020), as well as on new topics (e.g. digitization, use of digital technologies on-farm, circular economy, climate-smart agriculture and forestry, etc.).

For this session we call for contributions about new capabilities, approaches and experiences regarding training and guidance of advisors and other intermediaries in rural development.

Theme 3. Enabling policies for R&I: governance, frameworks and pathways

Lead convenor: *Guy Faure*

Co-convenors: *Julie Ingram, Francesco Mantino, Patrizia Proietti*

Rationale and objectives of the session

The recent policies for research and innovation are aimed to speed up the development of a more competitive and sustainable agriculture by fostering responsive systems for generating and spreading innovation, based on interactive and multi-actor approaches.

These approaches involve different actors, roles and functions. As well, they call for the tuning of more inclusive policies and governance frameworks aimed at boosting functional relationships between the various actors and components and fosters the systemic capacity to innovate, by switching from fragmented project-led innovation to a developmental agricultural system.

In this context, a new emphasis has been placed on the role of extension in capturing grassroot needs and ideas, strengthening links between farmers and other actors, including researchers, and ensuring both the support to niche innovation and a wide dissemination of innovative results along supply chains and territories. Similarly, the role of agricultural education is relevant for further development and uptake of innovation projects results. However, in many cases, the farmers' use of extension services and the involvement of advisors, trainers and educators in innovation projects (i.e. Operational Groups of European Innovation Partnership) remain challenging.

As well, extensionists are not the unique actors able to play such a role and they often have to collaborate with other service providers to boost innovation, including private ones. Most Agricultural Innovation Systems in Europe and elsewhere are characterised by complex partnerships and networks of public extension and private services. It is highly relevant to consider how their interaction affects an 'enabling environment' for co-innovation.

There is no doubt that delivering on more effective policies for innovation needs to give far greater recognition and power to all the innovation actors, especially extensionists, involving them since the early definition of policies and programs.

For this session we call for contributions about experiences on strategies and policies aimed at supporting 'enabling environments' for innovation, particularly through inclusive and supportive approaches towards the extension and education systems. It is also interesting to investigate how the new policies for research and innovation have fostered the reorganization of extension and education services.

Theme 4. The changing role of monitoring and evaluation: approaches, methods and instruments

Lead convenor: *Jeff Coutts*

Co-convenors: *Simona Cristiano, Boelie Elzen*

Rationale and objectives of the session

Monitoring and Evaluation is a critical management tool to understand what is working well in an intervention, what needs to change and what has been achieved. It impacts on how we operate in the future and demonstrating the value proposition of different types of intervention investments.

The strategic approach to EU agricultural research and innovation (R&I) follows an 'interactive innovation' model which aims to increase project impacts through the establishment of a process of genuine co-creation of knowledge. This is in line with an international trend in dealing with complex issues through using a more systemic, multi-actor and interactive approach in understanding and guiding the research impact pathway.

With this increased demand for adaptive governance of interventions and a more flexible and emergent approach to addressing complexities in rural communities, agriculture and the environment, we need to use new and innovative approaches to monitoring and evaluating these types of interventions.

For this session we call for contributions about the theory and practice of the evaluative approaches, methods and instruments to guide and assess the effectiveness and impacts of the R&I models and approaches being used by the EU and others - and the agencies and organisations that provide these services. The focus is on the 'how to' best go about M&E for this purpose.

CONFERENCE SESSION TABLE

TUESDAY, JUNE 18

11:00 – 13:00

| | |
|--|------------------------|
| room | PLENARY 1 |
| session type | Opening session |
| Keynote speaker: | LAURENS KLERKX |
| TRANSFORMATION, DISRUPTION AND PLURALITY IN AGRIFOOD SYSTEMS: EMERGING DIRECTIONS FOR RESEARCH ON EXTENSION | |

14:30 – 16:00

| | | | | | | | | | |
|---|------------------------------|---|---------------------------|--|---------------------------|---|---------------------------|--|------------------|
| THEME 1 - Education and Extension: roles, functions and tools for boosting interactive approaches to innovation | | THEME 2 - New skills and capabilities for Extension to achieve innovation policies objectives | | THEME 3 - Enabling policies for R&I: governance, frameworks and pathways | | THEME 4 - The changing role of monitoring and evaluation: approaches, methods and instruments | | FAO event | |
| room | PLENARY 2 | room | LIBRARY 1 | room | GREEN ROOM | room | LIBRARY 2 | room | PLENARY 1 |
| session type | paper presentation | session type | paper presentation | session type | paper presentation | session type | paper presentation | session type | workshop |
| chair | Maria Gerster-Bentaya | chair | Eelke Wielinga | chair | Franco Mantino | chair | Simona Cristiano | chair | FAO |
| EXTENSION SERVICES REORGANIZATION | | ENHANCING EXTENSION SKILLS AND CAPABILITIES | | CREATING AN ENABLING ENVIRONMENT FOR INNOVATION | | METHODS AND TOOLS TO M&E E&E PROGRAMMES | | AKIS ASSESSMENT FOR EVIDENCE-BASED POLICIES AND SUSTAINABLE INVESTMENTS | |

16:30 – 18:00

| | | | |
|-----------------------|--|-------------------------|-------------------|
| room | | room | GREEN ROOM |
| POSTER SESSION | | BUSINESS MEETING | |

WEDNESDAY, JUNE 19

09:30 – 11:00

| | | | | | | | | | |
|---|---------------------------|---|------------------------------|---|---------------------------|---|---------------------------|---|----------------------|
| THEME 2 - New skills and capabilities for Extension to achieve innovation policies objectives | | THEME 1 - Education and Extension: roles, functions and tools for boosting interactive approaches to innovation | | THEME 4 - The changing role of monitoring and evaluation: approaches, methods and instruments | | THEME 1 - Education and Extension: roles, functions and tools for boosting interactive approaches to innovation | | Italian Rural Network event | |
| room | PLENARY 2 | room | LIBRARY 1 | room | GREEN ROOM | room | LIBRARY 2 | room | PLENARY 1 |
| session type | paper presentation | session type | paper presentation | session type | paper presentation | session type | paper presentation | session type | workshop |
| chair | Pierre Labarthe | chair | Maria Gerster-Bentaya | chair | Simona Cristiano | chair | Patrizia Proietti | chair | Anna Vagnozzi |
| ENHANCING EXTENSION SKILLS AND CAPABILITIES | | ROLES AND FUNCTIONS OF PLURALISTIC SERVICES IN SUPPORTING INNOVATION IN AGRICULTURE | | METHODS TO ASSESS INTERACTIVE INNOVATION | | ROLES AND FUNCTIONS OF PLURALISTIC SERVICES IN SUPPORTING INNOVATION IN AGRICULTURE | | AKIS STRATEGIES IN CAP POST-2020 STRATEGIC PLANS | |

11:30 – 13:00

| | | | | | | | | |
|---|------------------------------|---|---------------------------|--|---|---------------------------|---|---------------------------|
| THEME 1 - Education and Extension: roles, functions and tools for boosting interactive approaches to innovation | | THEME 2 - New skills and capabilities for Extension to achieve innovation policies objectives | | | THEME 4 - The changing role of monitoring and evaluation: approaches, methods and instruments | | THEME 1 - Education and Extension: roles, functions and tools for boosting interactive approaches to innovation | |
| room | PLENARY 2 | room | LIBRARY 1 | | room | LIBRARY 2 | room | PLENARY 1 |
| session type | paper presentation | session type | paper presentation | | session type | paper presentation | session type | paper presentation |
| chair | Alexandros Koutsouris | chair | Michael Kuegler | | chair | Boelie Elzen | chair | Fleur Marchand |
| KNOWLEDGE CO-CREATION | | RESPONSIVENESS OF EXTENSION TOWARDS NEW ROLES AND EMERGING TOPICS | | | METHODS TO ASSESS NEEDS FOR E&E PROGRAMMES | | ON-FARM DEMONSTRATIONS: FOSTERING A LEARNING ENVIRONMENT: | |

14:30 – 16:00

| | | | | | | | | |
|---|---------------------------|---|---------------------------|--|---|------------------------------|--|----------------------|
| THEME 3 - Enabling policies for R&I: governance, frameworks and pathways | | THEME 2 - New skills and capabilities for Extension to achieve innovation policies objectives | | | THEME 1 - Education and Extension: roles, functions and tools for boosting interactive approaches to innovation | | THEME 4 - The changing role of monitoring and evaluation: approaches, methods and instruments | |
| room | PLENARY 2 | room | LIBRARY 1 | | room | LIBRARY 2 | room | PLENARY 1 |
| session type | paper presentation | session type | paper presentation | | session type | paper presentation | session type | workshop |
| chair | Patrizia Proietti | chair | Eelke Wielinga | | chair | Alexandros Koutsouris | chair | Lisa van Dijk |
| ENABLING THE ACTIVE PARTICIPATION OF EXTENSION IN AGRICULTURAL DEVELOPMENT | | FACILITATING NETWORKS | | | ROLES AND FUNCTIONS OF PLURALISTIC SERVICES IN SUPPORTING INNOVATION IN AGRICULTURE | | EVALUATING FARMER CENTRED INNOVATION: METHODOLOGIES AND EVIDENCE TO CAPTURE MULTIPLE OUTCOMES | |

16:30 – 18:00

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|---|---------------------------|---|------------------------------|--|---------------------------|---|---------------------------|---|---------------------------|
| THEME 2 - New skills and capabilities for Extension to achieve innovation policies objectives | | THEME 1 - Education and Extension: roles, functions and tools for boosting interactive approaches to innovation | | THEME 1 - Education and Extension: roles, functions and tools for boosting interactive approaches to innovation | | THEME 4 - The changing role of monitoring and evaluation: approaches, methods and instruments | | THEME 1 - Education and Extension: roles, functions and tools for boosting interactive approaches to innovation | |
| room | PLENARY 2 | room | LIBRARY 1 | room | GREEN ROOM | room | LIBRARY 2 | room | PLENARY 1 |
| session type | paper presentation | session type | paper presentation | session type | workshop | session type | paper presentation | session type | paper presentation |
| chair | Michael Kuegler | chair | Alexandros Koutsouris | chair | Alessandra Gemmiti | chair | Simona Cristiano | chair | Pierre Labarthe |
| ENHANCING EXTENSION SKILLS AND CAPABILITIES | | ROLES OF E&E IN FOSTERING AGRICULTURAL SUSTAINABILITY | | PRECISION AGRICULTURE AND DIGITAL INNOVATION: THE NEW CHALLENGE TO FOSTER ENVIRONMENTAL AND ECONOMIC SUSTAINABILITY | | METHODS AND TOOLS TO FOSTER CAPACITY DEVELOPMENT IN INTERACTIVE INNOVATION | | EXPERIENCES, ROLES AND FUNCTIONS OF EXTENSION IN MULTI-ACTOR PROCESSES | |

THURSDAY, JUNE 20

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|--|---|--|---|
| <p>"BIOFABBRICA DI RAMACCA" AND "AZIENDA AGRICOLA LORENZO FRASSON" AGIRA (EN)</p> | <p>"AZIENDA PLANETA SCIARANUOVA SULL'ETNA" CASTIGLIONE DI SICILIA (CT)</p> | <p>"PIANTE FARO" CARRUBA DI GIARRE (CT)</p> | <p>"BIO SIKELIA ORGANIC FARMER ASSOCIATION" CASSIBILE (SR)</p> |
| <p>Departure time 8:30 return 17:30</p> | <p>Departure time 9:00 return 17:30</p> | <p>Departure time 9:30 return 17:30</p> | <p>Departure time 8:30 return 17:30</p> |

FRIDAY, JUNE 21

09:30 – 11:00

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|---|---|---|---------------------------|--|---------------------------|---|---------------------|
| THEME 4 - The changing role of monitoring and evaluation: approaches, methods and instruments | | THEME 2 - New skills and capabilities for Extension to achieve innovation policies objectives | | THEME 3 - Enabling policies for R&I: governance, frameworks and pathways | | THEME 1 - Education and Extension: roles, functions and tools for boosting interactive approaches to innovation | |
| room | PLENARY 2 | room | GREEN ROOM | room | LIBRARY 2 | room | PLENARY 1 |
| session type | paper presentation | session type | paper presentation | session type | paper presentation | session type | workshop |
| chair | Simona Cristiano and Patrizia Proietti | chair | Eelke Wielinga | chair | Julie Ingram | chair | Claire Hardy |
| APPROACHES AND ACTOR FOR AKIS ASSESSMENT | | RE-THINKING AGRICULTURAL E&E PROGRAMS | | CO-INNOVATION PATHWAYS | | ON-FARM DEMONSTRATIONS: CHALLENGES AND OPPORTUNITIES | |

11:30 – 13:00

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|---|---------------------------|--|---------------------------|---|------------------------------|---|---|
| THEME 1 - Education and Extension: roles, functions and tools for boosting interactive approaches to innovation | | THEME 3 - Enabling policies for R&I: governance, frameworks and pathways | | THEME 1 - Education and Extension: roles, functions and tools for boosting interactive approaches to innovation | | THEME 4 - The changing role of monitoring and evaluation: approaches, methods and instruments | |
| room | PLENARY 2 | room | GREEN ROOM | room | LIBRARY 2 | room | PLENARY 1 |
| session type | paper presentation | session type | paper presentation | session type | paper presentation | session type | workshop |
| chair | Pierre Labarthe | chair | Guy Faure | chair | Maria Gerster-Bentaya | chair | Boelie Elzen, Herman Schoorlemmer, Laure Triste, Hanne Cooreman, Lies Debryne and Fleur Marchand |
| ROLES AND FUNCTIONS OF PLURALISTIC SERVICES IN SUPPORTING INNOVATION IN AGRICULTURE: THE AGRILINK EXPERIENCE | | SUPPORTING POLICY DECISION MAKERS | | ROLES AND FUNCTIONS OF PLURALISTIC SERVICES IN SUPPORTING INNOVATION IN AGRICULTURE | | REFLEXIVE M&E AS A TOOL TO STIMULATE PEER-TO-PEER LEARNING AT ON-FARM DEMONSTRATIONS | |

14:30 – 16:30

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|--|------------------------|
| room | PLENARY 1 |
| closing session | Closing session |
| keynote speaker | Kristin Davis |
| AGRICULTURAL EXTENSION AND EDUCATION FOR THE FUTURE | |

DETAILED CONFERENCE SCHEDULE

TUESDAY, JUNE 18

- Welcome to the 24th ESEE
Patrizia Proietti and Simona Cristiano, conference chairs
- Opening the conference
Paolo Rapisarda, director of CREA Centre for Olive, Citrus and Tree fruit
Roberto Henke, director of CREA Centre for Agricultural Policy and Bioeconomy
- Keynote: "Transformation, disruption and plurality in agrifood systems: emerging directions for research on extension",
Laurens Klerkxs, professor at Wageningen University
Chair Gianluca Brunori, professor at Pisa University

Session

| | | | |
|---------------|-----------------------------------|-------|-----------------------|
| Session title | Extension services reorganization | Room | Plenary 2 |
| Session type | paper presentation | Chair | Maria Gerster-Bentaya |

- Doing interactive research on innovation support services: a multi-actor process towards a more mature, co-designed framework, *Andrea Knierim, Hycenth Tim Ndah and Maria Gerster-Bentaya*
- Toward a new advisory service in Basilicata, *Maria Assunta D'Oronzio, Carmela De Vivo and Giuseppina Costantini*
- Organisational cultures and epistemology as barriers between vision and practice in advisory organisations in Sweden, *Jenny Höckert and Magnus Ljung*
- On innovation, cooperation and agriculture: some reflections on these topics, *Vincenzo Sequino and Alessandra Pesce*

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|---------------|---|-------|----------------|
| Session title | Enhancing Extension skills and capabilities | Room | Library 1 |
| Session type | paper presentation | Chair | Eelke Wielinga |

- Utilising a campaign strategy instrument to influence behaviour change in crop farmers, *Emily Pope and Fiona Geary*
- Making impact through evidence based behavioural change, *Helen Brookes, Kate Mackenzie, Samantha Crocker, Katie Thorley, Ben Williams, Kate Maslany and Jolanda Jansen*
- Investigating attitude of agricultural producers and consumers towards use of the U-Pick method, *Jaber Pariab and Enayat Abbasi*
- Women in Agri-tech: Increasing participation in the future of agriculture, *Amy Cosby, Bobby Harreveld, Mark Trotter and Sally Ferguson*

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|---------------|---|-------|----------------|
| Session title | Creating an enabling environment for innovation | Room | Green room |
| Session type | paper presentation | Chair | Franco Mantino |

- Assessing agricultural innovation systems: a literature review and research agenda, *Guy Faure, Aurélie Toillier, Syndhia Mathe and Sarah Audouin*
- Governance's effects on innovation processes: the experience of EIP AGRI in Italy, *Anna Vagnozzi and Francesca Giaré*
- Identification of key challenges and information needs of those enabling and implementing

interactive innovation projects and networks (within EIP Agri), *Susanne von Muenchhausen, Anna Maria Haering, Katrina Katrina Rønningen, Szabolcs Biro and Mark Redman*

- “Cultivate the network”: a key factor for an innovation ecosystem. The case of the Italian Rural Network, *Riccardo Passero and Alessandro Monteleone*

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|---------------|---------------------------------------|-------|------------------|
| Session title | Methods and tools to M&E E&E programs | Room | Library 2 |
| Session type | paper presentation | Chair | Simona Cristiano |

- Assessing Community Needs for Extension Programming, *Suzanna Windon and Amy Elhadi*
- Towards an evaluation plan: an on-the-job training experience in Piedmont Region, *Patrizia Borsotto, Roberto Cagliero, Ilaria Borri, Stefano Trione and Anna Vagnozzi*
- Evaluation and implementation of Farmer Field Schools: a literature review, *Teatske Bakker, Genowefa Blundo Canto, Patrick Dugue and Stéphane De Tourdonnet*
- Using Program Theory to Evaluate a Forest Landowner Education Program, *William Hubbard*

FAO event

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|---------------|---|-------|-----------|
| Session title | AKIS assessment for evidence-based policies and sustainable investments | Room | Plenary 1 |
| Session type | workshop | Chair | FAO |

Poster session

- Farmers' attitudes and perceptions towards agricultural knowledge and innovation: Evidences from olive growing sector in Andalusia, *Samir Sayadi, José Luis Cruz, Adriana Bertuglia, Carlos Parra López and Luis Miguel Abisu*
- From chemical to biological pest control in central Spain greenhouses: the role of innovation support services, *José Luis Cruz and Samir Sayadi*
- Innovation in agriculture risk management, *Pietro Bertanza*
- Storytelling and visual harvesting as tools to stimulate trajectory analysis and interactive knowledge exchange in the TRANSAE project, *Marion Liberloo and Jo Bijttebier*
- Systematic analysis of innovation types and partners to identify suitable interaction formats for successful multi-actor projects, *Marianne Kuntz and Astrid Weiss*
- Innovation broker in agriculture, *TAF*

WEDNESDAY, JUNE 19

| 9:30 – 11:00 | | | |
|--|---|-------|-----------------------|
| Session | | | |
| Session title | Enhancing Extension skills and capabilities | Room | Plenary 2 |
| Session type | paper presentation | Chair | Pierre Labarthe |
| <ul style="list-style-type: none"> • The role of extension services in the adoption of innovation by farmers. The case of precision farming tools for fertilization, <i>Noemie Bechtet</i> • Advisory role in farmers' micro systems of agricultural knowledge and innovation (microAKIS), <i>Pierre Labarthe, Lee-Ann Sutherland, Boelie Elzen and Anda Adamson-Fiskovica</i> • Different knowledge and knowledge providers to fulfil the needs of direct marketing farmers: experiences in Portugal and Italy, <i>Cristina Micheloni and Livia Costa Madureira</i> • Enhancing Crop Farmers' adaptive capacity and resilience to Water Crisis in the North West of Iran, <i>Esmail Karamidehkordi, Fatemeh Safari and Kobra Karimi</i> | | | |
| Session title | Roles and functions of pluralistic services in supporting innovation in agriculture | Room | Library 1 |
| Session type | paper presentation | Chair | Maria Gerster-Bentaya |
| <ul style="list-style-type: none"> • The impact of the agricultural extension on the sustainability of the agrofood industry: The case of contract durum wheat farmers and pasta production in Greece, <i>Evangelos Vergos, Konstantinos Zoukidis, Marios Koutsoukos, Jiannis Pourikas, Demetrios Bakodimos and Anna Papakonstantinou</i> • Supporting Agritourism Industry Development in Florida, <i>Mary Henry, Yvette Goodiel, Jessica Sullivan, Hannah Wooten, Kathryn Stofer and Joy Rumble</i> • Assessment of Factors Influencing Diffusion of Agricultural Innovations among Smallholders in Makueni County, Kenya, <i>Carolyn Khalayi Wafula, Anthony Esilaba and Cromwel Lukorito</i> • Designing frameworks for characterizing and assessing innovation support services and innovation support providers: SERVInnov project, <i>Syndhia Mathé, Sarah Audouin, Guillaume Fongang, Maria Gerster Betaya, Andrea Knierim, Hycenth Tim Ndah, Narilala Randrianarison, Aurelie Toillier and Ousmane Traoré</i> | | | |
| Session title | Methods to assess interactive innovation | Room | Green room |
| Session type | paper presentation | Chair | Simona Cristiano |
| <ul style="list-style-type: none"> • Redefining the value of agricultural innovation: Between value propositions and value co-creation, <i>Evangelos Lioutas, Chrysanthi Charatsari, Marcello De Rosa, Giuseppe La Rocca and Majda Černič Istenič</i> • Understanding interactive innovation for sustainable agriculture, <i>Anna Maria Augustyn, José María Díaz Puente, Robert Home, Tom Kelly, Brian Leonard, So Young Lee, Aine Macken-Walsh, Sylvain de Quedeville and Pablo Vidueira</i> • A qualitative approach to evaluate the effect of the introduction of "innovations" in mountain zootechnical holdings, <i>Francesco Beldi and Elena Bassano</i> • A two-mode network approach to analyse the interaction processes among farmers, <i>Norman Aguilar-Gallegos, Laurens Klerkx, Enrique Genaro Martínez-González and Jorge Aguilar-Ávila</i> | | | |
| Session title | Roles and functions of pluralistic services in supporting innovation in agriculture | Room | Library 2 |
| Session type | paper presentation | Chair | Patrizia Proietti |
| <ul style="list-style-type: none"> • Digitization and emerging social challenges: a conceptual framework, <i>Gianluca Brunori and Elena Favilli</i> • Better farmers influence change: The case of an Irish sheep monitor farm programme, <i>Martin Mulkerrins, Michael Gottstein and Bridget Lynch</i> • The role of agricultural extension towards facing climate change IN Al-Gharbia Governorate, Egypt, <i>Esam El-Baaly and Manal El-Khadragy</i> | | | |

- Methods and tools used by innovation support services in Italy, *Valentina Carta, Simona Cristiano, Maria Assunta D'Oronzio and Patrizia Proietti*
- How Much the Iranian Agricultural Graduates are Competent? (Investigating the employers' viewpoint), *Mahsa Saadvandi, Enayat Abbasi and Homauon Farhadian*

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|---------------|---|-------|---------------|
| Session title | Italian Rural Network event: AKIS strategies in CAP post-2020 strategic plans | Room | Plenary 1 |
| Session type | workshop | Chair | Anna Vagnozzi |

Session

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|---------------|-----------------------|-------|-----------------------|
| Session title | Knowledge co-creation | Room | Plenary 2 |
| Session type | paper presentation | Chair | Alexandros Koutsouris |

- Accompany the collective construction of a plan for the future. The case of a collaborative and territorialized process for the actors of the PDO cheese 'Fourme de Montbrison' (Loire, France), *Sylvain Dernas, Dominique Vollet, Patrice Cayre and Bertrand Dumont*
- RMPP Action Network: an interactive initiative from New Zealand, *Heather Collins and Denise Bewsell*
- Addressing the socio-ecological context of farm safety through a co-design approach to farm safety promotion interventions, *Tracey O'Connor, David Meredith, Jim Kinsella, John McNamara and Denis O'Hora*

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|---------------|---|-------|-----------------|
| Session title | Responsiveness of Extension towards new roles and emerging topics | Room | Library 1 |
| Session type | paper presentation | Chair | Michael Kuegler |

- Requirements of Agricultural Occupational Health Extension in Iran: Causal and Contextual conditions, *Somayeh Moradhaseli, Homauon Farhadian, Enayat Abbasi and Fazlolah Ghofranipur*
- Social farming - new challenge for development of advisors' skills and capabilities, *Józefina Król*
- New Area of Interest of Rural Extension: Care Farming, *Tayfun Cukur, Dilek Bostan Budak and Tecer Atsan*
- Agricultural advisers in dealing with farmer stress- A case study in the Teagasc Kerry/Limerick region of Ireland, *Claire McAuliffe, Deirdre O'Connor and Tom Kelly*

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|---------------|--|-------|--------------|
| Session title | Methods to assess needs for E&E programs | Room | Library 2 |
| Session type | paper presentation | Chair | Boelie Elzen |

- Assessing Leadership Development Needs for Modern Extension Organization, *Suzanna Windon and Mariah Stollar*
- Using a digital tool to gauge the relevance of agricultural advisory services, *Kevin Heanue, Tom Kelly, Lance O'Brien and Ronan Coady*
- Understanding farmers' innovation needs: a proposal for supporting the Public decision-making process to improve innovation adoption in agriculture, *Andrea Arzeni, Elisa Ascione, Patrizia Borsotto, Valentina Carta, Tatiana Castellotti and Anna Vagnozzi*

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|---------------|--|-------|----------------|
| Session title | On-farm demonstrations: fostering a learning environment | Room | Plenary 1 |
| Session type | paper presentation | Chair | Fleur Marchand |

- Networking of demonstration farms: a critical reflection on potential support tools, *Laure Triste, Heidrun Moschitz, Annie McKee and Fleur Marchand*
- On-farm demonstrations as learning environments: how can they stimulate learning that contributes to sustainable development in agriculture?, *Hanne Cooreman, Lies Debruyne, Heide Spiegel, Taru Sanden, Helena Elmquist, Peter Paree and Fleur Marchand*
- Learning and anchoring processes initiated by agricultural demonstration activities in Switzerland, *Rebekka Frick, Kathrin Huber and Heidrun Moschitz*
- A methodological approach to identify key characteristics and best practical approaches for organizing effective on-farm demonstrations, *Marianne Hubeau, Lies Debruyne, Hanne Cooreman, Laure Triste, Hannah Chriswell, Julie Ingram, Alex Koutsouris, Yiorgos Alexopoulos, Eleni Pappa and Fleur Marchand*

| | | | |
|---------------|--|-------|-------------------|
| Session title | Enabling the active participation of Extension in agricultural development | Room | Plenary 2 |
| Session type | paper presentation | Chair | Patrizia Proietti |

- Re-orientating extension and research to inclusive innovation: The case of hybridisation of a New Zealand agricultural research organisation, *James Turner, Helen Percy, Andrew Hall and Laurens Klerkx*
- Starting from scratch: Building knowledge and innovation systems for ecosystem services in Sweden, *Magnus Ljung and Lotta Fabricius Kristiansen*
- The Effect of Meta-cognitive and Self-directed Skills on Academic Achievement among Agricultural Students, Iran, *Masoud Bijani, Aliakbar Raeisi, Naser Valizadeh, Negin Fallah Haghighi and Maryam Neisi*
- International Agency Extension Model in Ukraine: Retrospective Analysis, *Suzanna Windon*

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|---------------|-----------------------|-------|----------------|
| Session title | Facilitating networks | Room | Library 1 |
| Session type | paper presentation | Chair | Eelke Wielinga |

- Building advisory relationships with farmers to foster innovation, *Monica Gorman, Peter Grogan and Kevin Heanue*
- Policy Makers as Free Actors: the South Holland Case, *Eelke Wielinga and Jifke Sol*
- The Agricultural Knowledge and Innovation System (AKIS) in Campania Region: the challenges facing the first implementation of experimental model, *Ferdinando Gandolfi, Concetta Menna, Teresa Del Giudice, Imma Cigliano and Maria Passari*
- Fostering the dialogue between traditional and scientific knowledge: Agricultural researchers' perception, *José Luis Cruz, Samir Sayadi and Luis Miguel Albisu*

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|---------------|---|-------|-----------------------|
| Session title | Roles and functions of pluralistic services in supporting innovation in agriculture | Room | Green room |
| Session type | paper presentation | Chair | Alexandros Koutsouris |

- Extension Education and Agricultural Technology Adoption Among Smallholder Farmers in Western Kenya, *Newton Nyairo and Mark Russell*
- Will Saudi farmers adopt the electronic marketing to trade their agricultural products?, *Bander Alsaghan, Ahmed Diab and Medhat Abdel-Wahab*
- The role of innovation support services in boosting innovation in female-owned Italian farms. Is being entrepreneurial enough?, *Marcello De Rosa, Luca Bartoli, Chrysanthi Charatsari and Evangelos Lioutas*
- Identifying the gap between research and practice: the case of innovative spraying equipment, *Alexandros Koutsouris, Emilo Gil, Paolo Balsari, Sebastien Codis, David Nuyttens, Spyros Fountas and Vasiliki Kanaki*

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|---------------|---|-------|---|
| Session title | Evaluating farmer centred innovation: methodologies and evidence to capture multiple outcomes | Room | Plenary 1 |
| Session type | workshop | Chair | Lisa van Dijk, Julie Ingram Simona Cristiano |

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|---------------|---|-------|-----------------|
| Session title | Enhancing Extension skills and capabilities | Room | Plenary 2 |
| Session type | paper presentation | Chair | Michael Kuegler |

- Building extension capacity in privatized extension systems: Insights from delivery of on-line professional development modules in Australia, *Ruth Nettle, Jana Axinja-Paschen, Margaret Ayre, Barbara King, Nichole Reichelt, Michael Santhanam-Martin, Tom Phillips, Jo Coombe and Jacquelyn Watt*
- Translating the transformative learning approach into practice, *Maria Gerster-Bentaya and Andrea Knierim and Beatriz Herrera Sabillón*
- Increasing the Competence of Agricultural Advisors in Uganda, *József Kozári*
- Innovative training for advisors and farmers on creating added value at farm level. Case study from Poland, *Jozef Kania and Henryk Skornicki*

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|---------------|---|-------|-----------------------|
| Session title | Roles of E&E in fostering agricultural sustainability | Room | Library 1 |
| Session type | paper presentation | Chair | Alexandros Koutsouris |

- The Outcomes of Sustainability Learning Transfer and Its Relation to Farmers' Subjective Readiness and Ability: Evidence from Conservation Agriculture Project in Iran, *Pouria Ataei, Hassan Sadighi, Mohammad Chizari and Enayat Abbasi*
- Integrated components of innovation system toward sustainability: evidence from dairy industry, *Zahra Fozouni Ardekani and Homayoun Farhadian*
- Looking for the missing link: The multiple meanings of sustainability in agricultural knowledge and information systems, *Chrysanthi Charatsari, Håkan Jönsson and Philip Papadopoulos*
- Awakening senses and sensitivity to make sense in learning approaches of agricultural sustainability, *Juliette Anglade, Matthieu Godfroy and Xavier Coquil*
- Place attachment and water conservation intention among Iranian farmers, *Naser Valizadeh, Hamid Karimi-Gougheri and Masoud Bijani*

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|---------------|---|-------|--------------------|
| Session title | Precision agriculture and digital Innovation: the new challenge to foster environmental and economic sustainability | Room | Green room |
| Session type | workshop | Chair | Alessandra Gemmiti |

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|---------------|--|-------|------------------|
| Session title | Methods and tools to foster capacity development in interactive innovation | Room | Library 2 |
| Session type | paper presentation | Chair | Simona Cristiano |

- Development of a participatory approach to foster transdisciplinary knowledge exchange on agro ecological farm innovation in an interregional context, *Jo Bijttebier and Marion Liberloo*
- Focus Group Discussion: a multi-purpose tool for stakeholder consultation, fostering social learning processes and monitoring learning outcomes, *Richard Kraaijvanger*
- Facilitating innovations in Rural communities for Carbon Sequestration Project in Iran, *Esmail Karamidehkordi, Kobra Karimi and Matthias Buchecker*

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|---------------|--|------|-----------|
| Session title | Experiences, roles and functions of extension in multi-actor processes | Room | Plenary 1 |
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|---|--------------------|-------|-----------------|
| Session type | paper presentation | Chair | Livia Madureira |
| <ul style="list-style-type: none"> Varieties of advice provision in mutable practices: direct marketing and biological pest control in Latvia, <i>Emils Kilis, Anda Adamsons-Fiskovica, Sandra Sumane and Talis Tisenkopfs</i> The challenges of disseminating agro-ecological innovations build on knowledge co-creation: the case of <i>Douro vineyards, Livia Madureira, Fabiola Polita, Tiago Mucha and Carla Marques</i> Rethinking the development of extension materials: A participatory approach to the development of a succession and inheritance decision support tool, <i>Tomas Russell, Monica Gorman, James Breen and Kevin Heanue</i> Use of Triple 'A' Model for Enhancing Knowledge Management and Communication Process among Maize Farmers in Kaduna State, Nigeria. <i>Ali Abdullahi</i> | | | |

THURSDAY, JUNE 20

Excursion

| | |
|------------------------------------|--|
| Departure time 8:30 – return 17:30 | “BIOFABBRICA DI RAMACCA” AND “AZIENDA AGRICOLA LORENZO FRASSON” AGIRA (EN) |
| Departure time 9:30 – return 17:30 | “AZIENDA PLANETA SCIARANUOVA SULL’ETNA” CASTIGLIONE DI SICILIA (CT) |
| Departure time 8:30 – return 17:30 | “PIANTE FARO” CARRUBA DI GIARRE (CT) |
| Departure time 8:30 – return 17:30 | “BIO SIKELIA ORGANIC FARMER ASSOCIATION” CASSIBILE (SR) |

FRIDAY, JUNE 21

Session

| | | | |
|---|--|-------|--|
| Session title | Approaches and actor for AKIS assessment | Room | Plenary 2 |
| Session type | workshop | Chair | Simona Cristiano and Patrizia Proietti |
| Session title | Re-thinking agricultural E&E programs | Room | Green room |
| Session type | paper presentation | Chair | Eelke Wielinga |
| <ul style="list-style-type: none"> GPS Cows: an interactive digital technology knowledge exchange with high school teachers, <i>Amy Cosby, Jaime Manning, Mark Trotter and Bobby Harreveld</i> The effect of course design on student engagement - Benefits and barriers, <i>Kevin Cunningham, Monica Gorman and James Maher</i> Farm advisory services and knowledge growth in Italy: comparison among three regional intervention models, <i>Ferdinando Gandolfi, Marcello Cannellini, Giorgio Trentin, Concetta Menna, Teresa Del Giudice, Carla Cavallo, Imma Cigliano and Maria Passari</i> Attitude of agricultural extension agents about electronic agricultural extension in Al-Gharbia Governorate, Egypt. <i>Esam El-Baaly</i> | | | |
| Session title | Co-innovation pathways | Room | Library 2 |
| Session type | paper presentation | Chair | Julie Ingram |
| <ul style="list-style-type: none"> Understanding attitudes, values, opportunities and barriers in participatory research: the case of Riso-Biosystems project on organic rice farming, <i>Elena Pagliarino and Secondo Rolfo</i> Cooperation Between Researchers and Practitioners in Small-scale Fisheries Co-management: a Comparison of Recent Experiences in the Mediterranean Sea, <i>Lucia Tudini, Luca Lanteri and Alessandro Voliani</i> The challenge of collaboration for achieving co-innovation in the New Zealand primary sector, <i>Janet</i> | | | |

Reid, David Gray, James Turner and Roxanne Henwood

- Pathways of social innovation in agriculture: good practices in Calabria region, *Tatiana Castellotti, Giuseppe Gaudio and Emilia Reda*

| | | | |
|---------------|--|-------|--------------|
| Session title | On-farm demonstrations: challenges and opportunities | Room | Plenary 1 |
| Session type | paper presentation | Chair | Claire Hardy |

- The Virtual Farm as an alternative or an addition to 'live on-farm demonstration' : Challenges and opportunities, *Claire Hardy and Lee-Ann Sutherland*
- Exploring structural factors which contribute to effective on-farm demonstrations, *Alex Koutsouris, Yiorgos Alexopoulos, Eleni Pappa, Hannah Chiswell, Julie Ingram, Hanne Cooreman, Lies Debruyne and Fleur Marchand*
- Disentangling success factors and principles of agricultural demonstrations, *Anda Adamson-Fiskovica, Mikelis Grivins, Boelie Elzen, Robert Burton, Sharon Flanigan, Rebekka Fricck and Claire Hardy*
- Gender norms in on-farm demonstrations: Why new approaches to increase female participation are needed, *Hannah Chiswell, Ingram Julie, Sanden Taru, Spiegel Adelheid, Debruyne Lies, Cooreman Hanne, Fleur Marchand and Áine Macken Walsh*

Session

| | | | |
|---------------|--|-------|-----------------|
| Session title | Roles and functions of pluralistic services in supporting innovation in agriculture: the AGRILINK experience | Room | Plenary 2 |
| Session type | paper presentation | Chair | Pierre Labarthe |

- The adventurous adoption processes of innovations: three Greek cases, *Alexandros Koutsouris and Eleni Zarokosta*
- The most important actors in Czech Agricultural Knowledge and Innovation System in farmers' opinions, *Marta Mrnuščík Konečná, Andrea Pekárková, Sumudu Boyinová and Martin Mistr*
- Top-down farm advice is still alive! Farm advice as a tool of symbolic imposition: insights from a French case-study, *Matthieu Ansaloni, Pierre Labarthe and Pierre Triboulet*
- Knowledge Diffusion and Precision Farming: Farmers and Advisory Suppliers in North-East Scotland, *Christina Noble and Leanne Townsend*

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|---------------|-----------------------------------|-------|------------|
| Session title | Supporting policy decision makers | Room | Green room |
| Session type | paper presentation | Chair | Guy Faure |

- A functional dynamics perspective in agricultural innovation systems for improved policy relevance, *Lisa Blix Germundsson, Charlotte Norrman and Magnus Ljung*
- How to assess agricultural innovation systems for supporting policy decision makers: a Delphi consensus study, *Aurelie Toillier, Syndhia Mathé, Abdoulaye Saleymoussa, Guy Faure and Delgermaa Chuluunbaatar*
- Policy support for farm women's entrepreneurship and innovation - comparing experiences and outcomes in Bavaria and Ireland, *Stefanie Düsberg and Monica Gorman*
- The generational renewal and related innovations in Italian rural areas. The controversial role of EU policies, *Francesco Mantino*
- Boosting different types of knowledge flows in EU AKISs: an overview of R&I infrastructures, *Anna Augustyn, Simona Cristiano, Floor Geerling-Eiff and Patrizia Proietti*

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|---------------|---|-------|-----------------------|
| Session title | Roles and functions of pluralistic services in supporting innovation in agriculture | Room | Library 2 |
| Session type | paper presentation | Chair | Maria Gerster-Bentaya |

- Possible roles and functions of education of advisors for boosting innovation in the Hungarian sheep sector, *Attila Németh, László Gulyás, Gábor Milics and András Vér*
- Multi-actor approaches to innovation in organic farming: role of Organic districts in Italy, *Alberto Sturla, Valentina Carta, Laura Vigano, Simona Cristiano and Patrizia Proietti*
- Farmers' use of information sources and adoption of reduced soil tillage technologies – the case of Russian Siberia, *Miroslava Bavorova, Ilkay Unay Unay Gailhard, Elena Ponkina and Tereza Pilarova*
- Advisor conceptions of roles and functions in the context of market-oriented extension: A comparison of Australian and New Zealand advisors, *James Turner, Fernando Landini and Helen Percy*

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|---------------|--|-------|---|
| Session title | Reflexive M&E as a tool to stimulate peer-to-peer learning at on-farm demonstrations | Room | Plenary 1, |
| Session type | workshop | Chair | Boelie Elzen, Herman Schoorlemmer, Laure Triste, Hanne Cooreman, Lies Debruyne and Fleur Marchand |

13:00 – 14:30

Lunch

14:30 – 16:00

CLOSING SESSION

Keynote: Agricultural extension and education for the future

Chair

Francesco Mantino, CREA

Kristin Davis, Development Strategy and Governance Division (DSGD), International Food Policy Research Institute (IFPRI) c/o University of Pretoria

KEYNOTE SPEAKERS



Prof. Laurens Klerkx

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Laurens is Professor at the Knowledge, Technology and Innovation Group of Wageningen University, The Netherlands. His research interests include intermediaries in agricultural innovation, innovation systems, change agency in sustainability transitions, internationalization of knowledge flows, and more recently the social dynamics of digitalization in agriculture. He has (co-)authored over 100 journal articles and several book chapters. Laurens is a member of the editorial board of the international journals Agricultural Systems and International Journal of Agricultural Sustainability, and editor-in-chief of the Journal of Agricultural Education and Extension. He is a member of the steering committee of the International Farming Systems Association, member of the Science Advisory Panel of AgResearch Ltd (New Zealand) and has held advisory positions for several research and innovation programmes and projects in Europe, New Zealand, Australia, and Latin America.



Dr. Kristin Davis

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International Food Policy Research Institute (IFPRI) c/o University of Pretoria, Department of Agricultural
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Extension and Rural Development
k.davis@cgiar.org

Kristin Davis is a senior research fellow in the Development Strategy and Governance Division of the International Food Policy Research Institute, Washington, D.C. She has conducted research on farmer field schools, rural institutions, agricultural innovation systems, pluralistic extension systems and extension education in Africa and worldwide. She has some 40 peer-reviewed journal articles, book chapters, and policy briefs. She is Editor-in-Chief of the Journal of Agricultural Education and Extension (JAEE). She has served as president of the Association for International Agricultural and Extension Education (AIAEE) and currently serves on the board of the AIAEE journal. Davis was the architect of the New Extensionist Learning Kit, a set of modules containing core competencies for the global extension agent.



ESEE 2019

24° European Seminar On
Extension (And) Education

Agricultural Education and Extension tuned
on innovation for sustainability.
Experiences and perspectives

PROCEEDINGS

Simona Cristiano and Patrizia Proietti (Eds)



- 1** Education and Extension: roles, functions and tools for boosting interactive approaches to innovation

Doing interactive research on innovation support services: a multi-actor process towards a more mature, co-designed framework

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Keywords

Innovation support services; multi-actor approach; SERVInnov Project.

Abstract

In spite of increasing interests on multi-actor approaches, mutually productive forms of collaborative research involving scientists and practitioners have not been sufficiently documented and analysed. Based on the SERVInnov project, this contribution presents the concept of an 'interactive research process' and operationalises it by 1) presenting relevant conceptual tools to analyse the process, 2) showing how this was realised for the purpose of co-designing conceptual frameworks for mapping and characterising innovating support services (ISS) and providers (ISPs), and, 3) reflecting on its benefits and limitations in generating scientifically valid knowledge for researchers, practically applicable knowledge for practitioners and joint-learning benefits for both groups.

We demonstrate the combination and conflation process of a range of innovation related concepts and key issues to a (more) mature framework for agricultural innovation support. Based on first presentations and tentative discussions of concepts during the kick-off meeting, an initial structure had been proposed as written document and submitted to partners. Reactions were unequally distributed and ranged from 'not at all' to 'many comments', mostly from partners from the global North. Face-to-face meetings were important to understand the meaning of concepts within the frame of different contexts. A joint field study was conducted in order to explore and test understandings and concepts and related tools. The SERVInnov experience calls for a better definition of project methodologies in multi-actor projects, so that the type of interactive process is more precisely planned and detailed beyond. There is still a need to investigate whether some types of interactive research processes or some of its sequences are more appropriate than others to trigger real collaborative work between the research and practice system.

Introduction

Recent global trends, especially within EU-Africa research and collaboration projects

have led to renewed interest in multi-actor collaborative approaches (Bäckstrand, 2006b; Biermann et al., 2007; Brouwer et al., 2016; Hemmati, 2012) for the purpose of agricultural and agro-food innovation generation and dissemination. This is especially inspired by a recognition of the complementary roles of researchers and practitioners (Hoffmann et al., 2007) involved in the co-production of concepts and methods which aim at generating both scientifically valid and practically applicable knowledge (Wiek, 2007). The interest is further authenticated by the observation that traditional research approaches have insufficiently related with practice (EU- SCAR, 2012, 2013). These observations - as a result of the linear knowledge generation and dissemination practice (World Bank, 2006) that had characterised this field for many years, has led to a paradigm shift from the focus on well-defined and often familiar groups of researchers, farmers and or practitioners to making use of multi-stakeholder collaborative research approaches as a source of knowledge and innovation generation.

In spite of this increasing interests, and with the exception of a few studies (Ellström, 2007; Svensson et al., 2007a; Svensson et al., 2007b; Wiek, 2007) mutually productive forms of interactive research¹ processes between researchers and practitioners, as well as across disciplinary boundaries have not been systematically documented and analysed. Additionally, there is an array of terms designating different forms of “multi-actor collaboration” such as: “co-creation”, “inter- and trans-disciplinarily, multi-stakeholder processes” or “participatory action research approaches” (Argyris and Schön, 1989; Bäckstrand, 2006a; Chambers, 1994; Hadorn et al., 2008; Punch, 2005; Stringer, 2013), which all in effect describe interactive research processes.

In this contribution, we use the concept of the ‘interactive research process’ (Ellström, 2007; Svensson et al., 2007a; Svensson et al., 2007b; Wiek, 2007) and operationalise it for the SERVInnov project by specifically, 1) presenting relevant conceptual tools to analyse this process, 2) showing how the process was operationalised for the purpose of knowledge-creation and integration by way of co-designing conceptual frameworks for mapping and characterising innovating support services (ISS) and providers (ISPs), and, 3) reflecting on the benefits and limitations of such research approach to generate scientifically valid knowledge for the Scientists, practically-applicable knowledge for the practitioners and joint-learning benefits for both of them. By so doing, we hope to i) bring more clarity to the meaning and understanding behind an interactive research process, ii) fill the evidence-based knowledge gap on the benefits and limitations of an interactive research process for the collaborating actors, iii) discuss the importance of analysing interactive research processes and the methodological aspects.

Interactive research process concepts

An interactive research process aims at producing both 1) research results of good scientific quality and, 2) practically-applicable knowledge as a basis for concrete measures. These two goals are complemented by a third one which consists in the learning outcomes gained by both parties through this interactive process (Svensson et al., 2015; Svensson et al., 2007b). The process depicted in Fig.1 shows two interacting systems, called the research system and the practice system (Ellström, 2007; EU-SCAR, 2013). Although this is not explicitly made clear by Svensson et al. (Svensson et al., 2007b), both cyclical systems exhibit three scopes of interactions i) research - research interaction (R-R), ii) practice - practice interaction (P-P), iii) and research - practice interaction (R-P). All these interactions are driven by problems or issues of interest, originating from either the research or practice system. Especially the research - practi-

1 we use the term interactive research in an overarching manner to cover all forms of collaboration, co-creation, inter- and trans-disciplinarily, multi-stakeholder processes including various forms of participatory action research approaches.

ce interaction process is based on the “assumption that there is a clear division of interests, responsibilities, powers and expertise between researchers and participants within the framework of the collaboration that takes place”(Svensson et al., 2007a pp. 269). Within the research system, activities such as data collection and analysis form the basic activities undertaken which are assumed to be guided by some form of explicit or implicit theories and concepts originating from either previous research work or practical experiences. In addition to such cognitive-theoretical factors, a range of other factors related to the participating individuals (from multi-disciplinary backgrounds in case of researchers) as well as organizational and societal conditions are assumed to influence the activities which take place within the interactive research process (Svensson et al., 2015; Svensson et al., 2007b).

At the start of the interactive process, practitioners and researchers officially meet, discuss and decide on the issues that the respective parties are interested in and wish to jointly examine. The agreed upon issues, then govern the researchers’ choices regarding the theoretical reference framework and choice of methods (Ellström, 2007; Svensson et al., 2015) within the research versus research scope of interaction.

The issues are then investigated by the researchers who collect data and analyse them while the end results are then discussed, interpreted and conceptualised in a joint process i.e. at the scope of research versus practice interaction activities (Probst et al.,

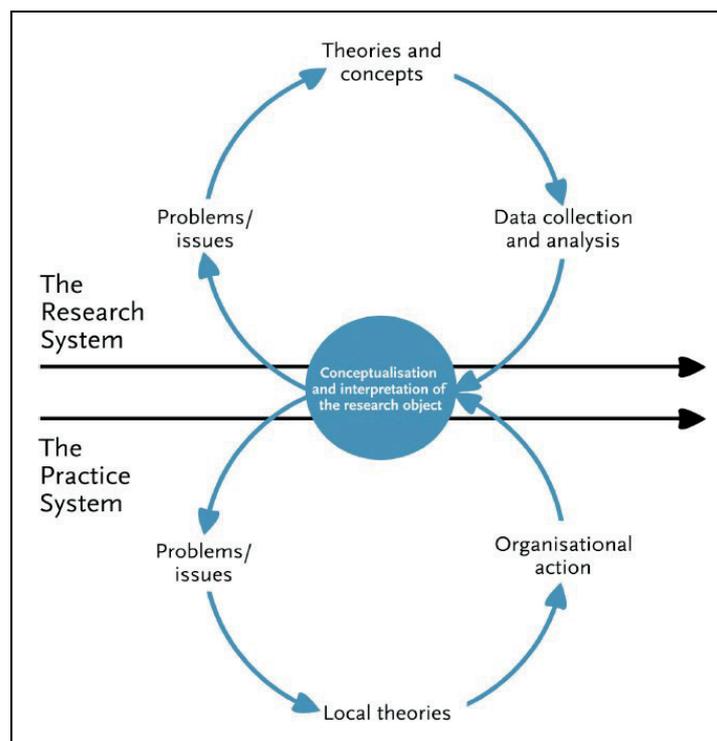


Figure 1: An interactive research process (Svensson et al., 2007b)

2019). Once, options for actions are proposed based on the derived results, the responsibility for taking action and implementing practical operational changes lies with the project participants from the practice system (Ellström (2007). After the proposed measures have been implemented, a new discussion can be held between the researchers and the practitioners to define the new issues they are jointly interested in continuing for the second round i.e. if they find that the preconditions for proceeding exist, and that there is a joint interest in doing so. The point of intersection (indicated by the shaded circle) in the model (Figure 1) is very important as it is here that the research – practice interaction process is assumed to produce common conceptualizations and

interpretations of the research object that are fed back as “cognitive input” into the next cycle of problem-solving activities, but also into the next cycle of the research process (Svensson et al., 2015; Svensson et al., 2007b).

Operationalising the interactive research process: the SERVInnov experience

Background and basis of the interactive research process in SERVInnov

Within the frame of the EU-LEAP-agri call 2017, 27 projects across 4 topics were selected for a three-years’ funding period. One of these projects is SERVInnov (“Strengthening innovation support services to enhance innovations for sustainable food production, ensuring well-being of rural populations and reducing environmental degradation and resource depletion”). It has the aim to investigate how, when and from whom innovative stakeholders in agricultural value chains can obtain innovation support services to enable them to successfully overcome problems and improve their livelihoods. SERVInnov directly builds upon experiences made in former EU projects such as AgriSpin and JOLISSA, where a broad range of innovations across Europe and African were studied and innovation support services (ISS) observed and categorised. Additionally, experiences from PRO AKIS are taken into account, where the focus was on examining the diversity of agricultural knowledge and information systems (AKIS) with corresponding advisory services across EU. In its project design, SERVInnov implies that experiences and insights gained in these projects can be made relevant for and applied to new contexts and for new beneficiaries such as smallholder farmers in various rural areas in Africa. Given the fact that SERVInnov consortium is composed of a mix of practice and research partners drawn from global northern and southern countries, with diverse interests, experiences, and expectations, this multi-actor setting called for the use of an interactive process as the most fitting research approach. As previewed in the SERVInnov project proposal, it is the design of a conceptual framework that constitutes the initial impetus for the interactive research process since it should serve the interests of both: the researchers and the practitioners.

Partners description and justification of the interactive research setting

The SERVInnov Research system consists of 6 research partners made up of Universities and Research centres from Europe (France, Germany), Africa (Madagascar, Cameroon and Burkina Faso) and of international character (IITA). Cirad (France) and the University of Hohenheim (Germany) had already past collaborative experience on a similar project (AgriSpin) and the project coordinator (Cirad/IITA) had already collaborated with some of the African Research organizations.

The practice system consists of 4 partners which are international NGOs active in Burkina Faso (GRET) and Cameroon (IECD), a professional association having a national mandate in Madagascar (FIFATA) and AFAAS which is an umbrella organization active throughout the African continent.

The partner organizations of both systems wish to enhance their comprehension of innovation support services. The research partners wish to provide evidence that the strengthening of agricultural food systems depends on certain types of ISS combinations within agricultural and agri-food value chains, as well as on some specific institutional arrangements. This should support policy recommendations and the derivation of new knowledge aimed at improving the functioning of ISP and ISS. The practitioner system is interested in generating new (practical) knowledge about the functioning of innovation systems in their respective countries in order to improve the performance

and quality of ISS and to enhance the sustainability of their ISPs' activities.

Co-designed conceptual framework – North-South research interactions

University of Hohenheim as lead partner for the conceptual work guided the interactive research process for the co-design of the joint framework. It started with a first presentation and discussion of concepts during the multi-stakeholder kick-off meeting in late September 2018. This first exchange resulted in the researchers' choices regarding the theoretical concepts that were expected and best suited towards fulfilling the objectives of studying support services and providers around innovation processes. On this basis, a draft conceptual framework was elaborated by the Hohenheim team, which was meant to address the topic in a comprehensive way, although differentiated into a macro- and a meso-scale level of analysis. As a written document, this first structure was forwarded to the partners via email inviting for feedback, comments and complementary contributions. Reactions were unequally distributed and ranged from 'not at all' to 'many comments', mostly from research partners from the global North. After several reminders, the conceptual framework deliverable was finalised by early December as a working document. However, due to the partial reactions, it was considered to be 'premature', as it remained open whether it was meaningful and apt to enhance collaboration for all partners. Thus, a face-to-face meeting of the research partners in January 2019 was used to renew discussions as a way to better tailor and explain the framework and to clarify differences in understandings. After several loops of follow-up interactions (e.g. via a series of virtual skype/video meetings, email communications) resulted an adjusted framework for mapping and characterising ISP and ISS (Knierim et al. 2018). This framework integrates a broad range of concepts apt to illustrate the complexity of agricultural innovation. As an example we present a graph that illustrates specifically what happens in a service situation as well as specific levels that could best fit as entry points for the mapping and characterising ISP and ISS (Fig. 2). Figure 2 illustrates a "service situation" within which ISPs, are represented by different forms and shapes with their clear organisational boundaries. Sometimes hierarchical structures are observed within ISP (see triangularly shaped ISP) amongst the internal member constellation.

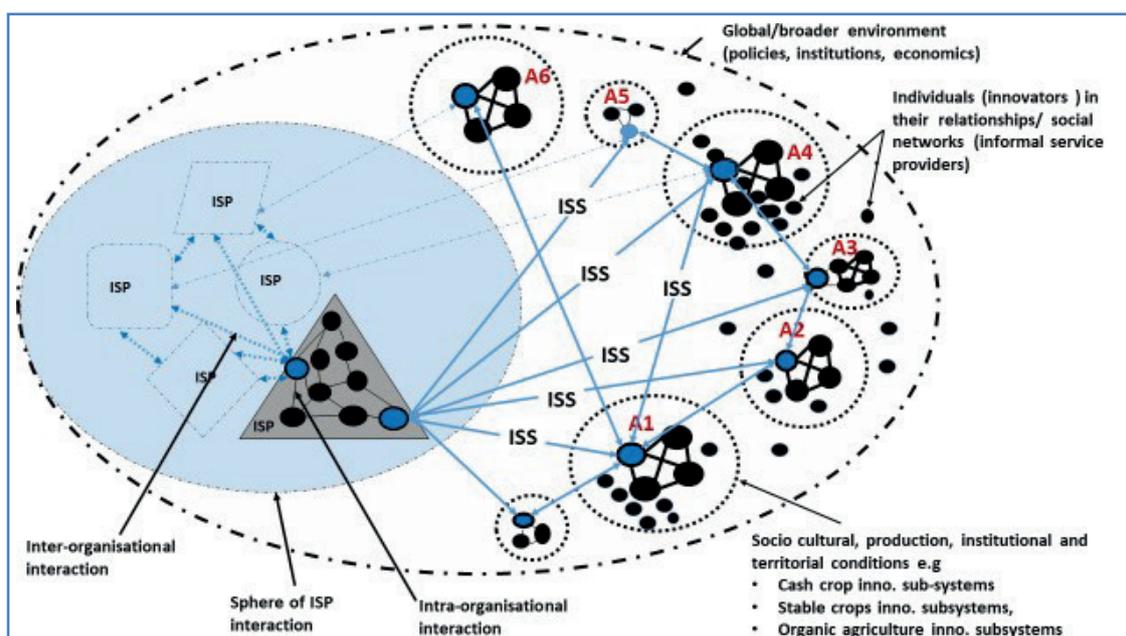


Figure 2: The SERVInnov meso-scale conceptual framework - a service situation

Such ISP are made up of individuals (service agents) represented within the different organisations (by round dots) in their different fields of specialisation. On the other hand, letters A1, A2, A3, A4, A5, A6 ...n, represent clients or beneficiaries' organisation. For a service provision to take place, the service provider does interact with the beneficiaries' organisation(s) or directly with individual beneficiaries to co-produce a service, which solves the problem of the beneficiary (Labarthe et al. 2013, Hoffmann et al. 2009).

Refining and probing the conceptual framework interactively

From late March to early April 2019 a field mission took place in Cameroon in order to further elaborate and exchange on how to best utilise the conceptual tool for studying ISS at an inter-organizational level.

Researchers from Europe, Cameroon and Burkina Faso met and undertook several activities ranging from uni-directional information provision and mutual knowledge sharing (e.g. presentation and discussion of the concepts derived from previous projects) to collaborative research activities (e.g. joint mapping of exemplary innovation sub-systems, co-writing and testing of a short interview guideline all followed by some discussions). During these activities, Cameroon researchers presented results from explorative fieldwork that was based on (parts from) the joint framework. Conceptual aspects were challenged including the appropriateness of some typologies of ISPs, the relevance of some categorization criteria and the different ways of assessing linkages among the ISPs.

The partners adjusted their comprehension of key terms and started to share the same coded language. In addition, divided into three mixed teams, the researchers tested and refined the method of targeted innovation system mapping and jointly brainstormed and characterised ISP for three exemplary innovation sub-systems. By doing so, they were able to justify or reject the appropriateness of some ISP characterization components (e.g. legal status, geographical scale of intervention, etc.). This knowledge could then be combined into a co-created "ISP mapping" and discussed in plenum. This co-conceptualized representation of the reality - which was originally based on a rather fragmented understanding of ISP systems - can now be used to inform other researchers in Madagascar and Burkina Faso about the joint conceptual approach.

Towards a shared-vision of the conceptual framework among the Research and Practitioner System

The field mission in Cameroon was also an occasion to introduce the conceptual framework to some practice partners from the national level in Cameroon. Core element of this meeting was a participatory exercise whereby the practitioners were invited to express their needs.

The results revealed (i) a high degree of concordance between practitioners' expectations and the project's intended outputs, and (ii) the expectation of practical support for successful interactions within the AKIS, with a particular focus on political decision makers and ISP, to name a few. Besides, practitioners strongly emphasised their interest in an ongoing interactive approach of SERVInnov. Future interactive processes are planned to take place among the researcher and practitioner systems, e.g. when the outcomes from the three study countries will be presented and discussed.

Reflecting on the benefits and limitations of interactive research processes

Summarising, we have gained a number of observations and insights from the so far practiced interactive approach on the joint conceptual bases. These are:

- The aggregation and the transmission of previously developed and tested concepts into a new context of application came with the risk of accumulating a huge body of knowledge that just due to its size may be challenging for 'newcomers' to appropriate;
- Written communication as e.g. through e-mail letters and text commenting was an insufficient tool for inclusive participation and constructive exchange on concepts and key term understandings;
- A joint understanding of the concepts' contents was only achieved through face-to-face discussions which took into account the different scientific communities' perspectives, and allowed partners to refer to their contexts of application;
- The application of the concepts through a targeted methodological approach has been greatly enhanced by organising and conducting a joined field-level test through visiting and interviewing selected stakeholders in Cameroon.
- Although the initially planned results from SERVInnov were corresponding well to practitioners' needs, they expressed a considerable number of further expectations with concrete political and practical relevance.

In the following, we discuss the gains from these and further observations for the two systems and the joint learning level.

Scientific knowledge generation

The interactive process among the diverse research partners did not yet generate scientifically valid data but constitutes a number of necessary steps in order to form an operational interdisciplinary and international North-South team of scientists. With respect to the here presented process, the development of a functional interface between the various researchers took the big bulk of activities in terms of time and, also resources vested. These activities allowed the different actors to align their knowledge and to effectively collaborate on concepts and data collection tools. In this regards, the co-development of a conceptual tool is central.

From a more abstract point of view, interactive research processes that are taking place among researchers (R-R) contribute to adjust and refine the conceptual basis and research tools. They are therefore useful to improve the quality of the research outcomes. The products of these interactions (both on the conceptual framework and methods) should however be taken cautiously. What emerges from the interactive research processes is only a prototype which needs to be enhanced based on systematic literature review. In Social Sciences, most of the data collection tools are not totally fixed/determined but only provide a guidance for the interview process, so this flexibility is not a problem. The real benefit of the R-R interactive research processes is that, the knowledge-bases of all partners is taken into consideration allowing a qualitative gain in the preparation of the data collection tools.

Sharing the conceptual tools among partners and making sure that this will be adapted and used in a way to effectively analyse the situation across three different countries has been challenging. Nevertheless, the operationalization of the co-designed framework and concepts and respective steps of interaction is being handled with a certain degree of flexibility as this depends largely on the prevailing conditions and experiences in the respective case study areas. However, a cautious effort in maintaining main themes and focus of the framework and cross-cutting levels of focus for interactively mapping and characterising ISS and ISP is necessary in order to allow inter-subsystem and inter-countries comparisons where and when possible.

Practically applicable knowledge generation

Based on the so far experiences with the SERVInnov interactive approach, it is assumed that the following knowledge can potentially be generated by the practitioners through the future interactive research:

Firstly, the interactive processes that are planned for the next steps of the project are likely to on the one hand, lead to a better understanding of the ISPs positioning in terms of ISS delivery for specific innovation subsystems. On the other hand, the ISPs will obtain some potentially useful information from the ISS clients with regard to how they perceive ISPs, their needs and their strategies to mobilize ISS.

Secondly, the Practitioners of Cameroon have already been able to reflect on their own difficulties and needs. The research partners have already integrated some of the expressed needs of the practitioners into the SERVInnov Project. Some research questions have for instance been refined to reflect their difficulties to find innovative funding mechanisms and qualified human resources, an aspect that may be further reflected upon during the case study analysis stage. The Project will thus fill up better their knowledge gap.

The practitioners of the three countries will further be able to reflect on their own capacities during the interview phases (WP2). This knowledge comprises information on their accumulated expertise, their business model and their development strategy. This could be a first step towards a deeper analysis and strategic action (re-orientation, specialization, partnerships development, change of legal status to better reflect their mandate and attract funding, etc.).

Finally, the interactive processes are going to improve the networking capacities of the practitioners. Indeed, some of them will have an opportunity to get to know each other and even to collaborate on some joint-learning activities (Mapping validation workshop in WP2) during the research process.

Joint-learning outcomes

As previously described, joint-learning outcomes is an important lesson of the interactive research process since it consists in sharing case-specific and school-of-thought specific knowledge among each other at various stages of the project. The SERVInnov experience has shown that different forms of innovation research process have different effects. Presenting the conceptual framework and then asking for feedback has received very diverse levels of response. This could be explained by different reasons. First of all, the international research partners had previous collaboration experience on the same topic, this has probably played in favor of a fast and abundant reaction. Moreover, during the Cameroon field mission, the African research partners have demonstrated their high level of motivation and interest towards the conceptual framework and a strong willingness to work towards its improvement. The uni-directional innovation research process to introduce the conceptual framework has given rise to rich discussions where the Partners shared discussed with some degree of freedom. A potential explanation to this was the setting of the innovation research process which was taking place in a face-to-face manner in their mother tongue rather than in a distant written way in English. It seems that the following collaborative innovation research process have even reinforced the level of discussions.

Conclusions

The Interactive research process loop has particularly been useful to analyse the activities at stake within this multi-actor research project. However, in the case of the SERVInnov project, the Research System was initially divided between the Northern and the Southern partners.

The SERVInnov experience also confirms that conceptualizing complex social systems brings significant benefits since through the interactive research process, the different visions of the reality can be adjusted and not only scientifically knowledge, but also practically applicable knowledge and joint knowledge-base can be generated. Using the co-designed framework, the Research and Practice Systems should be able to generate either practical or scientific outputs for itself. This can happen in entirely independent ways or through a certain level of collaboration (e.g. the practitioners are invited to review the Scientific papers and the Scientists are invited to support some strategic development plans).

Ensuring that both partners systems equally benefit from the interactive process in terms of knowledge generation is however challenging, especially since researchers generally initiate and lead most of the interactive research processes. Moreover, the interactive phases among practitioners and researchers in the planning phase of the project are often limited to some short face-to-face interactive meetings, whereas multiple written exchanges among the Researchers allows a higher degree of appropriation of the conceptual tool by them. There is therefore a risk that the practitioners do not generate enough practically applicable knowledge for themselves.

Agreeing with Poh and Erwee (2004), we observe that there are obvious benefits of collaborating among multi-stakeholders on a common conceptualization of the reality, since the knowledge becomes transferable and allows further elaboration.

The SERVInnov experience calls for a better definition of Project methodologies in multi-actor projects – especially when they are trans-disciplinary and trans-border – so that the type of interactive research process are more precisely planned and detailed beyond the one commonly mentioned in project proposals and which consist in normal R-P interactions often limited to data collection phase.

There is still a need to investigate whether some types of interactive research processes or some sequences of this research processes are most appropriate than others to trigger real collaborative work around a conceptualization of the research object.

Finally, the SERVInnov project's preliminary activities have shown that multi-actor project settings are dependent on socialization processes which need to be supported by field missions and face-to-face exchanges.

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Towards a new advisory service in Basilicata

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Keywords

FAS, CAP, innovation advisory service

Introduction

The transition towards the improvement of Lucanian agro-food systems and the emphasis on multi-actor and trans-disciplinary approaches towards innovation has led to an increasing interest in actors who can facilitate and support these processes. The literature under different perspectives have been explored extension and advisory services with result involved the actor performing and function (Birner, 2009; Cristiano, Proietti, 2012, 2015; Koutsouris A. (2012). This study explores the existing Lucanian advisory services, including those within innovation co-operation projects, known as the Operational Groups (OG) which were recently approved by the Basilicata region. Consulting services have undergone profound changes over the last few decades, both in role and function and the way they are organised. Public services in Italy have been strongly influenced by Common Agricultural Policy (CAP), with considerable focus in the 90s creating conditions for the establishment of regional agricultural development agencies. However, services have been impacted significantly since 2000 with the introduction of financial cuts (Vagnozzi, 2005), and, funding for advisory services was reduced by about half between 2000 and 2005, in comparison to the previous five years (Vagnozzi, 2008) and have continued reducing. Agricultural innovation system services have been declining both at regional and national level, and, as a result, Basilicata's agricultural services have begun internal restructuring to include the integration of consulting services and the reduction in the range of activities for agricultural innovation, mainly due to skills shortage and an inability to exploit the rural development policies of the Rural Development Programme (RDP). The 2007-2013 Community Programme provided the knowledge and innovation system with an important role in the CAP, thanks to the mandatory establishment of the Farm Advisory System (FAS). Advice is considered to be the tool to guide farmers towards increased competitiveness; unfortunately the FAS has not been able to increase the effectiveness of services and promote increased integration into the wider context of the knowledge system (AKIS). This is mainly due to the absence of a clear Community strategic plan able to promote a systematic approach to the development of human capital with a series of regulatory constraints (Cristiano, 2012). Basilicata consultation services participation was limited in Measure 124 "Cooperation for the development of new products, processes and technologies" which introduced the principle of interactive innovation as a learning tool for actors (Enrd, 2013). The conditions for trans-disciplinary and multi-actor interrelationships between enterprises, research and education were created during the 2014-2020 programming period, developing new methodologies for interactive transfer are supported by the establishment of the European Partnership for Innovation (EIP) networks set up through Operational Groups (OGs).

Research approach

Business consulting services in Basilicata have been in decline, changing the organizational model significantly, becoming increasingly fragmented with opportunity for growth in some productive sectors. The difficulty for consultants in receiving EU funding and information from the Basilicata 2007-2013 RDP has further impacted the region. A wide debate on these issues has been opened at national level (Brunori, 2005) in which the need to understand the real demand for services by the territory, often only present in a latent form, is emphasized (Disanto et al. 2016).

This paper highlights the results of research carried out in Basilicata on the role of regional development services and the various actors and their participation in innovation processes. This research focus on how advisory services respond to Lucanian agricultural innovation needs and how do they develop innovation pathways from Measure 16.1 of the 2014-2020 RDP. In response to Lucanian agricultural innovation needs, qualitative interviews were carried out with consultants to grasp the evolution of development services in the region, and the role of agricultural and forestry services in innovation processes. The interviews focussed on the actors' experience of consulting services and how innovation needs were met over time. Interviews with stakeholders were aimed at grasping:

- the evolution of development services in the region,
- the role of agricultural and forestry services in innovation processes.

Various stakeholders were interviewed for the survey, who had participated in the analysis of innovation needs and in the candidacy for the establishment and management of the Operational Groups (OGs) in Basilicata.

Results

In response to the first objective a new role has emerged for both public and private regional consultants, which has evolved and adapted to Community needs over the last decade. Public consultancy services have been affected by the lack of "dedicated" Community resources and, tools at its disposal. Basilicata consulting services strengths lie in the system actions undertaken in recent years by private consultants such as the financing of value chain, which shows an increase in competence in organizational and management skills.

Corresponding data from the Farm Accountancy Data Network (FADN) surveyors revealed that work carried out in close contact with the farmers has made it possible to grasp their needs and understand what consulting services are available. The main results from the FADN are that agronomic treatment advice and cultural care carried out by the manufacturers technical representatives and the Tax Assistance Centres "CAFs" are useful for the deployment of all administrative matters. Development Agency for Innovation in Agriculture's (ALSIA) involvement in the field of consultancy services has decreased for various reasons in recent years, including the downsizing of experimental and model farms, to problems relating to the governance of the agency itself due to staff shortages and management by commissioners for long periods. ALSIA was last reorganized in 2015, and to date, has three action areas: a) planning and development, b) research, c) basic services, divided into transversal services. Experimental farms can guaranteed a more direct relationship with agricultural companies on issues relating mainly to cultivation techniques and animal husbandry. Multifunctionality, plays a part in intervention and advice and the quality and certification of agricultural products, also recognized by Community trademarks. However, in the absence of plans to boost staff numbers and retrain existing staff, there will be a reduction in the number of te-

chnicians and an increase in the average age of employees, both penalizing factors. The Metapontum Agrobios Research Centre and ALSIA recently joined forces allowing for the implementation of innovation activities in the agriculture, agro-industry, green chemistry and bio-economy sectors.

Private consulting services include the Regional Association of Breeders (RAB) who manage the territory and veterinary services for the prevention and treatment of diseases for various species and services relating to food and production. To meet the needs of regional livestock companies, RAB's consulting services have been revised and technicians have been trained on the new mission of improved sustainability with the creation of networks between the various actors.

Nine fruit and vegetable producers have been active in the region and provide consultancy services regulated by the Community. The Agricultural Professional Organizations (APO) provide consulting services on topics such as marketing, production chains, health and safety, correct use of pesticides, and pay particular attention to the classification and quality of products. In all cases, the activities carried out follow the organizations strategies, in the absence of a regional policy strategy.

A large number of regional consultants, both public and private, have participated, in the innovation pathways of Measure 16.1 of the 2014-2020 Basilicata RDP. Basilicata region selected 21 projects and financed 11. OGs consist of 190 partners: 31% public and 69% private. The public sector is represented by universities, research institutions and ALSIA. The private sector, agricultural and forestry companies, represents 84% of which is represented by. Fruit and vegetables, viticulture and forests are the three OGs with the largest number of partners OGs increased participation in consulting services compared with Measure 124 of the 2007-2013 Basilicata RDP, a positive sign of the need to embed the dissemination of innovations in the model.

EIP is a network of organizations, enterprises and individuals focussed on creating new products, new processes and new organizational structures, while working with institutions and policies that affect their behavior and performance (Hall et al., 2006), it is mainly based on the concept of an "Agricultural Innovation System" (AIS).

This system requires all the actors to be present in the innovation process, adopting many roles, such as, facilitators (Koutsouris, 2012), consultants and innovation brokers, who can stimulate change and develop innovative solutions (Koutsouris, 2012), as well as support and facilitate people engaged in agricultural production to solve problems

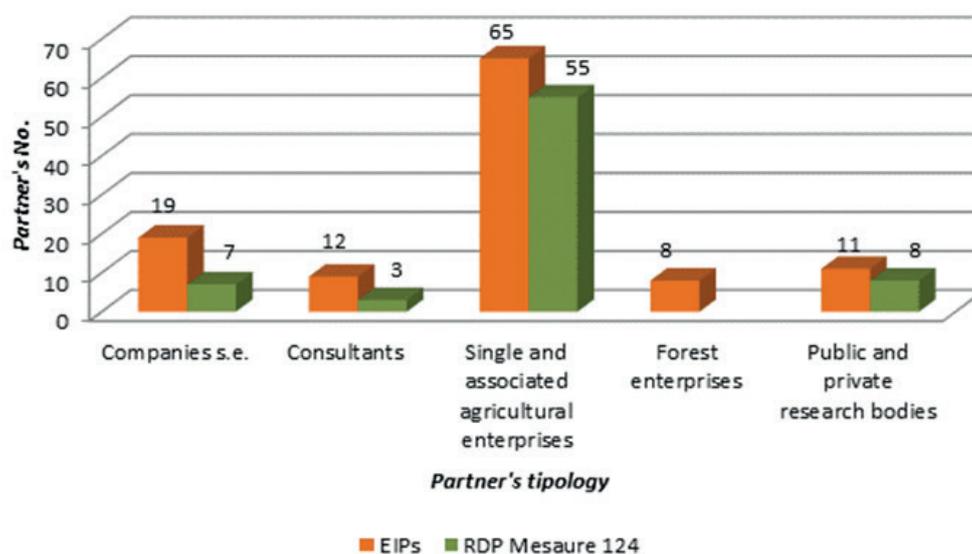


Figure 1 - Partnership EIPs and Measure 124 (RDP 2007-2013)

Source: CREA's processing on Basilicata Region data

and obtain information and develop skills and technologies to improve their living conditions and well-being (Birner et al. 2009). The various Lucanian research actors decided to work together for the first time to create common projects for the regional territory (D'Oronzio, 2018) and therefore also supported or replaced innovation broker.

The facilitators stressed the importance of the multidisciplinary aspect of the "Research Table" which has facilitated the creation of varied joint projects, perfectly integrated to respond to the multiple needs of actors and advisory services. The facilitators also highlighted the importance of working together: discussing, analysing and co-designing are essential elements in the creation of a network.

Conclusions

The Basilicata AIS is complex. Over the years, there has been positive growth in terms of farmers and foresters knowledge and skills, perhaps due to the effect of rural development policies which have provided more opportunity for services. Consultants organised their services to satisfy the needs of agricultural and forestry enterprises, including public actors who created a different regional system of service provision.

The establishment of the EIP in Basilicata, stimulated the implementation of a new knowledge transfer model based on collaborative approaches and on the co-development of innovation. The lack of support from the Region has forced consultants to become specialized innovation intermediaries, honing their skills and professionalism and re-connecting with AIS. In the EIP, actors must work more in synergy, networking to provide specific support to farms.

The facilitator interviews were an excellent opportunity to explore the perceptions of consultants and, at the same time, help them reflect on their role. The changes within Lucanian EIPs requires more support from the Region with a focus on promoting the knowledge system with the aim of relaunching the agri-food industry, to improve networks between all the actors whilst recognizing their new role.

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Organisational cultures and epistemology as barriers between vision and practice in advisory organisations in Sweden

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Abstract

Purpose: This paper builds on the premise that an individualistic culture obstructs the organisational capacity both of taking a systems approach on the situations they face and of working with learning and change processes corresponding to second and third order character. The aim is to establish what is needed for the creation of a collaborative culture within the advisory system in Swedish agriculture.

Methodology: The paper is based on a multiple-case study approach, but is also a longitudinal study, the main data being three sets of qualitative semi-structured in-depth interviews conducted between 2010 and 2015.

Findings

We argue that Swedish advisory organisations seem to suffer from an inconsistency between their formulated visions and the way they organise and offer their services. We claim that many of the shortcomings in the organisations are related to the lack of space for reflective discussions and learning across competencies where existing schemata and related systems boundaries are subject to questioning and realignment, but also because of a simplistic view of how collaborative cultures are created.

Practical implication: The article discusses how a more reflective and critical advisory service can be achieved and emphasises the role of leadership in creating a conducive environment in which a collaborative culture among advisors can emerge.

Originality/Value

There are several papers that deal with advisors, their different roles and new advisory methods. This paper takes an organisational perspective and discusses how despite actions to create a collaborative culture having been taken, many advisory organisations are still characterised by being individualistic in Sweden.

Keywords: Sweden, advisory service, organisational culture, loops of learning, system boundaries epistemology

On innovation, cooperation and agriculture: some reflections on these topics

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CREA- Council for Agricultural Research and Economics

Keywords

Innovation, CAP, agricultural development systems

Abstract

The future vision of agriculture has two extreme positions, represented by the High-Tech scenario dominated by large multinationals investing in advanced technologies, and a very strict localism in which the single local communities seek self-sufficiency. This paper analyses a path that enhances a guidance and oversight role at national level, by employing Data-Driven Methodologies and Open Data-based Machine Learning technologies, and by supporting a cultural change through the contribution of emerging disciplines (i.e. design thinking). This new path should not forget the importance of the territorial approach in order to enforce action learning and micro-learning, with a new system that is certainly far from the traditional methods.

Introduction

The long process of reorganization of the Common Agricultural Policy (CAP), starting from the mid-2000s, has led to a re-modulation of both strategies and tools, introducing elements of subordination (called conditionality elements) to get economic benefits. The aim was to respond to the needs of civil society, which required the primary sector a much more multi-functional role. Not only it had to produce food, but above all safe food, produced with the greatest contribution of the young generations while: protecting environment, biodiversity, landscape, territory and local culture; supporting the development of rural areas, the quality of life and income of farmers; providing effective responses to climate change, food security and territorial planning (OECD, 2011; European Commission, 2010).

In order to provide adequate answers to these new demands, innovation becomes central, even if the complexity of the new paradigm of agricultural and rural development redesigns its aims, trajectories and transfer mechanisms (Knickel et al., 2009; North and Smallbone, 2000).

Innovations in different sectors (agronomy with solutions based on nature, rearing, vertical agriculture, animal husbandry, technology, digital, organizational and product-related innovations) are within our reach and can foster the multi-functionality of the EU's agricultural and food systems (Knickel, et al., 2004). Research and innovation are the basis of the progress made to deal with the challenges of the agricultural sector and of the EU's rural areas at economic, environmental and social level (Smits et al., 2010). On the other hand, the needs and contributions of rural areas are increasingly entering into the European Union's research program, and also the CAP intends to further enhance

synergies with the research and innovation promotion policy (Knickel et al. 2009). In this way a path has been outlined; starting from 2004 and within a horizon that goes at least up to 2030, it outlines the shift in emphasis from the production of goods to the behaviors of the agricultural entrepreneur, who is encouraged to introduce innovations consistent with the production activities of the different agricultural systems. This contextualization of innovation implies a high multidimensionality and a relative complexity. Therefore, the mediation of knowledge becomes a key issue. In this sense, considering that even beyond 2021 the Knowledge System will have a central role in the programming of the Structural Fund, some reflections about the functioning methods of the extension services seem to be appropriate; they are responsible for implementing the various territories and, in a “non-experimental” way, targeted and continuous initiatives for involving the agricultural entrepreneur, providing advisory services and supporting innovation.

In fact, agricultural extension services have always been an instrument for achieving the objectives set at Community level. In the paradigm of modernization, which inspired the first phase of the CAP linked to food security objectives (also associated with a standardized demand for products), the need for an increase in productivity has addressed linear models of knowledge and innovation transfer. The transition towards a reflexive modernization (closely associated with a de-standardization of the demand for products), where the topics of the sustainability of agricultural systems have begun to “condition” the offer of innovation, has involved a different articulation of the contents of knowledge and innovation, stirring up the debate on the need to review the organizational methods, knowledge and skills of the subjects that transfer knowledge / innovation (Materia, 2012; De Rosa et al., 2014)

It must necessarily be a medium and long term scenario: in fact, it concerns a cultural change that is so radical as to require times and ways of implementation which, as we shall see, respond to the needs of the agricultural world and take into account the availability of continuous information technology and fast evolution.

The goal of our work is to analyze the “Agricultural Extension Services”, first through a historical analysis by examining the European Policy in the 1980s and 1990s and then by defining its role in modern agriculture; then we will propose, in this context, a possible description of the organizational system aimed at promoting innovation and the exchange of knowledge in the agri-food sector. We will try to identify a methodological framework that helps look beyond the specificity of the agricultural sector, in order to create something new in Agriculture.

In Section 2 we will try to analyze the evolution of the Agricultural Extension Services starting from the 1980s; in Section 3, we will analyze the CAP and the new knowledge and innovation systems in agriculture; subsequently, in section 4, we will propose a specific case of development. Finally, in Section 5, we will show some conclusive elements of the work.

The AESs in the 1980s and 1990s

In recent decades we have witnessed a real and important growth in agricultural productivity, supported also by Agricultural Extension Services. In those times we used to speak of the AKS - Agricultural Knowledge System, a term coined in the 1960s and linked to an interventionist agricultural policy that sought to coordinate the transfer of knowledge to speed up agricultural modernization. The term AKS (Agricultural Knowledge System) indicated a set of actors: researchers, consultants and educators working in a specifically agricultural field. Therefore, the emphasis was on the role of formal knowledge production in national agricultural research institutes, which was then transferred to the agricultural system according to linear models (producer - innovation

user) mediated by the Agricultural Extension Services, both of individual (e.g. business consultancy) and collective type (e.g. training) (Rivera and Sulaiman, 2010).

Starting from the 1970s, international organizations such as OECD and FAO (Food and Agriculture Organization) introduced the concept of “Agricultural Knowledge and Information Systems” (AKIS), described as “a set of agricultural organizations and/or persons, and the links and interactions between them, engaged in the generation, transformation, transmission, storage, retrieval, integration, diffusion and utilization of knowledge and information, with the purpose of working synergistically to support decision-making, problem solving and innovation in agriculture” (Röling, 1990)

The concept developed the notion of AKS, emphasizing the process of knowledge gene-

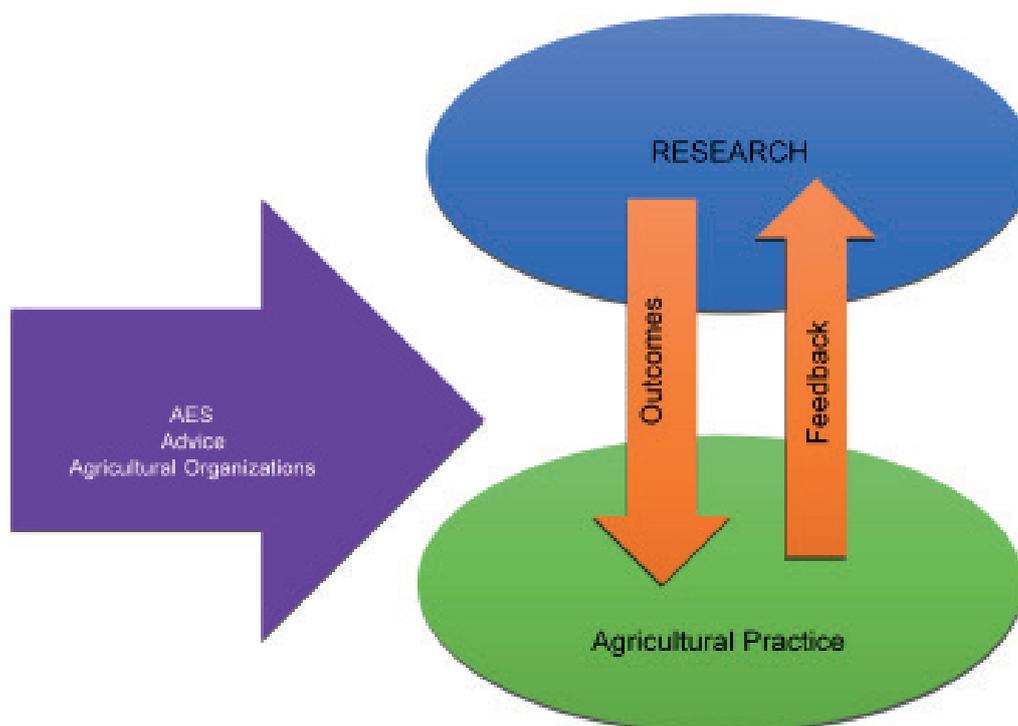


Figure 1 - Top-down model of knowledge

ration which was then transferred to the rural world (Leeuwis and Van den Ban, 2004). In those years, it was essentially a matter of implementing some process innovations, consisting of technological solutions ready for use and to be adopted without specific efforts in adapting and learning them. Martinelli (1998) pointed out that in many European regions, however, there is a difficulty between innovations, investments and cultural/ economic traditions of the region itself. The system was supported by a top-down model of knowledge, in which innovation arose from a “pre-packaged” solution, based primarily on science and technology and the innovative potential of which was expressed through a set of indicators referring to scientific research, its management and “transfer” to the various application fields. (Esposti, 2013)

Indeed, in the 1980s and 1990s, we witnessed a real and important growth in agricultural productivity, supported above all by the private sector and undoubtedly also by Agricultural Extension Services; what supported it were not so much technologies, but the optimization of production factors, fungicides, fertilizers, crop chemicals, etc.

In order to build up and strengthen this system, the CAP has provided for various interventions over the course of twenty years, starting from the Reg CE. n. 270/79.

With this objective, for example, the training system for agricultural technicians (called in Italy, *Divulgatori Agricoli Polivalenti*, All-purpose Agricultural Popularizer) was developed, which, once employed by the Public Administration, had the task of linking research

ch with agricultural enterprises. Thus the CIFDA (Consorti Interregionali per la Formazione dei Divulgatori Agricoli, Interregional Consortiums for the Training of Agricultural Advisers) were founded for the training (lasting 9 months) of the aspiring technicians, whose salary was reimbursed by the EU for the first six months of work.

In Italy, the CONSESA (National Committee for the Agricultural Development Services), the PNSSA (National Program on Agricultural Development Services) and other reference bodies were established.

The first Multifund Operational Program on Agricultural Disclosure (89/93), on the one hand, ensured the financing of CIFDA and their courses, and the reimbursement of salaries on the other. It also added experimentation and, with Measure n. 4, identified some OUT (Local Operating Units) on which to concentrate dissemination methodologies, equipment and more.

From 1994 to 1999, a specific measure for research funding was introduced in the Multi-regional Operational Program too. Even then, to benefit from this, a partnership was needed between the world of research (for innovations) and the regions (to define needs and ensure its impact on the territory).

With the 2007 - 2013 CAP programming, specific measures were then introduced for Advice and Cooperation, aimed at transferring innovation. These measures effectively embedded the contemporary debate on the issue of social capital, a term which is not always defined in a single way, but that certainly constitutes a consolidated “metaphorical” concept to indicate the importance (for the management of the territory, and therefore for “politics”) of solid social relationships permeated by a “widespread trust”, able to facilitate coordinated actions to stimulate institutions. The communities and territories characterized by a system of relationships, based on mutual and widespread trust between people, and by the sharing of a set of values and norms, in fact, generally manage to address unitary “actions” when their members, in aggregate form, are activated on the basis of common rules to reach common goals. In this sense, social capital is considered as a “productive” resource useful for achieving objectives that individuals could not reach otherwise.

Social capital is based on three different forms of relationship: bonding (physical or cultural bond), bridging (networking or associations) and linking, i.e. of “action”, of relationship with the institutions, which the communities recognize as interlocutors and towards which they are activated in order to obtain new and adequate policies (Harper, 2002). The existence of organized channels towards institutions is certainly the form of social capital that better manages to sustain the effectiveness of a development policy, since the social capital, as an asset, is also substantiated by the other two forms of relationship. In this sense, it is therefore in line with the paradigm of cohesion and the logic of sustainable development, in the field of which it contributes to improving the global understanding of what quality of life is, what are the private behaviors that contribute to it, and which policies are necessary to promote and support it.

The concept of “relational goods” proposed by Storper (1997), indicating “a specific type of goods that arise from relationships and by means of relationships between people, and are essentially made up of these relationships themselves” (Colozzi, 2005, p. 13), is substantially similar to that of social capital (which we have just described). Also the ancient Chinese concept of *guanxi* (*kuan-hsi*), which describes the importance attached by Chinese culture to care of personal ties (Wong and Salaff, 1998), fits within this framework. Focusing on these concepts was an important step as it allowed us “recognizing that the propensity and ability to cooperate, expressed by the members of a given society, significantly influence the characteristics of the economic and political development” (Mutti, 1998). In this sense, social capital acquires the nature of a collective good: those who strengthen these reciprocity structures generate benefits for all the individuals included in these structures (Putnam, 2004).

Public interventions are developed consistently with these acquisitions, starting from the 2007 - 2013 CAP planning, which, with the new measures for the Cooperation and the Transfer of innovation, intend to improve the levels of social capital in the society; the latter, due to its ability to increase the level of trust and improve the dissemination of information, must be considered a fundamental element to limit inequalities and increase development (Sabatini, 2004).

To date, the strategy of the European Commission is moving in this direction to such an extent that, with the drafts of the new regulations, the EU Commission requires to build an ad hoc system: let us see which one and how to do it.

The evolution of the CAP and the new systems of knowledge and innovation in agriculture

We have just seen how the new vision of modern rurality implies an integration of the sectorial (rural and agricultural) approach with the territorial one, fueling the need to develop “social capital”. From the renewed approach also springs a new perspective of knowledge systems defined with the acronym AKIS (“Agricultural Knowledge and Innovation Systems”), a concept that seeks to encompass all the complexity of the processes of knowledge and innovation in the rural sphere. This transformation does not leave aside the actors of the “old” AKS system, but it widens the audience of stakeholders, encouraging them to be more open and more cooperative. The shift towards the new system mainly implies a plurality of approaches and a change in the conversation economy (Storper, 1997): it is no longer a matter of conveying a single message to the farmers (for example, that of “improving efficiency”), but it is about encouraging them to adopt a broader and more complex vision.

Indeed, innovation does not only concern the technical or technological dimension, but it increasingly involves strategy, marketing, organization, and management (OECD-Eurostat; 2005). Innovation in agriculture does not necessarily mean applying or developing “new” technologies, since innovations are also the result of different ways of thinking, doing things and recombining the different kinds of knowledge in an innovative way.

This is therefore the scenario in which in 2012, the European Commission established The European Innovation Partnership for Agricultural productivity (EIP-AGRI); these are partnerships which, by implementing the Europe 2020 strategy, support multidisciplinary cooperation to reach faster outcomes in research and innovation. Their objectives are the same as those of agricultural policy (competitiveness, sustainability, biodiversity, food security, etc.) alongside that of “building bridges between cutting-edge research knowledge and technology and farmers, forest managers, rural communities, businesses, NGOs and advisory services.” (EU Reg. No. 1305/2013 art.55 d).

Some member states operate in the same field; for example, in Italy, the Ministry of Agricultural Policies has published the 2014-2020 Strategic Plan for innovation and research in the agricultural and forestry sector, within which there are 6 innovation strategies (productivity, climate change, supply chain coordination, quality and typicality, sustainable use of resources, and knowledge systems reorganization).

The European Commission Communication on the post-2020 Common Agricultural Policy (CAP) entitled “The Future of Food and Agriculture”, reaffirms that knowledge exchange and innovation are a transversal objective of the new CAP; at the same time, it supports a model of innovation emphasizing the collaboration between the actors, in order to “supplement” the various forms of knowledge to the best. Farmers need to acquire new knowledge, new skills and innovative ideas to develop and manage production systems that have to become smarter, more resilient and sustainable.

Therefore, if the future CAP encourages greater investments in research and innovation (€ 10 billion within the EU Horizon Europe program), it also reiterates the need to im-

plement all the actions allowing farmers and rural communities to benefit from them. In the Proposal for a Regulation of the European Parliament and of the Council dated 01/06/2018, it was reiterated that “The strategic plan of the CAP of each country will include a section on how to stimulate the knowledge and innovation exchange (for example, through advisory services, training, research, rural networks, pilot projects, EIP-AGRI operational groups) and how to finance them”, while Member States will be encouraged to use big data and new technologies for performing controls and monitoring activities “(European Commission, 2008)

The connection with the outcomes achieved within the EIP-AGRI is clear; a sort of AKIS 2.0 is introduced, which proposes an interactive model of innovation focused on the needs of the agricultural world, where knowledge is co-created by farmers, researchers, advisors, companies, NGOs, etc. A system in which all the actors are equally involved in knowledge and innovation systems focused on the real problems of the agricultural world, so as to provide feasible solutions that farmers are motivated to implement (EIP-AGRI 2018).

In this direction, by 2020, a new effort will be required; in particular, member states, regions, and authorities implementing agricultural policies will have to design a new system providing for a different set of:

- Roles
- Competencies
- Methods
- Instruments

Roles

Starting from the roles, reference is made to the AKIS 2.0 model, presented by Inge Van Oost, in which many suggestions for the various actors emerge in line with the strategic objectives of the post 2020 CAP.

With reference to the specific role of public authorities at European level, the EIP-AGRI network brings together all the actors necessary for the adoption of innovations (farmers, advisors, researchers, agri-food companies, NGOs etc.) and is managed by the Commission through the EIP-AGRI Service Point, which has activated many services including thematic focus groups, the organization of events to foster confrontation and encourage cooperation, the collection of implemented practices, and the structuring of an interactive web portal on innovation in agriculture.

Today’s challenge is to spread this model to the peripheries, without taking away - while spreading it - the creative energy that characterizes it. This challenge directly affects the Agricultural Extension Services, now often renamed as Innovation Support Services, which need somehow to change tools and mentality to facilitate the achievement of the objectives set in the EU (EIP-AGRI Service Point, 2014).

Moving from the center to the peripheries, let us then describe the Italian national system. In Italy, it is the task of the National Rural Network to promote the connection between the world of research, the companies and the service providers, and therefore to support the implementation of the EIP-AGRI initiative (in connection with the European Network), as well as to promote links with “H2020” and national policies. In the current programming, the Rural Development Programs of every region offer the financial support necessary for the Operating Groups that intend to develop, experiment with and apply innovative approaches, in line with the EIP objectives, through sub-measures 16.1 and 16.2 (operational groups and pilot projects). At the same time, regional RDPs contribute to the transfer of knowledge and innovation in the agro-forestry sector and in rural areas, also through measures 1 (Training, Information and Exchange) and 2

| Actros | Tips |
|--|---|
| Research | Promote greater interaction between research and practice Better reflect the needs and context of farmers Encourage researchers to engage more with farmers |
| The Advisory service | Tailor advice to farmers` changing needs Improve its links with research Act independently and be trustworthy |
| Training | Improve knowledge and accessibility to lifelong learning opportunities for all farmers Promote more peer-to-peer learning and informal knowledge exchange among farmers Foster more innovation |
| Industry | Develop better understanding and create Win-Win partnerships with farmers |
| Publishing services and the media | Improve the use of networks for informal exchange of knowledge Improve the coverage of agricultural issues by the mass media, emphasizing the theme of agricultural innovation Ensure better quality information about farming issues in agricultural media |
| Public Authorities | Build HARD and SOFT infrastructures promoting knowledge exchange between researchers, advisors and practice Invest in independent advisory services that promote mutual trust and cooperation (EIP-AGRI 2018). |

Figure 2 - Actors and Tips in the production and research transfer system

(Advisory service). In the context of the Italian national system, therefore, what does it mean to imagine an “organizational structure for the Agricultural System of Knowledge and Innovation”? How will the advisory services need to change and how will they work, in the context of the AKIS, together with the research, the rural network, the pilot projects, and the EIP-AGRI operational groups?

A first reflection concerns the territorial aspect: if, on the one hand, the support and intermediation services to innovation work better when employing models adapted to the local dimension - thanks to which they can more easily intercept the organizations most suitable to the different types of projects - on the other hand, the most innovative projects are often based on cross-cutting ideas (to sectors, regions and/or scientific disciplines); indeed, it is well-known in the literature that organizational systems based on weak ties are more inclined to innovation (Boschma, 2005). Therefore, it is possible to imagine a double dimension for the AKIS: one national level to promote the cross-cutting dimension, and one regional level to enhance the different territorial expressions; it will not necessarily have to provide (strong) formal agreements between the different subjects, and shall therefore employ different actors to support and intermediate the innovation, with the aim of favoring the identification of innovative ideas, the connection of potential partners, the identification of funding sources, the drafting of the project proposal and related partnership agreements, and the cooperation within the same operating group.

Therefore, a national animation service could be envisaged, to promote the networking aspects of innovation, in a cross-cutting perspective and in connection with the European Network, which will also make available innovative ways of sharing data and information to the whole system. This service should be in close connection with regional structures, which perform the following functions:

- animation on the territory to promote cooperation (all activities aimed at the creation of a GP, the drafting of the project proposal, the definition of partnership agreements, the facilitation between project partners);
- promotion of knowledge and information exchange towards the primary sector actors, with the aim of renewing the classical training methods too;
- support to advisory services, in order to focus special attention to innovation.

The last point is central, because the new AKIS system (art. 13 of the Proposal for a Regulation of the European Parliament and of the Council dated 01/06/2018) will fully integrate the renewed advisory services, to which a role of support on issues of main importance is entrusted (Conditionality; Compliance with European legislation on biodiversity, water, air and pesticide use; Antimicrobial resistance; Risk management; Support for innovation), and on which we need to invest in order to improve and innovate the various regional divisions giving rise to variously articulated mixed public-private systems.

Skills

Before speaking of skills, it needs to widen the perspective and go beyond the specifically rural world; in searching for some models, for example, it is possible to find the methodology developed by Otto Scharmer at the MIT in Boston, i.e. the Theory U. It represents with a U shape the path, i.e. the steps to exit from the comfort zone and generate innovation and change at the individual, team, organization or territorial level (Scharmer, 2009). In the graph, the red arrow shows the effect of “superficial innovation”, which reaches a future that resembles the past, as it uses a routine, called downloading: acquired knowledge, past experiences, preconceived ideas, and even common places are downloaded; we only listen to those who think like we do, without making any original critical elaboration. It is the past that claims to project itself into a future, in which everything is supposed to go on like before.

To reach a real future of change, in which current and new problems require new solutions, it is necessary to leave the comfortable straight road and delve deep, with a process of immersion and re-emersion from the typical U shape, which goes through the 7 steps shown in the figure. To realize the “philosophy” embodied by the EIP- Agri, therefore, it may be appropriate that the innovation teams engaged in the Agricultural Innovation Support Services develop their own MindSet, acquiring the awareness of having to leave the comfort zone, thus of having to abandon their own practice so as not to contribute to building a future that will be the same as today.

Also, a learning path in the Five Disciplines of the Learning Organizations, developed by Peter Senge, is useful for imagining a governance modality of the innovative teams that need a Leadership capable of: Understanding in an interconnected way, Working Collaboratively, Generating Vision (Senge, 1991).

Methodologies

There are many methods to achieve innovation. Specifically, the Design Thinking methodology has been the most widespread one, also thanks to its strong structuring. At the foundations of this methodology we can find a research process that is structured and guided by two fundamental drivers: the focus on people and the intersection

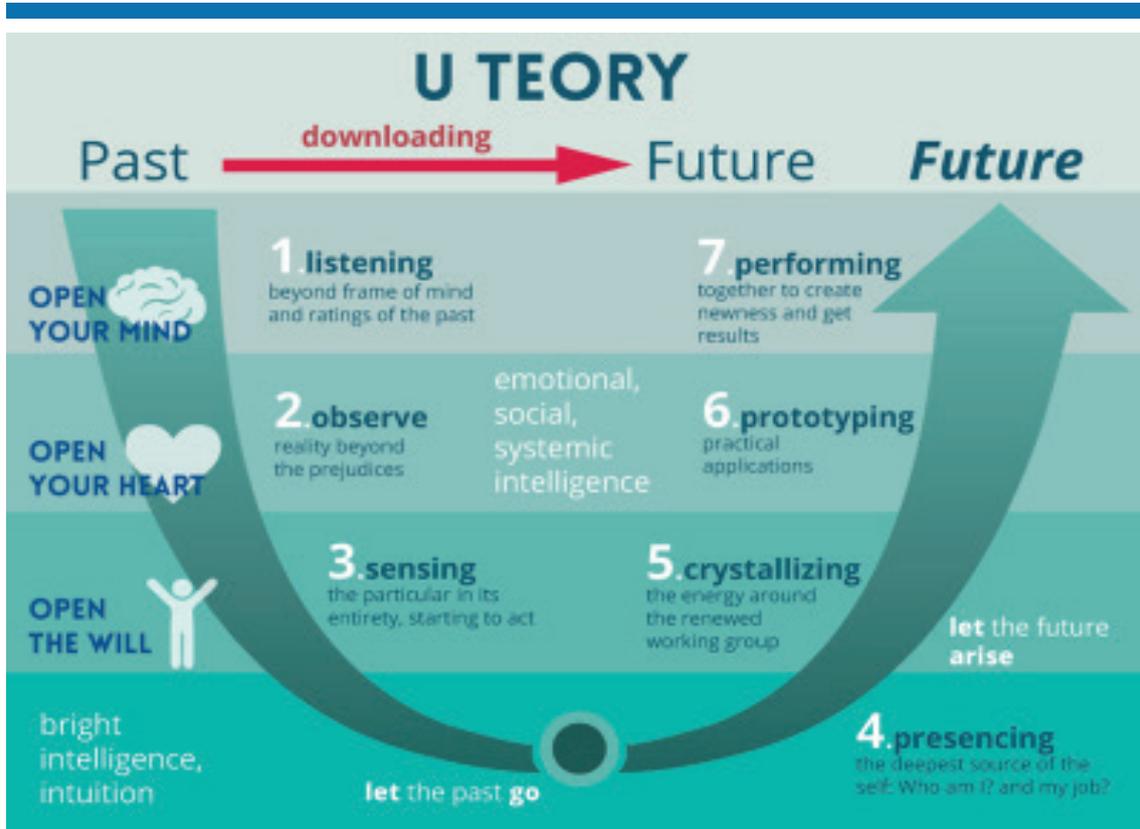


Figure 3 - Theory U (Source: Scharmer 2009)

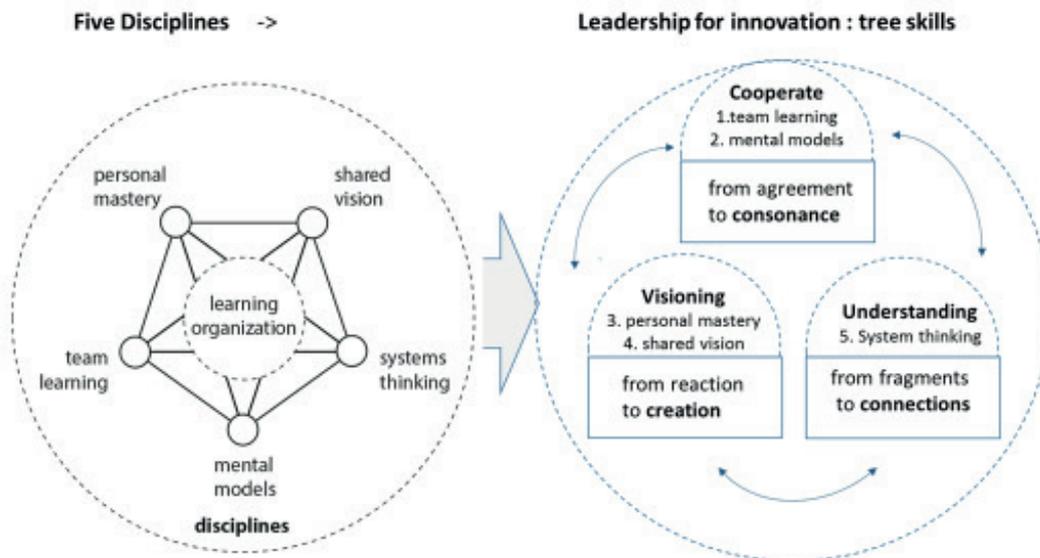


Figure 4 - Five Disciplines & Leadership for innovation

between sustainability, desirability and feasibility.

In all Design Thinking models innovation is achieved through a path and is the result of a virtuous combination of Inspiration, Ideation and Implementation, three spaces which do not follow each other sequentially, but that are overlapping.

Two among the many models seem to be the most useful ones. The first is “the double diamond” developed by the Design Council in 2005, which also clearly highlights the succession of diverging and converging steps of the thinking, typical of the Design

Thinking.

The first step represents the initial part of the divergence, i.e. the Discovery phase, where the design team maintains a broad perspective to allow the generation of a wide range of ideas and influences. The second step, i.e. the Definition phase, closes the first diamond and is a kind of filter where the first questions are reviewed, selected and discarded.

In the third Step, the Development, we are back into a diverging phase: different design solutions are developed, iterated and tested by the multidisciplinary team, employing the tools supporting creativity (Brainstorming, sketching, scenarios, prototypes). At the end we can find the Delivery phase, in which the final concept is decided through the final tests, the authorization of the organization, and the feedback by the Stakeholders. The second methodology, by Hasso-Plattner Institute of Design at Stanford, is structured in five steps: empathizing, defining (the problem), devising, prototyping and testing. Its specific interest consists in emphasizing the Problem-Finding: the first step towards identifying an innovation is searching for the right questions to ask oneself, because Stakeholders are often not able to clearly define the problem, the challenge or the need that must be really met. Basically, the first three phases of the model are dedicated to this, that is, to the definition of the Point of View (within the meaning of the ToP - Technology of Participation).

The overlap of the two models helps us well represent Design Thinking as an iterative and non-linear process in which we try to listen to users, identify (correct) challenges, redefine problems in order to identify alternative strategies and solutions that may not be clear at the beginning.

So it is essentially a process, but it is also an approach, a way of thinking, based on Creative Trust, Iterative processes, Continuous learning, Empathy with the people involved in the process, Multidisciplinary and Teamwork, Visualization of concepts, processes or ideas produced during the research, and Creation of prototypes, so as to turn an idea from abstract into concrete with the aim of testing it and assessing if it is valid or not.

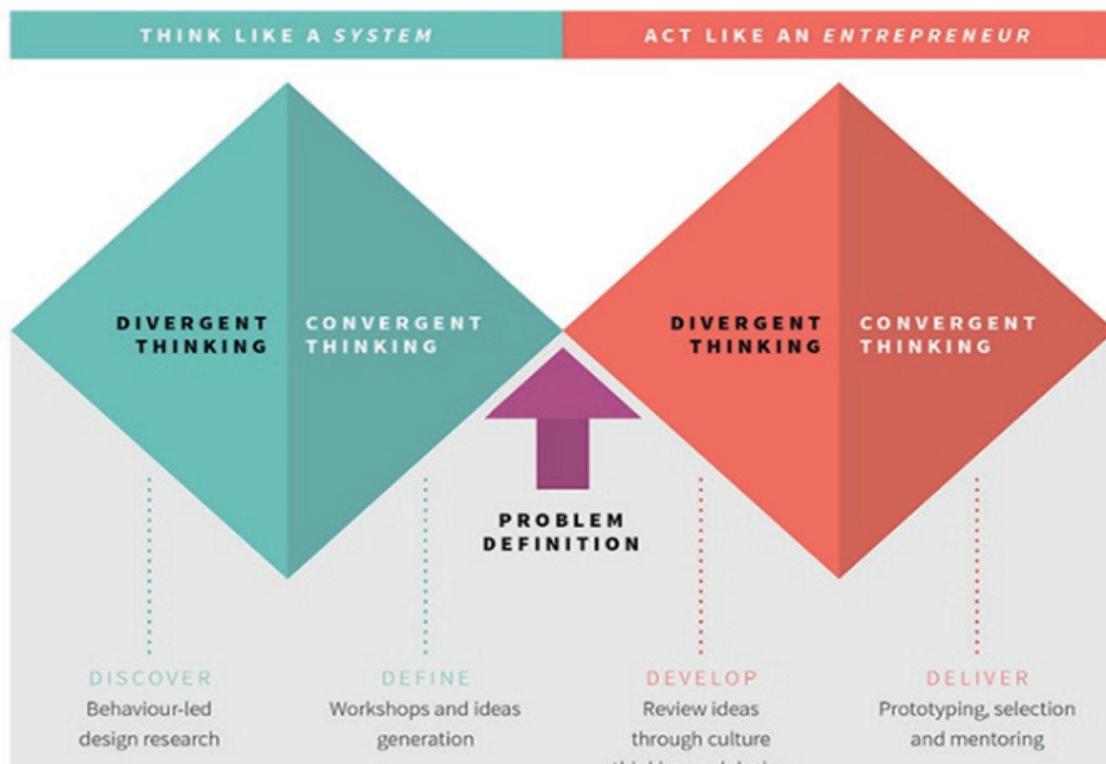


Figure 5 - Design Thinking Model by the Design Council

This is because, in Edison's words, "the value of an idea lies in the using of it". Speaking of methodologies, we cannot obviously neglect the one coined by Henry Chesbrough in 2003, i.e. the open innovation, the paradigm assuming that companies can and must use all possible sources of innovative ideas - whether internal or external, perhaps coming from the START-UPS - and entering markets through internal and external paths, if they want to increase the number of ideas transformed into products to be placed on the market (Chesbrough, 2003).

The rethinking of the open innovation paradigm by the policy maker and the managers of Agricultural Innovation Support Services implies many aspects, including the identification and management of physical places of innovation (enabling the interactions between the various actors), and then some familiarity with the specific open innovation tools that change according to the phase of the innovation process: from the initial phases, in which ideas must be generated and evaluated (in which Call4ideas, crowd-sourcing initiatives, Hackathons, innovation laboratories, and so much more prevail), up to the implementation of innovation and its concretization (in which synergies with accelerators and/or business incubators, business models based on platforms, Corporate Venture Capital and Licensing are possible).

In this respect, the Public Administration is starting to take actions (as shown by the ones already implemented by the Agency for digital Italy), for example, with the program "Cambia la burocrazia, usa l'Intelligenza!" (Change bureaucracy, use Intelligence), which is a co-design program dedicated to innovative companies that use Artificial Intelligence as a supporting technology to help change the way public administrations



Figure 6 - Design Thinking Model by the Hasso-Plattner Institute

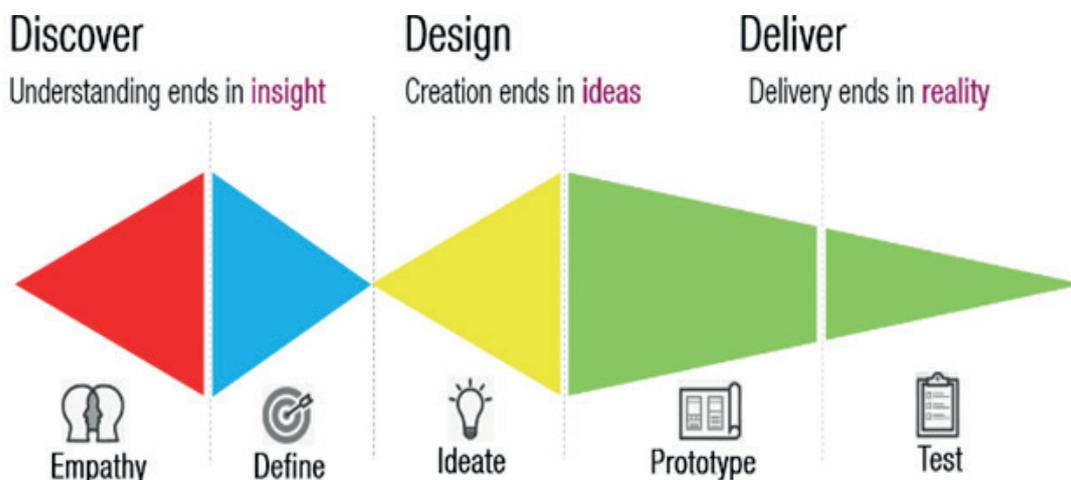


Figure 7 - The two overlapping Design Thinking models

work and offer their services to citizens.

The instruments

Once described roles, competencies, methods and organizational models to “structure” the teams involved in the Agricultural Knowledge and Innovation Systems (AKIS),

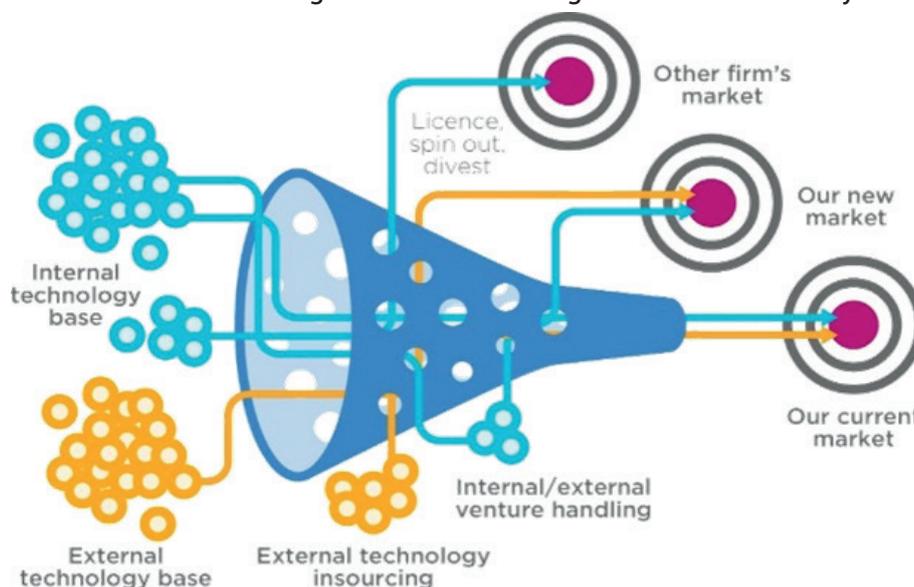


Figure 8 - Open innovation methodology (Source: Chesbrough, 2003)

which will have the task of supporting a greater spread of cooperative approaches in the environmental field, let us now come to describe some useful instruments for reaching the purpose.

In 2020 we cannot think of not exploiting what the evolution of digital disciplines has made available to us: from the SmartPhone to Artificial Intelligence (AI), through the Big Data. In fact, today we are able to collect, process and make available, in real time, a quantity of information that was previously impossible, and this develops a vision that we cannot ignore. On the other hand, the confirmation that this is the way to be pursued for the public administration too, comes also from government initiatives: on March 21, the Agency for digital Italy presented its White Paper on AI.

What is it about?

The term Big next to Data does not evoke a dimension (big data are not necessarily big), but rather a quantity and multiplicity. Indeed, there are many types of data in agriculture: soil moisture, phenological phase of the crop, position of a tractor, quotation of a foodstuff, wind strength, productivity of a cow, fermenting wort temperature. Only the data produced by the tractors in Italy, as the Smart Food observatory of the Polytechnic University of Milan reminds us, amount to 1 million giga per year.

The term also refers to a contemporaneity: the most interesting data are those coming in real time (or almost) from different sources, that can be analyzed to make timely decisions.

It still refers to an extreme variety: traditionally, when we think of data, we imagine tables containing numbers and texts, while big data also consist of satellite images, photographs taken with a smartphone, GPS sensor coordinates, newspaper articles, notarial deeds or posts on social networks.

Lastly, the term refers to a high degree of cross-cutting: the big data useful for a farm are not only those produced in the field, but also those relating to financial markets, public administration or discussions on blogs and social networks.

Moreover, while the data number, the variety and updating has undergone an exponen-

tial growth, the cost of their memorization decreases drastically: if, in 1992, in order to memorize 1 Gigabyte of data it needed 1.000 dollars, already in 2012 the cost was of 0,03 dollars.

What can we do with all this data? The Machine Learning systems applied to Big Data can help us make decisions, because:

- from that large amount of data they extrapolate trends (data patterns), and in this way, they help us make decisions based on data (on evidence);
- they manage to learn what we are looking for;
- if necessary, they can use the logic of natural language to extract “meaning” from texts (Social Analytics)

In fact, as part of the “Agriculture 4.0” phenomenon, a market hat is valued around 100 million euros in Italy, there are more than 300 solutions, the 89% of which concerns Precision Farming (and exploits the Internet Of Things and the Big Data) and the remaining Internet of Farming. Unfortunately, this phenomenon affects only the 1% of the cultivated area¹.

In any case, thanks to advanced sensors, big data and artificial intelligence systems, through a cross-analysis of environmental, climatic and crop factors, Agriculture 4.0 now allows us establishing the irrigation and nutrient needs of crops, prevent pathologies, identify pests before they proliferate, perform targeted interventions, save time and resources, and affect product quality.

If the potential of Artificial Intelligence and Big Data applied to precision farming have already achieved many results, however the scenarios of predictive analyses is still a lot to develop. In fact, the “agricultural policy” itself could usefully base its decisions on predictive and prescriptive analyses carried out on a large amount of unstructured data, by using Machine Learning-based systems. This leads us to important issue of “technological agridata storage” which - probably - will have an important impact not only for the growth of this sector, but also for the management of all the environmental variables related to it, where the adoption of an Open Data model will be encouraged (data open and available to all), by enabling the creation of an expert system of environmental monitoring through the “Agridata”.

Obviously - as usual - it needs to escape from the easy enthusiasm and the exaltation of technology. With the increase in data and with the automation of their transformation into information, we risk losing control. Hence the increasingly felt need for Data Analyst (currently the most sought after profession in the world), because we must not forget that:

- Not all big data have the same value. Each datum, in its native form, must be evaluated with regard to its reliability, so as to attach it a different ‘weight’. The price of agricultural diesel is a reliable datum, just like the amount of fertilizers poured into a given area of the field. Similarly, the data detected by a drone that flies at 100 meters above ground are more reliable than those generated by a satellite, while the conversations on Twitter concerning a pesticide, for example, should be treated with caution;
- The big data do not provide unchangeable certainties. By its nature, the information obtained from the analysis of big data is changeable because changeable are the underlying data.

In the development scenario of the Smart Farming, the Big Data therefore play a leading role, like many people have understood: the direct investment of Monsanto and

¹ Smart AgriFood observatory data from the Polytechnic University of Milan

John Deere, which is really substantial, is matched with the venture capital initiatives by DuPont, Syngenta, Bayer, DOW and those by incubators and start-ups. The phenomenon also concerns our national territory where, in the context of an Agriculture 4.0 market estimated at around 400 million euros for the year 2018 by the Smart Agrifood observatory (+ 270% compared to 2017), Data & Advanced Analytics Solutions are in the 71% of the cases. However, by reading this survey with a focus on StartUPs, it also emerges the impact of digitalization on the Supply Chain, which is becoming increasingly integrated: a 50% of the solutions concerns e-commerce and a 7% concerns the Traceability (both internal and external) of the products.

In this scenario, the architectural choices on the Agridata will play an important role in the dynamics of the Agri-Food System development. In parallel with the fervor of private industry, in fact, some public institutions are working for Big Data applications to employ the "Open Data", useful for the agricultural operator, in his "precision" operations, and for the public authority, to address policies, strategies and actions in a Data-Driven modality.

Thus, within digital offer for agriculture we are witnessing, on the one hand, some big players enriching their traditional offer with Big Data and Artificial Intelligence through closed, proprietary systems extended to large parts of the Supply Chain; at the same time, StartUPs and academic spinoffs offer more open systems, which are based on open sources, standards and interfaces. These include, for example, GODAN (Global Open Data for Agriculture & Nutrition), a network of governmental and non-governmental agencies, private individuals and associations, which has more than 850 partners today and is very active in promoting collaboration on the topic of Open Data, made available not only from government sources, but also from research bodies, space agencies, large corporations and individuals, associations and NGOs.

So the reflections developed by Wolfert et al. (2017) about the future of Smart Farming, envisaged in a continuum between two extreme scenarios, gain importance: the first scenario is marked by a strong integration of the Supply Chain, which are supported by proprietary systems and data, and are characterized by the stability of commercial partners; the second one is based on the "Open Data", in which farmers are freer to change their partners, approach more directly to the market, and share their data with the community, through those responsible for governing the territory.

A working hypothesis: Agrinnova 4.0

Let us now try to imagine a possible model for updating the role of the Public Administration within the AKIS, which, as mentioned above, should:

- Build HARD and SOFT infrastructures that promote the knowledge exchange between researchers, advisors and agricultural practice;
- Invest in independent advisory services that promote mutual trust and cooperation (EIP-AGRI 2018).

Let us start with the Hard infrastructures, which are aimed at supporting a Data Driven approach, favored by modern technologies. The evolution of the last ten years allows us collecting and validating huge amounts of heterogeneous data in real time, analyzing them, extracting their information, putting them together and providing an overall view of them. It therefore depends on the actor's ability to read and (above all) evaluate them for specific purposes.

In this direction, let us imagine a BIG - DATA for agriculture (or its stakeholders), in which there are heterogeneous data entered by all the actors and which is able to respond to different types of queries (each seeks an answer to a different question)

However, we are not thinking of a new CyberSyn, the huge console of a computer that

ran all around the room, with comfortable armchairs, placed at the center, which had armrests equipped with controls ². In fact, this approach is not effective: the data must be built socially and have specific nuances at different levels.

Therefore it is necessary to reason towards a multiplicity of information sources (local and international research, companies, advisors, agricultural companies themselves, public administration), a plurality of data (of agrotechnical, climatic, chemical environmental, economic, and administrative nature) and actors who, at the same time, provide and use information. All this with a fundamental recommendation: guaranteeing the balance of the actors in the system, which all enter data to then receive information in exchange.

Many BIGA DATA projects, in recent years, have been developed to fill the gaps in official statistics: for example, from the analysis of geolocated tweets in Jakarta (it was the second city in the world for Twitter use) the mobility pattern of the megalopolis was reconstructed; from the analysis of the decline in minutes for prepaid phone cards, unemployment provisions were forecasted. All these projects employed an extractive logic. They extracted the value of the citizens' data, and transferred it unilaterally to the government or a central unit. In exchange, those who contributed to building the system did not receive useful information for their needs.

The time is ripe to return the value of the data to local communities with Climate FieldView the farmers receive information on the weather or seeds on the mobile phone, they could also get those on the risks of climate change or local pollution, and therefore those on how to change their crops and practices towards a more sustainable behavior, as well as on the financing sources available and on the advisors network. In short, information that will help make the best decisions over time, because, as Van Oost also

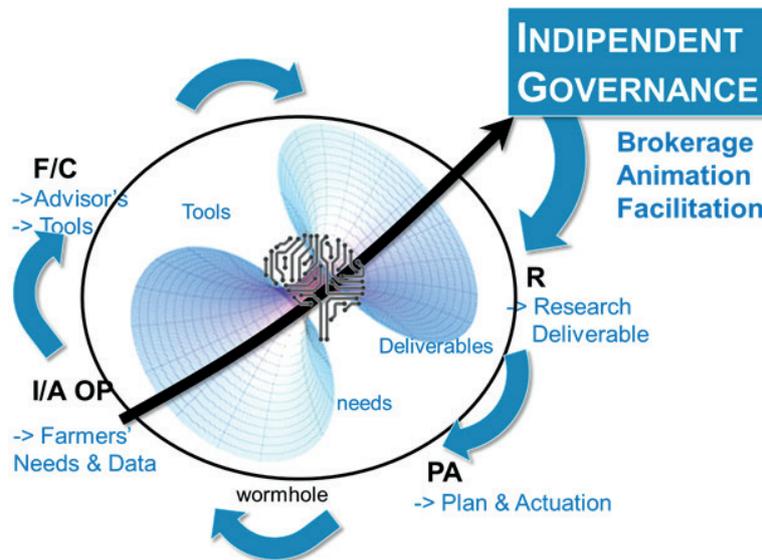


Figure 9 - Agrinova 4.0

says, the time has come to give something back (Van Oost 2018)

This new exchange model, as an ICT service integrated into the Innovation Support Services, should therefore have a "Public" nature, be a collective good and have an open data based architecture. Within the field of the AKIS organization it is part of the national-scale services, and acts as a Hard infrastructure to support not only Networking activities, but also those Knowledge Share ones.

² The reference is to the room in which Salvador Allende dreamed of leading Chile, with technologies that allowed him having information and data to make decisions; a prototype that was kept alive for a couple of years and was destroyed in 1973.

With reference to the Soft aspects, in line with what was previously expressed, for the National Agricultural and Regional Development Services, we wish not only a technical-scientific structure supporting the transfer of innovations, but a team of people who can read and use the large set of data and information made available by modern storage and processing technologies, and which can stimulate partnership, sharing and design.

Consequently, the first step is to build a team interested in supporting innovation. Certainly, the heterogeneity of the components combined with a multidisciplinary approach can be advantageous. However, the team must be led by a mindset supporting the bond between the members and the tendency towards a common goal, since the main characteristic of a winning group is that of fighting the anomie and the acting in the absence of rules, values, standards, and expectations: this framework can be supported by the Design Thinking.

This reflection obviously has an important impact on counseling, for which it is necessary to establish new support services and new training objectives, as well as on training for the agricultural entrepreneur, who is a beneficiary of these systems.

It may be argued that what has been described takes time to be implemented, and that the step to be taken is too great, given the current level of digitization of the Public Administration, but what matters is the direction, the vision to adopt. The evolution of the system will take place in medium-long times, but from a short perspective, it needs to evaluate both the single project and a synergistic whole (cluster) of projects that can simultaneously contribute, over time, to indicate the trajectory of innovation. Nowadays, it is therefore necessary to stimulate the change through a "narrative of evolution", which can describe in advance the plausible path of innovation. This path will be then progressively readjusted and turned into documented real lines of innovative transformation.

Once the trajectory has been described, some operational considerations emerge: in a "Quick Action" perspective, they allow us implementing some small solutions consistent with the idea towards which we are evolving. From a more strictly operational point of view, in fact, we can use a new set of indicators for monitoring and evaluating results.

Traditionally, the outcome of innovation is evaluated on the basis of two dimensions: the introduction of new products or services on the market and the introduction of new processes aimed at increasing productivity, with immediate consequences on the increasing of the turnover generated from new activities or from the optimization of the previous ones, i.e. the growth of the operating margin.

Other indicators could be added to these ones, for a broader evaluation of the impact of the PA in terms of "social capital" growth. In fact, if we have consolidated the idea that innovative solutions come from cross-functional or interdisciplinary teams, and that, in order to put them together, it needs tools able to guarantee an effective integration between competences and to generate the spark of creativity, then the working hypothesis is that public selections, intended as calls for access, may in fact constitute one of these tools in operational terms. These because they force to formalize briefs, organization, and economic plan, in order to finalize a project to a concrete objective. The new partnerships established to respond to the calls for tenders, especially when supported by the technical assistance services included in them, could therefore constitute one of the results of the "measures" implemented by the PA. Thus the aforementioned evaluation should also be included in the key performance indexes of evaluation. With which specific indicators? Our proposal is that the first indicator could simply concern the number of projects and partners, which must be evaluated diachronically, in the different sessions of the same intervention. Of course, this indicator could be then further articulated: has the average number of partners in the project increased over

time? Has their diversification grown? And so forth. A further indicator could refer to the “persistence”, or better, the solidity of the partnerships: how many networks created to respond to a call for tenders have, in fact, continued to operate over time, for other projects and possibly in other dimensions (supra-regional, national, and international)? How many networks have then given birth to more complex and formalized organized structures? Thinking about it carefully, these KPIs would indirectly measure the impact of the measure itself, in terms of cultural, social and economic growth of territory, and would therefore evaluate the contribution of the organization of the specific PA in the general growth of the country system.

Therefore, this approach introduces a deep innovation in the very meaning of technical assistance, which will have to evolve increasingly from a prevalent technological content (where present), i.e. from administrative bureaucracy, towards activities of integration, facilitation and development, thus forcing to reason about the modality of the advisory offer itself (which, for example, could be requested on demand using a voucher) and of the training.

Conclusions

In the last 20 years, agriculture has undergone a series of pressures: the need for a constant increase in production, the competition on international markets, the search for ever greater sustainability, the climatic variability and the intensification of extreme phenomena, the closest connections between territory and production, and the achievement of efficiency margins to recover profitability. These pressures affect agriculture more than other sectors, because the primary sector relies on finite resources, i.e. land and water, which are furthermore exposed to exogenous climatic variables.

For this reason, in this sector more than in others, research and innovation represent an endogenous variable to the system, where the availability of information and the possibility of accessing it are fundamental to remain on the market.

It is on these topics that the debate was articulated and that experiences were developed, to search

an efficient system. The growing amount of information and its organization must allow for a real qualitative leap that companies are required to make.

Low contractual strength and low capitalization necessarily oblige the development of a system of services supplied and supported by the public component, which plays a leading role. However, the modalities are neither simple nor taken for granted, in terms of pervasiveness and permeability. We therefore believe that beyond a model, a cliché that can be replicated in different contexts, we must make reference to a path, a set of options, based on very different economic and structural contexts.

We therefore believe that beyond a model, a cliché that can be replicated in different contexts, we must make reference to a path, a network of options, customized on very different economic and structural contexts.

Our reflection thought this line of thinking, and on the one hand, uses the knowledge system as a tool to strengthen social capital, and on the other, exploits the concept of relational good. Roles, competencies, methodologies and tools need to be operational. We are sure that, in order to optimize the results, it needs to start from the individual experiences and then proceed by propagation through the right mix of instruments.

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The impact of the agricultural extension on the sustainability of the agrifood industry: the case of contract durum wheat farmers and pasta production in Greece

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Keywords

Contract farming, durum wheat, agricultural extension.

Abstract

The main purpose of this research is to examine the association of contract farming and agricultural extension, and its impact to the sustainability of the agrifood industry. Thus, exploring whether this synergy can enhance the production of quality products, the research focuses on a case study of contract durum wheat farmers in Greece.

Among the research main findings is farmers' belief to contract farming and agricultural extension that have a significant contribution to certain production factors, such as quality, farm income assurance, farmers' attitude change for improvement and on the promotion of collaboration under the context of the agrifood chain's sustainability.

In addition, farmers consider premium quality products being a synergy result of contract farming and agricultural extension.

The research presented in this paper has practical implications for farmers, agrifood industry managers, agricultural policy makers, agricultural extension staff and rural sociology researchers.

However, more efforts have to be contacted to examine in depth specialized issues and aspects of contract farming and agricultural extension relationship.

Introduction

Nowadays, farmers worldwide face new challenges as conditions for agricultural production constantly modify due to several factors, such as globalization, population growth and migration, climate change, production risks and uncertainties, consumer new dietary preferences, structural changes and technological improvements (Münchenhausen & Haering, 2012). Thus, under these emerging conditions, agricultural extension, reflecting on both lifelong experiential learning and vocational training, is a crucial

factor to the agrifood industry for enhancing competitiveness to successfully meet new challenges as they lay ahead. In this context, the creation of synergies plays a significant role in the development of the sector. The type of synergy which can strengthen the cooperation and foster collaborative culture is contract farming (Glover & Kusterer, 2016). In particular, contract farming refers to agricultural production being carried out on the basis of a mutually beneficial agreement between the food industry and farmers (Minot & Ronchi, 2015). It is a strategy which has been used worldwide for decades as it provides benefits to both buyers and suppliers with respect to risk and uncertainty (Glover & Kusterer, 2016). More specifically, in contract farming, they agree in advance on the terms of production and specify prices, quantities and quality standards, inputs and provision of consulting services and technical assistance (Simmons, Winters & Patrick, 2005). Thus, farmers are given an assured market for their products, knowing in advance when, to whom and at what price they will sell their products (FAO, 2013). On the other hand, the industry can have an assured supply of primary material of certain quality standards, achieving to have a better planning of the production process (Minot & Roy, 2006). Besides, contract farming is also viewed as an opportunity to enhance agricultural extension focusing on lifelong learning and vocational training apart from being a sterile commercial agreement (Wals, Lans & Kupper, 2012).

In many cases, agrifood firms, in cooperation with agricultural extension entities, organize a wide range of educational activities for farmers who, having ensured their products' sale, are encouraged to participate in these activities (Robinson-Pant, 2016; Minot & Ronchi, 2015). Thus, suppliers under contract often attend information and training seminars to acquire knowledge and skills in order to optimize their production (Formentini, Sodhi & Tang, 2016). This association of contract farming and agricultural extension can make the cultivation and production processes more sustainable, as it encompasses a wide range of training issues concerning contemporary farming methods.

In Greece, Melissa-Kikizas Food Products S.A., is one of the major pasta manufacturers in the country, absorbing each year 100.000 tons of high quality Greek durum wheat (Giannarou, 2015) having a market share of 26% in the domestic pasta market (Nielsen ScanTrack, 2019). From 2013 to date, Melissa-Kikizas Food Products S.A., established a relation with the American Farm School with the scope to organize and execute intensive training and consulting programmes as gradually they applied to 331 individual contract farmers who cultivate approximately 3.200 hectares. These programmes provide up-to-date knowledge and information, as well as, the necessary skills in order them to gain contemporary knowledge and to enhance efficiency in the yield result. It should be noted that the American Farm School, founded in 1904, is among the premier institutes of southeastern Europe for education and research in agriculture, agrifood systems and environmental studies, playing also a prominent role in farmers' lifelong learning and vocational training. To that extend, the institute provides a wide range of sectorial experiential learning and field consulting opportunities to learners in Greece and the neighboring countries over the last decades. Within this context, a training course was designed specifically for durum wheat farmers engaged in contract farming with Melissa-Kikizas Food Products S.A. (Appendix 1).

As indicated in Figure 1, there has been a considerable gradual increase in the number of producers participating in the contract farming program of Melissa-Kikizas Food Products S.A. Also, there is a steady increase in the hectares of cultivated land under durum wheat contract farming.

As part of their training in the Melissa Wheat Academy, producers attend classes of experiential learning, acquiring knowledge and skills in precision agriculture, farm machinery efficient use, crop protection methods in correspondence to the environmental protection management, Common Agricultural Policy fundamental principles and pro-

duction cost management. In addition, farmers visit the industrial plant and production lines in an effort to create awareness towards quality products and consumers' demands (Giannarou, 2015).

Each year, a new pool of selected farmers from central and northwestern Greece joins the program, acquiring valuable knowledge and skills, necessary for improving primary product quality. Selection of farmers to join contract farming with the company relates to the following criteria: a) minimum 8 hectares per individual producer, b) 4 hectares per land parcel, c) use of certain durum wheat varieties depending on soil and climate conditions (e.g.: Maestralla, Bronte, Pietrafitta, Claudio, Meridiano, Monastir, and Matt), d) use of certified seed of minimum 160 Kg/hectare, e) soil analysis application per candidate parcel for cultivation, and f) record keeping during cultivation process. Approximately 70% of the initially applied farmers are selected to participate in the program, while a considerable 30% fail to fulfill the required criteria. From those selected, only 40% manage to produce durum wheat according to the preset by the industry quality

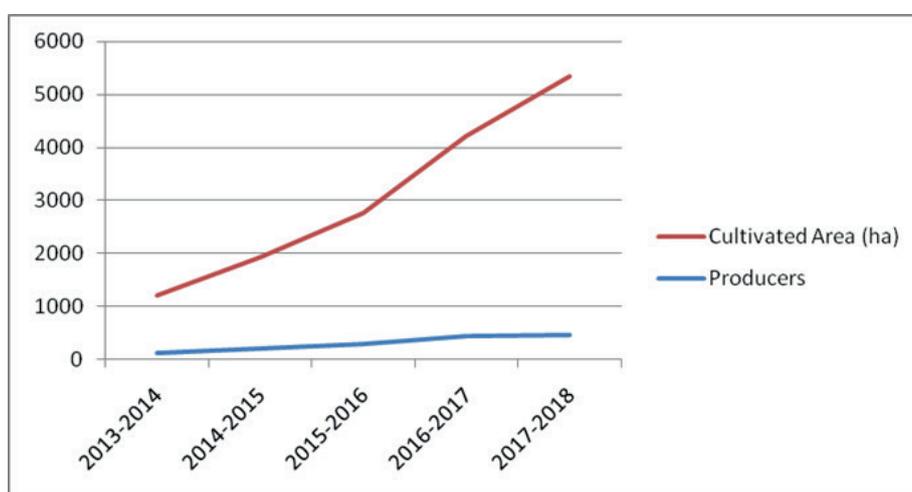


Figure 1 - Producers and hectares engaged in contract farming from 2013 to 2018

standards for the explicit market boutique pasta products known as “Melissa Golden Choice”.

Bearing in mind the recession in Greece over the last decade, the exodus of young people from the countryside and the “brain drain” which has affected negatively the community development potential, investment of people towards training and agricultural extension might play a crucial role to future prosperity opportunities. As Alexandros Kikizas, the firm’s CEO highlights in a newspaper interview

“We noticed that young farmers were leaving their fields and weren’t proud about saying they were farmers. At the same time, cost-cutting efforts started to override those to produce a good-quality product, and their potential to raise a family and to have a dignified quality of life were significantly reduced. Thus, the aim of contract farming is to help farmers return back to their fields, to start loving their land, to be proud of what they do, and to come closer to the consumer by learning the needs of the industry first” (Giannarou, 2015).

On the technical side, farmers’ benefits emerge through the application of LISA (Low-Input Sustainable Agriculture) and SOCRATEES (Soil-Crop-Atmosphere and Technology Educational Evaluation Systems) methodologies (Gertsis & Vasilikiotis, 2018) related to integrated cultivation management (ifarma – Agrostis, professional farm management software). To gain that knowledge, producers had to participate in an annual 25 hour experiential learning program, accompanied by another 176 hours field consulting

exercises, both dispersed throughout the cultivation period in order to cover seasonal needs in situ. The annual yields become an explicit boutique pasta product by the manufacturer known as “Melissa Golden Choice” (Appendix 2).

Participant producers secure the base price of primary production delivered to the company, and besides, gain an average bonus of 4.6 cents per kilo by keeping standard yield quality characteristics. This figure is significantly above the annual regular average market price. On the other hand, the pasta company covers its annual quality yield supplies for producing value added final products that eventually enjoy higher prices in the market compared to similar other products.

Methodology

For the purpose of this study, a combination of qualitative and quantitative research was used in order to examine thoroughly the main parameters. At first, the interview was chosen as a qualitative research tool since it provides an in-depth analysis of opinions and viewpoints and helps to clarify variables utilized later, at the stage of quantitative research (Robson, 2011). Thus, 10 semi structured interviews with contract durum wheat farmers were conducted in private meetings between November and December 2018. The interviews had an approximate duration of 1 hour and the primary data recorded were used to highlight and determine key points of conceptual axes for the questionnaire which was formed and used later. It is scientifically acknowledged in social sciences that qualitative research can provide valuable information of non-numerical form (Babbie, 2001).

In this case study, the interviews offered insights of farmers’ mentality, thoughts, feelings and perceptions giving them the opportunity to express themselves and to reveal various interesting aspects of contract durum wheat farming. The questionnaire was constructed specifically to serve the main purpose of this case study research (Appendix 3). The drawn conclusions are based on the findings of the qualitative research and are supported by international literature reviews. The questionnaire method was used as it is the most widespread and popular research method for gathering data and it is often used in social science research, as results can be easily quantified (Robson, 2011). The questionnaire designed for this research was consisted of fourteen closed answer questions and the respondents’ level of agreement, or disagreement with statements was assessed by using a 5-point Likert-type scale questions (Robson, 2011; Vagias, 2006). The unit of analysis for the present study was contract durum wheat farmers selected with the method of convenience sampling (Babbie, 2001). It should be mentioned that a small, yet carefully selected sample is not necessarily a disadvantage for social science researches, and under special circumstances, can be representative of the whole (Fogelman & Comber, 2007). Therefore, especially in cases in which the population consists of units of different accessibility, the researcher may deliberately resort to subjective selection of a representative sample, at his/her discretion, consistent with the study population profile (Gray, 2014; Fogelman & Comber, 2007). Thus, although the respondents formed a convenience sample, there was a systematic effort to select farmers that were representative of the population.

The questionnaire was initially pilot-tested in January 2019 in face-to-face sessions with five farmers and redefined based on the feedback received. The final survey was conducted between January 2019 and March 2019 and statistical analysis was carried out using the Statistical Package for Social Sciences (SPSS v.17). A total of 30 questionnaires were handed out and all of them were returned (response rate: 100%).

Findings

In the phase of quantitative research, statistical analysis of the questionnaires initial-

ly attempted to outline the respondents' profile (Table 2). Thus, out of the 30 farmers, 26 were men (87%) and only 4 women (14%) with an average age of 42.1 years. The majority of participants (63%) were from the Region of Thessaly, a region characterized by a rich durum wheat tradition, while 7 out of the 30 farmers (23%) were from the Region of Western Macedonia and 4 out of 30 were from the Region of Central Greece (13%). As far as education level is concerned, 12 respondents had senior level secondary education (40%), 6 had post-secondary vocational education (20%), while 12 of them carried tertiary level degrees (40%). At the time, although the average total cultivated land with durum wheat per individual farmer was 28.5 hectares; the average individual contract cultivation with the company was 15.8 hectares (Table 1).

Next, by means of a five-point Likert scale ranging from "not at all significant" to "very significant" (Vagias, 2006), participant farmers were asked to rate the significance of reasons/motives for participating in contract farming program. The interviews conducted at the phase of qualitative research pointed out five reasons. More particularly, as indicated in Table 2, ensuring higher price (bonus-Golden Choice) seems to be a strong motivation, since 27 out of 30 farmers (90%) characterizes it as "very significant" and 3 of them as "significant" (10%). Additionally, 20 farmers (70%) claim that ensuring a lower-minimum price for durum wheat production is a "very significant" reason for entering contract farming, while 9 of them consider it to be "moderately significant". Examining the provision of training and technical support at various cultivation stages as a reason for participating in contract farming, 21 respondents believe it is "signifi-

Table 1 - Contract durum wheat farmers' profile

| | |
|--|--|
| Gender | Male: 26 (86%) Female: 4 (14 %) |
| Age (average and standard deviation) | 42.1+11.2 years |
| Region | Region of Thessaly: 19 (63%) Region of Western Macedonia: 7 (23%) Region of Central Greece: 4 (14%) |
| Level of education | Senior Secondary Education: 12 (40%) Post-secondary vocational: 6 (20%) Tertiary Education: 12 (40%) |
| Current total cultivated land with durum wheat | 28.5 hectares |
| Cultivated durum wheat under contract | 15.8 hectares |
| Average years in contract farming | 2 |

cant" (70%) and 8 of them "very significant" (28%). As far as ensuring production disposal is concerned, 19 farmers (64%) claim to be a "very significant" reason while 10 of them characterize it as "moderately significant". Finally, 21 participants believe that improving the quality of field production is a significant reason (70%) and 9 of them believe it is a very significant reason (30%).

Moreover, using a five-point Likert scale ranging from "not at all significant" to "very significant" (Vagias, 2006) farmers were asked to rate the significance of agricultural extension on certain fields of contract durum wheat farming. Seven fields were selected taking into consideration the literature review and the feedback provided by the interviews (Table 3). More specifically, agricultural extension for production cost reduction

is “very significant” according to 5 farmers (17%), “somewhat significant” for 15 of them (50%), “moderately significant” for 6 of them (20%), “not very significant” for 3 of them (10%) and “not at all significant” for only one of them. Then, as far as crop protection is concerned, 5 respondents characterized the agricultural extension as “very significant” (17%), 18 as “somewhat significant” (60%) and 7 as “moderately significant”

Table 2 - The significance of reasons/motives for participating in contract durum wheat farming

| Reason/motive | Not at all significant | Not very significant | Moderately significant | Somewhat significant | Very significant | Total |
|--|------------------------|----------------------|------------------------|----------------------|------------------|-------|
| Ensuring production disposal | 0 (0%) | 1 (3%) | 10 (33%) | 0 (0%) | 19 (64%) | 30 |
| Ensuring higher price (bonus- Melissa Golden Choice) | 0 (0%) | 0 (0%) | 0 (0%) | 3 (10%) | 27 (90%) | 30 |
| Ensuring lower price | 0 (0%) | 0 (0%) | 9 (28%) | 1 (2%) | 20 (70%) | 30 |
| Training and technical support at various cultivation stages | 1 (2%) | 0 (0%) | 0 (0%) | 21 (70%) | 8 (28%) | 30 |
| Improving the quality of field production | 0 (0%) | 0 (0%) | 0 (0%) | 21 (70%) | 9 (30%) | 30 |

(23%). Moreover, agricultural extension for crop nutrition was characterized as very significant” by 6 farmers (20%), “somewhat significant” by 15 of them (50%) and “moderately significant” by 9 (30%). The significance of the agricultural extension in the field of CAP and new CAP was “very significant” according to 3 farmers (10%), “somewhat significant” for 11 of them (37%), “moderately significant” for 15 of them (50%) and “not very significant” for one of them (3%). Then, the significance of agricultural extension in the field of land stewardship was “very significant” according to 5 farmers (16%), “somewhat significant” for 17 of them (57%) and “moderately significant” for 2 of them (6%). Concerning Good Agricultural Practices, 14 respondents characterized the agricultural extension as “very significant” (47%), 14 as “somewhat significant” (47%) and 2 as “moderately significant” (6%). Finally, the significance of agricultural extension on the field of climate change and environment was “very significant” according to 5 farmers (17%), “somewhat significant” for 19 of them (63%) and “moderately significant” for 6 of them (20%).

Subsequently, research focused on examining the contribution of contract farming and agricultural extension to certain factors. More particularly, bearing in mind the relevant literature review (Glover & Kusterer, 2016; Swanson, 2008) and the feedback derived from the interviewees at the phase of qualitative research, farmers were asked to evaluate the contribution of contract farming and agricultural extension to five factors (Table 4). Thus, examining at first quality production, 9 farmers consider the contribution of contract farming and agricultural extension “very significant” (30%), 17 of them “somewhat significant” (57%) and 4 of them “moderately significant” (13%). Then, 7 far-

mers consider the contribution of contract farming and agricultural extension to farm income assurance very significant” (23%), 16 of them somewhat significant” (54%) and 7 of them “moderately significant” (23%). In addition, 6 respondents consider the contribution of contract farming and agricultural extension to improvement of farmers’ attitudes very significant” (20%), 20 of them somewhat significant” (67%) and 4 of them “moderately significant” (13%). As far as promotion of collaboration in agrifood chain is concerned, 8 farmers consider the contribution of contract farming and agricultural extension “very significant” (26%), 17 of them “somewhat significant” (57%) and 5 of them “moderately significant” (17%). Then, focusing on sustainability of agrifood chain,

Table 3 - The significance of agricultural extension on certain fields of contract durum wheat farming

| Field | Not at all significant | Not very significant | Moderately significant | Somewhat significant | Very significant | Total |
|--|------------------------|----------------------|------------------------|----------------------|------------------|-------|
| Production cost reduction | 1 (3%) | 3 (10%) | 6 (20%) | 15 (50%) | 5 (17%) | 30 |
| Crop protection | 0 (0%) | 0 (0%) | 7 (23%) | 18 (60%) | 5 (17%) | 30 |
| Crop nutrition | 0 (0%) | 0 (0%) | 9 (30%) | 15 (50%) | 6 (20%) | 30 |
| Agricultural policy and new CAP | 0 (0%) | 1 (3%) | 15 (50%) | 11 (37%) | 3 (10%) | 30 |
| Land stewardship and enhancement | 0 (0%) | 0 (0%) | 8 (27%) | 17 (57%) | 5 (16%) | 30 |
| Application of Good Agricultural Practices | 0 (0%) | 0 (0%) | 2 (6%) | 14 (47%) | 14 (47%) | 30 |
| Climate change-environment | 0 (0%) | 0 (0%) | 6 (20%) | 19 (63%) | 5 (17%) | 30 |

participants 6 farmers consider the contribution of contract farming and agricultural extension “very significant” (20%), 13 of them “somewhat significant” (43%) and 11 of them “moderately significant” (37%). It should be noted that there were no answers at all, considering either “not at all significant” or ‘not very significant” the contribution of contract farming and agricultural extension to any of the five factors.

Additionally, the quantitative research showed that the vast majority of farmers, 28 out of 30, (93.3%) believe that Melissa Golden Choice is a synergy result between contract farming and agricultural extension. Moreover, 12 farmers claim that premium quality products can upgrade primary production to a very great extent (40%) and 15 of them to a great extent (50%). Finally, 18 respondents highlighted that they would suggest contract farming to other producers to a very great extent (60%) and 12 to a great extent (40%).

Discussion and practical implications

Nowadays, agricultural extension becomes more important than it used to be in the past, as its function and tasks are increasingly assumed by the agrifood industry and educational institutions (FAO, 2013). Institutions that facilitate extension are significant players in efforts to respond to critical issues such as agrifood chain sustainability, environmental protection and rural welfare. In this context, new synergies, mutually beneficial are required, if sustainability of agrifood chain is to move forward on a win-win basis, both to the industry and farmers. Actions to support synergy built up framework in the agrifood chain requires strengthening the culture of cooperation between all parts of the chain, role enhancement procedures of the agricultural extension and training programmes for new extension employees in terms of required contemporary knowledge and skills to provide up-to date consulting guidance to farmers for absorbing new trends and methods. In addition, new agricultural extension programmes, based on the needs and demands of producers, linked to the agrifood chain sustainability goal, need to be scheduled for implementation. Unfortunately, nowadays in some cases, extension programmes are outdated as circumstances rapidly change, and thus, adjustments to

Table 4 - The contribution of contract farming and agricultural extension to certain factors

| Factor | Not at all significant | Not very significant | Moderately significant | Somewhat significant | Very significant | Total |
|--|------------------------|----------------------|------------------------|----------------------|------------------|-------|
| Quality production | 0 (0%) | 0 (0%) | 4 (13%) | 17 (57%) | 9 (30%) | 30 |
| Farm income assurance | 0 (0%) | 0 (0%) | 7 (23%) | 16 (54%) | 7 (23%) | 30 |
| Improvement of farmers' attitudes | 0 (0%) | 0 (0%) | 4 (13%) | 20 (67%) | 6 (20%) | 30 |
| Promotion of collaboration in agrifood chain | 0 (0%) | 0 (0%) | 5 (17%) | 17 (57%) | 8 (26%) | 30 |
| Sustainability of agrifood chain | 0 (0%) | 0 (0%) | 11 (37%) | 13 (43%) | 6 (20%) | 30 |

the change may be necessary to consider.

The findings of this research highlight contract durum wheat farmers' opinions concerning the association of contract farming, agricultural extension and the production of quality products. According to farmers, the synergy of these factors is very significant and contributes to sustainability of the agrifood chain. Especially in periods of recession, as it is the case for Greek economy where it suffers high youth unemployment due to the industry's failure to efficiently operate, the association of contract farming and agricultural extension can provide the means of employment opportunities for rural households, particularly in regions where chances for farmers undergoing training to upgrade knowledge and skills are often limited. A further challenge for rural societies is to strengthen these synergies in order to find the right path for rural development and

sustainability. Further on, the practical implications of this case study offer interesting insights for farmers, agrifood industry managers, agricultural policy makers, agricultural extension staff and rural sociology researchers.

More specifically, the findings provide a starting point for future research on various aspects of this issue. Thus, similar research can be conducted in other fields of contract farming and agricultural extension, examining for example, the barley and brewing industry, or contract grocery production and supermarkets. In addition, similar approaches might be taken in the livestock contract farming sector. Another interesting parameter to be taken into consideration for further research is consumers' perceptions and attitudes and their awareness for quality products. Bearing in mind that consumers are the key element in the agrifood chain, further research can examine the interactions in depth between farmers, industry and consumers, focusing on the production of premium quality products. Finally, as agriculture and climate change interact to one another, it is recommended to focus research on food security for quality and quantity production. Bearing in mind that good agricultural practices reduce the negative impact of climate, contemporary agricultural extension practices through contract farming can be a leading factor to achieve benefits on this issue.

To sum up, the research presented in this paper builds on our understanding of the connection of contract farming and agricultural extension with the production of premium quality products.

Originality

This research explores an issue which has not been previously examined in the Greek scientific literature dealing with rural issues. Therefore, the case study presented in this paper is an original research, which has not been previously published. The authors take full responsibility for conducted research, data interpretation and conclusions.

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Supporting Agritourism Industry Development in Florida

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Agritourism, farmer panels, networking, industry development

Abstract

Agricultural Awareness is an UF/IFAS Extension Roadmap super issue. Agritourism presents a public agricultural awareness experience and a business opportunity for agricultural operations. 112 million out-of-state Florida tourists, including four million Europeans, spent \$111 billion in 2016. Florida's agriculture boasts a multibillion dollar impact, yet lags in number of agritourism operations and revenue generated. The UF/IFAS Ag Awareness Initiative Team conducted conferences, supported by a Florida Department of Agriculture and Consumer Services Specialty Crop Block Grant. Objectives were to improve awareness and knowledge of agritourism opportunities, and foster cooperation. Conferences included lectures, panel discussions and farm tours. Small group discussions developed consensus, later used in strategic plan development. Agendas convened: agritourism operators, Extension faculty, government and trade group representatives from within and outside of Florida. Post program respondents reported improved awareness or knowledge (n=51) and 82% planned to use the information in their businesses. Respondents appreciated breakout sessions, panel discussions and Sonoma County, California and North American Direct Farm Marketing Association speakers. Tour respondents (n=51) indicated increased knowledge of: Florida agritourism industry status (88%); operation challenges (96%); and practices of farms visited (96%). Follow-up surveys showed adoption and progress towards recommended practices. Strategic report produced recommended increased industry and service provider cooperation. Driving innovation in Florida's agritourism market requires an integrated approach, partnering strengths of Extension as an educator and convener with interests of stakeholders. Agricultural operations with boldness to explore opportunities will ultimately determine industry strength. Extension demonstrates practical value by providing cooperative framework to support these discussions.

UF/IFAS agricultural awareness initiative

University of Florida Institute of Food and Agricultural Sciences (UF/IFAS) is a land grant institution with responsibilities for teaching, research and Extension. The mission of Extension is to partner with communities to provide quality, relevant education and research-based expertise to foster healthy people, a healthy environment, and a healthy economy (UF/IFAS, 2013). UF/IFAS Extension conducts periodic strategic planning and needs assessments in order to establish high priority initiatives to determine future scope of work. The need for food systems and environmental awareness was identified as one of five highest priority needs, or super issues, in the most recent assessment. These assessments are based on a series of public meetings around the state as well as solicited input contributed via online surveys and other means.

The term food systems encompasses not only food production but the other interdependent factors of the larger system in total (FAO, 2018). These factors are numerous, including inputs, such as land, water and fertilizer; food processing, marketing and distribution; consumption; use of by-products, and pre and post-consumer waste disposal. Food systems studies go beyond food itself and seek to examine the greater social and environmental impacts of the whole: from worker justice and consumer access to healthy food, to questions of water, nutrient and land use. The very idea is so broad in scale, Florida Extension has only recently taken up this holistic concept as part of its Extension program, and full integration within the existing reductionist system remains to be seen.

If food systems is a broad idea, food systems awareness is at least as equally broad, encompassing a wide breadth of potential angles and metrics to gauge educational program success. In general, as society has continued to advance technologically and economically, a smaller proportion of our population is involved in agriculture. USDA statistics show farm producers make up only about 1% of the total US population (USDA NASS, 2019).

Public awareness of agriculture, not only as an important economic contributor, but as the very source of our food production has diminished as the gap between rural and urban communities has grown wider (Lundy, Ruth, Telg, & Irani, 2006). Unchecked, a lack of awareness of our inherent reliance on agriculture has a wide range of potential downside not only for agricultural producers but also for the greater society as a whole, particularly with regard to allocation of resources such as land and water.

Simultaneously, trends around the world are emerging, wherein the public is interested in growing their own food and examining the practices involved in the greater food system from production inputs to ultimate waste disposal. The public in many cases is feeling unsure of scientific experts and information presented as scientific fact (Gauchat, 2012). The prevalence of online self-publishing and sharing can amplify sensationalized reports, bombarding the public with information they are ill prepared to critically analyse with low baseline levels of scientific literacy and a tendency leaning towards eroding trust of institutions (Miller 2004). Also noted in recent characterizations of consumer behavior, younger generations of consumers are demonstrating preferences for authenticity and unique experiences over purchase of consumer goods in many cases (Marketline, 2017). This interest in authentic experiences and re-discovery of self-sufficiency in food production bode well for regions with vigorous agriculture and established culture of accommodating visitors, such as Florida.

Florida's record tourism

It's no secret that Florida is an international tourism destination. The state has experienced record tourism numbers since 2012, with more than 126 million annual visitors, including more than ten million overseas visitors in 2018, according to most recent

estimates (VISIT FLORIDA, 2019). Europe is the number one world region for international visitors to Florida, with nearly four million European visitors in 2018. Of European countries, United Kingdom is the lead origin of international visitors.

Direct tourism spending reached more than 111 billion U. S. dollars in 2016 and has been on a steady incline in step with the number of visitors. Figure 1 details steady increases in spending from 2012-16. The overall economic contribution, including indirect and induced impacts of tourism is even greater, cited at \$189.1 billion for 2016 (Tourism Economics, 2018).

Notably, according to VISIT FLORIDA, international visitors tend to stay longer and spend nearly twice as much as domestic visitors (VISIT FLORIDA, 2018). While overseas visitors composed less than 10% of overall out of state visitors in 2016, they spent 18.7% of the total visitor dollars.



Figure 1 - Out-of-state Florida visitor spending trends (Tourism Economics, 2018)

Florida's agriculture matters

Tourism is undoubtedly a major economic driver for the State of Florida; what may be less apparent, however, is that Florida also has a major agriculture industry, contributing more than 160 billion dollars in sales revenue and providing major supply of USA fruits and vegetables, particularly during the winter season (Hodges, Rahmani & Court, 2017). Florida's vigorous agriculture with its 47,590 farm operations covering nearly 10 million acres (USDA NASS, 2019) also boasts a multibillion dollar indirect and induced economic impact, detailed in Table 1.

Table 1 - Economic contributions of Florida's agriculture, natural resources, and food industries in 2015 by industry groups and region (Hodges, Rahmani & Court, 2017)

| | Direct Employment (Jobs) | Direct Industry Output (M\$) | Foreign and Domestic Exports (M\$) | Industry Output Impacts (M\$) | Employment Impacts (Jobs) | Value Added Impacts (M\$) | Labor Income Impacts (M\$) | Other Property Income Impacts (M\$) | Tax on Production and Imports Impacts (M\$) |
|--|--------------------------|------------------------------|------------------------------------|-------------------------------|---------------------------|---------------------------|----------------------------|-------------------------------------|---|
| Industry Group | | | | | | | | | |
| Crop, Livestock, Forestry & Fisheries Production | 130,327 | 11,276.6 | 7,220.2 | 22,429.4 | 212,959 | 12,714.7 | 7,861.3 | 4,274.6 | 578.9 |
| Agricultural Inputs & Services | 180,252 | 18,562.9 | 10,361.2 | 32,311.0 | 271,940 | 15,052.9 | 9,826.6 | 4,364.3 | 862.0 |
| Food & Kindred Products Manufacturing | 59,323 | 26,828.9 | 11,134.9 | 40,865.5 | 151,432 | 13,898.0 | 7,574.6 | 5,071.5 | 1,251.9 |
| Forest Products Manufacturing | 22,239 | 8,877.6 | 5,940.8 | 16,306.8 | 73,040 | 6,549.8 | 3,922.9 | 2,188.6 | 438.4 |
| Mining | 28,874 | 4,254.6 | 1,958.2 | 7,118.9 | 48,826 | 2,650.7 | 1,677.7 | 729.5 | 243.6 |
| Food & Kindred Products Distribution | 1,167,295 | 89,000.3 | 22,818.4 | 130,443.9 | 1,471,440 | 78,832.8 | 48,698.8 | 20,639.3 | 9,494.7 |
| Nature-based Recreation | 27,925 | 1,912.9 | 1,095.4 | 3,894.6 | 42,475 | 2,336.2 | 1,476.7 | 729.4 | 130.1 |
| Total All Industries | 1,616,235 | 160,713.8 | 60,529.1 | 253,370.2 | 2,272,113 | 132,035.1 | 81,038.4 | 37,997.2 | 12,999.5 |
| Florida Economic Region | | | | | | | | | |
| Miami-Fort Lauderdale | 46,937 | 4,701.1 | 2,139.2 | 6,359.2 | 60,033 | 2,627.1 | 1,652.9 | 716.1 | 258.2 |
| Orlando | 122,183 | 15,398.3 | 8,153.9 | 23,533.1 | 178,302 | 11,675.8 | 6,495.7 | 3,983.1 | 1,197.1 |
| Tampa St.Petersburg | 508,614 | 49,554.4 | 20,543.0 | 74,022.6 | 686,828 | 40,678.2 | 25,855.8 | 10,763.4 | 4,059.0 |
| Sarasota-Bradenton | 411,608 | 41,808.5 | 20,468.0 | 60,751.9 | 553,441 | 30,549.3 | 18,246.0 | 9,288.4 | 3,014.9 |
| Jacksonville | 25,828 | 2,268.0 | 1,156.9 | 3,208.5 | 33,540 | 1,610.8 | 959.7 | 484.1 | 167.1 |
| Pensacola | 58,639 | 4,421.0 | 1,766.4 | 5,885.6 | 70,103 | 3,066.2 | 1,945.6 | 773.0 | 347.6 |
| Gainesville | 179,938 | 14,552.9 | 5,751.1 | 20,324.4 | 225,416 | 11,031.7 | 7,276.4 | 2,698.0 | 1,057.3 |
| Tallahassee | 42,104 | 4,987.5 | 2,946.7 | 6,456.2 | 53,949 | 2,549.5 | 1,506.9 | 785.8 | 256.8 |
| Panama City | 219,281 | 22,967.9 | 9,866.0 | 33,758.3 | 291,909 | 17,286.8 | 10,449.9 | 5,046.2 | 1,790.7 |

Employment represents full-time and part-time jobs. Monetary values are given in millions of dollars Total impact estimates include regional multiplier effects. Florida regions are multi-county functional economic areas defined by the U.S. Bureau of Economic Analysis. Source: IMPLAN model and state/county data for Florida (IMPLAN Group LLC).

There may be opportunity for both the tourism industry and the agricultural sector to benefit by adding agritourism farms to the available venues for visitors. Florida visitor spending on recreational experiences grew at 3.6%, a faster pace than overall visitor spending from 2015- 16, reflecting higher interest in experiences (Tourism Economics, 2018). Lodging remains the largest percentage of visitor spending, at 29%. Growth in spending was greatest in the food and beverages sector, increasing 4.2% from 2015-16. These figures suggest that Florida farms able to incorporate lodging and unique meals into their agritourism offerings may be particularly well positioned to benefit from trends in consumer spending.

Florida’s agritourism industry is growing

USDA Census of Agriculture statistics demonstrate growth and increasing revenue of Florida’s agritourism industry. From 2007-12, the number of farms offering recreational services or agritourism activities more than doubled from 281 to 724 (USDA NASS, 2019). Key to this increase has been the passage of legislation limiting the liability of agritourism operators in the event of an accident. Florida Statute (F.S) 570.96, originally passed in 2013, defined agritourism and limited liability for operations that post a notice stating the potential for injury when engaging in farm activities and that participation in the activity acknowledges and accepts inherent risks to the activity. The legislation also limited the authority of local governments to pass any new restrictions that could inhibit the ability of farms to engage in agritourism. The law was later updated in 2016 (F.S. 570.85-89) to further define an agritourism activity to include civil ceremonies, such as weddings, which had become a point of contention between regulators and farm operations (Henry, 2014). The update also added that local governments may not enforce existing regulations which would inhibit farms from engaging in agritourism (Henry and Stofer, 2017). The latest edition of census statistics show that the number of farms offering agritourism services has continued to expand, albeit by a much smaller margin, increasing from 724 to 761, or about 5%, from 2012-17. However the increase in average revenue from agritourism activities increased by more than 70%, from \$15.7 million to \$27 million during this time, and the number of farms with agritourism receipts of \$25,000 or more doubled, increasing from 86 to 174. This may indicate that farm operations are continuing to improve their services, and public awareness and interest in participation is also increasing. Figure 2 compares Florida’s agritourism trends to national statistics.

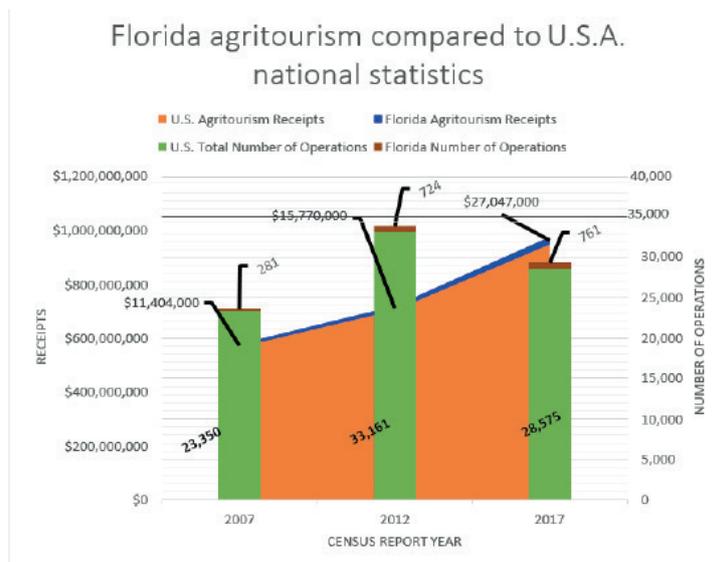


Figure 2 - Florida agritourism compared to U.S.A. national statistics

No doubt this expansion is encouraging in terms of the industry finding its footing and gaining experience in operations and marketing; however, Florida still underperforms in terms of number of agritourism operations and revenue compared to other states. As detailed in Table 2, Texas is the leader in agritourism operations and revenue, followed by California and Colorado. Perhaps California with its well-known established vineyards and history of cultural value for sustainable agriculture within segments of the population is to be expected; however, Texas' standing as the number one state for agritourism may be less readily expected. Perhaps the sheer land size of the state or the game hunt and ecological tour industry focus, supported by a Texas A&M Extension Specialist and a public private partnership project called Long Acres Ranch Nature Tourism Center, supports the numbers (Phillips, 2015). Land in production or overall size of state, cannot fully explain the expanded industry,

Table 2 - Number of agritourism operations and revenue of selected states reported for 2017 Census of Agriculture (USDA NASS, 2019)

| State | 2017: Number of agritourism farms | 2017: Average revenue from agritourism (millions) | 2012: Number of agritourism farms | 2012: Average revenue from agritourism (millions) |
|----------------|-----------------------------------|---|-----------------------------------|---|
| Texas | 5,723 | \$162.567 | 7,775 | \$132.864 |
| California | 1,130 | \$84.043 | 1,699 | \$64.520 |
| Colorado | 1,056 | \$63.986 | 864 | \$28.240 |
| North Carolina | 995 | \$23.785 | 1,135 | \$17.625 |
| Virginia | 863 | \$40.993 | 814 | \$15.216 |
| Florida | 761 | \$27.047 | 724 | \$15.770 |

however, as North Carolina, with a similar number of farms to Florida, operating on less total production acreage than Florida, has consistently ranked high in number of agritourism operations (USDA NASS, 2019). In fact, the 2017 Census reflects a decrease in number of North Carolina agritourism operations and an increase in average revenue, a trend captured in statistics from other agritourism leaders including Texas and California. Interestingly, this state is one of few to focus on tourism and agritourism within Extension, employing a State Extension Tourism Specialist and prolific agritourism research publisher, Dr. Carla Barbieri of North Carolina State University.

The 2017 Census shows the number of Florida agritourism operations are now rivaling or surpassing other southeastern states, however reports show some southern states, like North

Carolina, have a significantly longer established agritourism industry (Xu and Rich 2012). For example, in 2007, when Florida reported 281 agritourism operations, North Carolina reported 602, down slightly from 2002 Census figures, when 622 agritourism operations were reported. Average revenue for North Carolina agritourism operations in 2007 was \$21.031 million, only slightly lower than Florida's current agritourism revenue, ten years later. (USDA NASS, 2009). Funding for diversification of agricultural operations may be a strong indicator of agritourism activity as many southeastern states, once dominated by tobacco production, including North Carolina, receive Tobacco Master Settlement funding, and have been allotting portions of funding to increase farm diversification, supporting transition to a wider variety of crops and enterprises, and perhaps underpinning earlier entry into agritourism (USDA ERS, 2000). No doubt liabi-

lity protections are important to industry expansion and in the case of North Carolina, an agritourism liability protection law was passed in 2005 (General Assembly of North Carolina, Session 2005; Henry and Stofer, 2017).

Will Florida catch up? Is an expansion of the agritourism industry in Florida's future? Statistical trends appear to support this and the role of Extension is to look to provide the information that farm operations need to move forward.

Supporting Florida agritourism development

UF/IFAS Extension and Extension in general commonly finds itself in a position to support industry development but must walk a fine line between advocacy and education. The role of the Extension service is to provide research based information to support evidence based decisions to improve quality of life and protect natural resources. This may not fully coincide with the expectations or desires of industry, which would sometimes prefer Extension take on additional roles related to regulation and advocacy. Extension's reputation as a unbiased third party with a science based educational mission is key to the credibility and ultimate value, not only to our institution, but to the greater idea of Extension around the globe. We do not advocate, but seek to inform the public and the industries of our state. We agree to leave our personal opinions at the door and discipline ourselves to relying on research. When we don't know we say so, and that is the value of involving Extension in discussions that lack a readily apparent conclusion. In short, Extension does not replace the role of industry trade groups, but our role can include bringing stakeholders together to brainstorm and maneuver through complex conversations to address needs that lack a cohesive solution in their identification and discovery stages.

UF/IFAS agritourism conferences

The UF/IFAS Extension Ag Awareness Initiative Team conducted specialty crop agritourism conferences in South and Central Florida in the summer and fall of 2017 to address these issues, with support from a Florida Department of Agriculture and Consumer Services (FDACS) Specialty Crop Block Grant and other sponsorships. Conference objectives were to improve the awareness and knowledge of specialty crop agricultural operations concerning agritourism opportunities and foster cooperation among the industry. Each conference included lectures, moderated panel discussions and a day of farm tours. A final session entailed Extension led small group discussions to develop consensus around the needs of current and prospective agritourism providers, later used to develop a strategic plan.

Conference design

Agenda designs convened a mix of speakers from (total): current agritourism operators (6), County Commissioners (2); tourism board representatives (3) and other service providers (4); industry trade group representatives within and outside of Florida (3); regulators and policy developers (4); and Extension faculty presenters (7). Extension faculty co-operators assisted with small group discussion and tours. One conference farm tour visited four and the other visited three specialty crop operations.

The South Florida conference was attended by 29 and the Central Florida conference was attended by 63. The South Florida farm tour was attended by 40 and the Central Florida farm tour was attended by 29. Evaluation data were collected via post program surveys, analysed using Qualtrics.

Sponsorship of the program included funding from an FDACS Specialty Crop Block Grant, industry and other stakeholder support including Polk County Farm Bureau, Cen-

tral Florida Development Council, Farm Credit, and in kind contributions of time, facilities and non-funded travel of some speakers.

Central Florida conference presentations were recorded and a series of short videos interviews with selected speakers were created and added to the UF/IFAS Extension Small Farms and Alternative Enterprises You Tube Chanel Beginning Farmer and Agritourism playlists. Thumb drives with conference materials were included in participant registration materials. An optional evening social at a local restaurant offered additional networking opportunity for speakers and participants.

Evaluation results

Combined post-program evaluation results show respondents (n= 51, response rate 55%) reported increased awareness or knowledge of information on agritourism topics: 75% for the general status of the industry; 76% for marketing opportunities; 69% for consumer preferences; 57% for legislation; 59% for best practices; 47% for funding opportunities; 51% for liability; and 88% for business planning. Participants (82%) planned to use the information in their business. Comments reported special appreciation for breakout sessions, panel discussions and out-of-state speakers from Sonoma County, California, and the North American Direct Farm Marketing Association. Marketing, networking, resources and information on Florida agritourism legislation were cited as the most useful conference benefits.

Combined tour evaluation responses (n=51, response rate 74%) indicated increased knowledge of: the status of Florida agritourism (88% of respondents); challenges faced by agritourism operations (96%); and agritourism practices of farms visited (96%). Respondents (90%) indicated increased knowledge of the economic contributions made by Florida agritourism operators. Respondents indicated the tour impacted their perceptions of agriculture and the environment and intended to take action based on their experience: 92% have a greater appreciation of agriculture and the environment; 88% are more aware of the value that agriculture and the environment can add to their community; 88% will make better future decisions concerning sustainability of important agricultural and environmental aspects of their community; 96% will share what they learned with others; and 82% planned to get more involved in agricultural and environmental initiatives as a result.

Follow up survey results

A follow-up survey, IRB [201900881], was conducted in May 2019, 23 months after the June 2017 conference and 20 months after the September 2017 conference. The survey consisted of nine questions and was emailed to 105 attendees, including speakers and co- operators. 23 responded, however only 15 completed the consent, a 14% response rate. The purpose of the survey was to gauge practice adoption and longer term impact of the conferences.

Follow-up survey respondents reporting taking action as a result of their conference participation as ranked in Table 3. Overall, participants continued their research on agritourism options, visited agritourism operations and evaluated the online presence of their agritourism operation for improvements. Respondents (11%) installed the warning signs required for liability protections under Florida's agritourism law (F.S. 570.85-89). Least taken actions were those requiring higher levels of complexity, such as developing a business plan or launching an agritourism enterprise.

As a result of participating in the agritourism conference, 100% have shared what they learned with others: 47% indicated they had shared the information with more than 10 people, while 40% indicated they had shared what they learned with 1-5 people. Respondents (87%) feel they make more informed decisions on agriculture and the

environment in their community because of information gained at the conference; 73% agreed or strongly agreed they have increased their involvement in agriculture and environmental initiatives as a result of attending the conference; and 27% have sought a career opportunity related to agriculture and the environment as a result of attending the conference.

For additional resources needed, respondents (2) indicated: “recycling and reuse initiatives” and “what right to farm statute allows agritourism operators to build without permits”. Respondents (2) indicated they would like additional training on local ordinances vs. state law and “green and organic applications”.

Table 3 - Agritourism conference participant follow-up actions taken as a result of participating

| Q 5 As a result of participating in the Agri-Tourism Conference, I have (please check all that apply) | |
|---|---|
| Rank | Actions taken |
| 1) Equal responses 19% | Visited an agritourism operation |
| | Conducted research to investigate agritourism options |
| 2) Equal responses 12% | Reached out to service providers |
| | Investigated funding sources to start or expand an agritourism operation |
| 3) Equal responses 10% | 863 |
| | 761 |
| 7% | Taken steps toward creating or revising an agritourism business plan |
| 7% | Taken steps toward creating or revising an agritourism business plan |
| Q 11 As a result of participating in the Agri-Tourism Conference, I have (please check all that apply) | |
| Rank | Actions taken |
| 1) 22% | Evaluated the online presence of my agritourism operation to consider any improvements |
| | Revised an existing agritourism marketing plan |
| 2) Equal responses 15% | Expanded my agritourism operation |
| | Evaluated my agritourism operation to see where improvements could be made |
| 3) 11% | Installed signage warning visitors of inherent risks involved in agritourism activities |
| | Revised an existing agritourism business plan |
| 4) Equal responses 7% | Increased my sales or net income from agritourism |
| | Purchased or expanded liability insurance to cover their agritourism operation |
| | Prepared an agritourism business plan |
| No action taken on these | Prepared an agritourism marketing plan |
| | Initiated an agritourism operation |

Strategic report

The team also produced a strategic plan for developing agritourism in Florida in the coming years. Florida has many opportunities to grow the agritourism sector, particularly in terms of numbers and diversity of operations that do not yet have agritourism components as well as groups, both government and non-government, who are interested in promoting agritourism. Florida's agricultural and tourism sectors separately are large drivers of the economy, and recent legislative changes provide protections for agritourism. In addition, there is consumer interest in agritourism, based on our focus group research.

However, Florida agritourism faces potential weaknesses and threats as well.

Consumer awareness of agritourism is probably quite low. Current tourism marketing in particular is heavily focused on out-of-state or out-of-region tourists rather than local visitors. As of yet, organizations that currently or could promote agritourism are not coordinated well, leading to potential duplication of effort. Tourism is so large that agritourism operations can face stiff competition, and agriculture in Florida itself faces threats such as pests, disease, weather, labour and other costs, and urban sprawl.

Therefore, our strategic plan focuses on reaching out to current producers and agritourism operators, plus Extension personnel and agritourism support organizations in the near-term. Short-term goals would be to coordinate among the various organizations to define each one's roles and involve Extension agents in improving agritourism. Longer-term, we would offer ongoing operator education and create state-wide initiatives, leading to increases in awareness of and visits to agritourism operations.

Implications

Florida has the agriculture and the annual visitors to forge a strong agritourism industry. Farm operations looking to increase their revenue options and income are dabbling in hosting recreational visitors. Florida's agritourism industry is growing, and consumer trends suggest the public is looking for the services Florida agriculture can offer (Stofer, Rumble, & Anderson, 2018). Particularly challenging, yet compelling in terms of potential to meet consumer demand, will be navigation of regulations to allow overnight farm stays, farm dinners and unique "transformational" experiences, sought by travellers, as indicated by VISIT FLORIDA, to capture a larger percentage of tourist dollars spent (2018). International visitors originating from regions already savvy in agritourism experiences, such as Europe, may be a high value target audience for Florida's agritourism operators. Developing solutions to drive innovation in Florida's agritourism market requires an integrated approach, partnering the strengths of Extension as a non-biased educator and convener with the interests of various industry actors. Agricultural operations with boldness to explore new opportunities will ultimately determine the strength of the industry, however Extension can demonstrate practical value to advancing opportunities by providing cooperative framework to support these impactful discussions.

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Designing frameworks for characterizing and assessing innovation support services and innovation support providers: SERVInnov project

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Keywords

Agricultural Innovation System, Innovation support services; Innovation support providers; innovation sub-system

Abstract

Based on the assumption that agricultural development increasingly involves complex undertakings, a consensus is now acknowledged regarding crucial priority to promote innovations within agriculture and across food systems in the Global southern countries (including Africa) aiming at realizing economic growth and inclusive development. Such innovations can be enhanced by a broad range of innovation support services (ISS) presently provided by a pluralistic field of support service providers (ISP). Nevertheless, the broad picture shows a multitude of suppliers addressing innovative initiatives with various approaches, tools, funding and governance mechanisms as well as varied visions of sustainability and development particularly in African context

where international organization and agencies are involved into the promotion of innovations. This paper presents a system-oriented conceptual framework co-designed within the LEAP-AGRI SERVInnov project to characterize and assess ISS and ISP in three African countries: Burkina, Cameroun and Madagascar. The main finding is the need to adapt the Agricultural Innovation System (AIS) approach through the involvement of hybrid and informal actors. Another insight focuses on the need to consider the ISS agricultural sub-systems that encompasses the co-existence of a pluralistic vision of sustainable development (including funding mechanisms) and, what transpires during a service relation situation. These findings should help, firstly ISPs to better design their interventions in order to reinforce their supporting activities toward innovations and secondly, help decision makers to better manage the innovation support services at the system level. The main scientific input is the development of the concept of innovation support system deduced from AIS.

BETTER farmers influence change: The case of an Irish sheep monitor farm programme

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Keywords

Monitor farms, influence, practice change

Abstract

Purpose

To examine the influence of an Irish sheep monitor farm programme on farmer practice change, using the Teagasc BETTER farm sheep programme as an example.

Design/Methodology/Approach: This study used a mixed methods approach. Semi-structured interviews were conducted with BETTER farmers and their advisors. Structured interviews were conducted with members of the BETTER farmers' local discussion groups and e-Profit monitor data from five BETTER farmers was analysed.

Findings

The provision of extra intensive and tailored advice accelerated practice change on the participating BETTER farms. Increased productivity, through changes in management practices, had a positive impact on financial performance. BETTER farm participants positively influenced members of their associated discussion group to make at least one change with newer members most likely to be influenced. Selecting relevant BETTER farmers with a willingness to change is important. Facilitators should not overuse BETTER farmers for hosting or contributing to discussion group meetings.

Practical/Theoretical Implications

There may be the potential to enhance the influence of the BETTER farm sheep programme, and similar extension programmes, in terms of peer-to-peer learning and practice change if discussion group members have more input into their design and implementation. Attention needs to be given to the selection of BETTER farmers and

their use by discussion group facilitators and/or extension agencies.

Originality/value

There has been little research in regards to the influence of monitor farm programmes on the monitor farmer and/or the influence of the monitor farmer on his/her peers.

Introduction

Evidence suggests that farmers are strongly influenced by social norms and peer pressure (Ajzen, 1991), generally share experienced based knowledge with other farmers (Wood et al., 2014) and are most influenced by the successful demonstration of farming methods by their peers (Gustavsson et al., 2018; Šūmane et al., 2018; Weyori et al., 2018; Kilpatrick and Johns, 2003). Therefore, demonstration activities hosted by farmers can prove effective in supporting peer-to-peer learning (Gustavsson et al., 2018) an approach which typically involves farmers learning from and with each other (Pappa et al., 2018).

The use of commercial farms can add relevance, geographical spread and industry credibility to projects (Crawford et al., 2007). Monitor farms were first established in New Zealand during the 1980's (Jack, 2009) and have the potential to show improvements over time which allows the host farmer and farmers in the associated discussion group learn from the process and impact of change (Bailey et al., 2006). Monitor farms are owned and operated by a group of local farmers, are facilitator moderated, and are typically organised around a single farm over a three to four-year period (Koutsouris et al., 2017; Sheath and Webby, 2000).

In terms of learning, experimentation and practice change, the monitor farmer is the main beneficiary of monitor farm programmes (Prager and Creaney, 2017) and they have increased their productivity and profitability through participation (Campion et al., 2018; B&LNZ, 2015; Lynch et al., 2013). New Zealand (Sheath et al., 1999; McIvor and Aspin, 2001), Australian (Campbell et al., 2006) and Scottish (Watson Consulting, 2014) monitor farm programmes have had a positive influence on practice change among the wider farming community.

In an Irish context, Teagasc¹ have monitor farm programmes (Hanrahan et al., 2019) focus farms (Teagasc, 2019) and BETTER² farms (Mulkerrins et al., 2018). The structure of these programmes, in terms of selecting farmers from existing facilitator-moderated discussion groups and demonstrating improvements in productivity and profitability over a three to four year period, is generally the same. For that reason, in the context of this paper, monitor farms/farmers and BETTER farms/farmers will be used synonymously.

The BETTER farm sheep programme (BFSP) was designed to establish focal points for the on-farm implementation, development and evaluation of technologies relevant to the sheep sector in a commercial setting (Campion et al., 2018). A key aspect of the BFSP, like other monitor farm programmes, is to improve the adoption of technology by the wider sheep sector (Lynch et al., 2013). All Teagasc discussion groups have access to the BETTER farms and are encouraged to visit them as are other Teagasc clients and non-clients through organised farm walks, open days and demonstrations (Mannion, 2016).

Participatory extension, in particular farm discussion groups, has become a popular form of extension in Ireland (Hennessy and Heanue, 2012). Furthermore, there is a po-

¹ Teagasc is the Agriculture and Food Development Authority in the Republic of Ireland.

² BETTER is an acronym for Business, Environment, Technology through Training, Extension and Research.

sitive relationship between discussion group membership, technology adoption and farm profit (Läpple and Hennessy, 2015; Hennessy and Heanue, 2012). Many discussion groups in Ireland participate and/or participated in schemes in which they are incentivised to attend (Šūmane et al., 2018) and adopt a number of pre-determined technologies. The adoption and diffusion of agricultural innovations by farmers can potentially improve the productivity, profitability and sustainability of their farms (Wheeler et al., 2017). Although extension programmes aim to support farmers in achieving practice change, they often fail to deliver on the intended adoption outcomes (Turner et al., 2017). However, the literature suggests there could be high levels of learning and adoption by BETTER farmers and their discussion group peers (Prager and Creaney, 2017).

The objective of this paper is to critically assess BETTER farms in Ireland to inform gaps in the literature in relation to (1) the actual practices that are adopted on monitor farms,

(2) the impact of these practices in terms of productivity and profitability, (3) which practices, if any, can monitor farmers influence their peers to adopt and (4) the perspective of facilitators on the advantages and influence of BETTER farmers.

Methods

A mixed methods approach was taken through the combination of qualitative and quantitative research methods (Bryman, 2008). Knook et al., (2018) argue that the use of the qualitative data has not been well integrated or has been treated as an alternative to quantitative methods in previous research in relation to participatory extension programmes.

Semi-structured interviews

Semi structured interviews (SSI) were conducted face-to-face with all lowland BETTER sheep farmers (n=8) in July 2016. These SSI lasted 90-120 minutes and were audio recorded. Additional SSIs were conducted in May 2017 with Teagasc advisors (n=8) who facilitate the local discussion groups, of which the BETTER farmers were members. These SSIs lasted 30-45 minutes and were recorded, similar to Mannion (2016), using the internal Teagasc Microsoft Lync system.

Structured interviews

Guided by the results from the SSI, structured interviews were conducted with farmers. A random sample of ten farmers was selected from each of the local discussion groups, of which the BETTER farmers were members³. Questionnaires were sent in batches of 10-15 at three to five day intervals and follow-up phone interviews were arranged. During the structured interviews (n=69) Microsoft Lync was used for recording and quantitative data were inputted into Survey Monkey, an online survey software. These data were exported to Microsoft Excel 2010 and prepared for analysis in the Statistical Package for Social Sciences (SPSS).

Teagasc e-Profit monitor analysis

Each BETTER farmer completed a Teagasc e-Profit monitor⁴ for each year they participated in the BFSP to capture their physical and financial performance. The objective

3 One group were omitted as they had not visited the BETTER farm yet (he was a new entrant to the BFSP).

of this analysis was to determine the component of the BETTER sheep farmers' gross margin that can be attributed to increased productivity over the normal three-year duration of the BFSP (Lynch et al., 2013). The parameter used to assess increased productivity was the number of lambs weaned per hectare. The first year of participation was set as the base year. The contribution to increased productivity was calculated by comparing the actual change in gross margin to what the change would have been if there was no increase in productivity from the base year. This is referred to as "no gains". The base year costs were inflated in accordance with the Central Statistics Office (CSO) agricultural price index 2016. Data for the base year until the end of year three on the BFSP were analysed for five farmers⁵.

Results

The results will be presented under the following headings; influence of the BFSP on the BETTER farmers, BETTER farmers perception of their influence on their peers, advisors perception of the influence of BETTER farmers, the influence of the BETTER farmers on their discussion group peers and facilitating discussion groups with BETTER farmers.

Influence of the BFSP on the BETTER farmers

The greatest numbers of changes made on the BETTER farms after joining the BFSP were in relation to; grassland management, breeding and flock health practices respectively (Tables 1-4).

The BETTER farmers acknowledged that the extra and more intensive advisory support they receive was the "essential" incentive of the programme which helped accelerate practice change;

"If I wasn't in the BETTER farm programme I probably wouldn't have implemented some of the things quite as fast". BETTER Farmer 5

Furthermore, it gave the farmers confidence in their decision making;

"I think he gave us confidence because he was there to tell us and when it did work out once I thought well it worked out last year it should work out this year...now I have confidence... paddocks and things I wouldn't have done any of that, definitely not". BETTER Farmer 3

The BETTER farmers increased their productivity and profitability while participating on the BFSP. A significant proportion of the increase in gross margin can be attributed to increased productivity through the changes made by the BETTER farmers (Fig.1).

The increase in financial performance through participation in the BFSP is mentioned by BETTER farmer six;

"The overall gross margin, before joining the BETTER Farm Sheep Programme, was around €350 per hectare. Last year that would have been up at €800-900, the sheep side would have been about €950, so it has increased a lot".

The importance of the financial incentive provided through participation was also acknowledged. This was viewed as additional income by some BETTER farmers while others viewed it as "compensation" for the extra work they had to do.

BETTER farmers perception of their influence on their peers

All of the BETTER farmers believed they have had a positive influence on some far-

⁴ An online financial analysis tool.

⁵ Two of the farmers were omitted due to participation in the study published by Lynch et al., (2013) while the third had not yet completed three years of the BFSP.

Figure 1 - Increased gross margins from increased productivity on the BETTER farms

| Financial performance | Year 1 | Year 2 | Year 3 |
|---|--------|--------|--------|
| Average actual gross margin (€/hectare) | 275 | 466 | 700 |
| Average "no-gains" (€/hectare) | 275 | 291 | 480 |
| Average gross margin increase from productivity (€/hectare) | 0 | 175 | 220 |
| Productivity | | | |
| Average number of lambs weaned/hectare | 12.54 | 14.02 | 14.93 |

mers in their local discussion group to make changes. Being able to see results on a commercial as opposed to a state owned research farm was cited as having a greater influence on farmers;

"If I meet Pat down the road and talk to him and say I was in Athenry⁶ today and say jays they are great lambs fed off grass and everything is honkey dorey...Ahh yeah he would say but sure look that is a state farm you wouldn't know what's going on there...so when you put it into the ordinary farmer's circle and say that you have Joe Soap out here in the middle of the sticks doing it, and they know exactly what is going on here, there is huge interest in it". BETTER Farmer 1

However, not all farmers in discussion groups were open to learning and making changes;

"Some of the guys in the group are willing to change, some of the guys are willing to learn and some of the guys in the group have no interest in it, they just want their few pound at the end of it". BETTER Farmer 2

The influence of the BETTER farmers is not limited to their group with the majority of the BETTER farmers receiving regular phone calls or visits from neighbours and/or other local farmers in relation to advice on new or existing practices.

Advisors perceptions on the influence of the BETTER farmers

Six of the eight advisors felt that the BETTER farmer in the group had an influence on the other members of the discussion group in terms of practice change. The greatest influence, according to advisors, was in relation to grassland management;

"He has six to eight divisions per group whereas we are getting lads even to get into four or five and it is helping but I can definitely see "buy-in" from some of the guys". Advisor 5

It was acknowledged that farmers may not necessarily be aware of this positive influence;

"I have one of the most negative divils in my group and even he is convinced by it. Farmers take a long time to change...these lads are nearly doing these things subconsciously you know". Advisor 2

Similar to the BETTER farmers, advisors commented that the influence of the BETTER farmer is not restricted to the local discussion group. BETTER farms host open days, student groups and other discussion groups that want to visit the farm.

⁶ Teagasc National Sheep Research Centre.

Table 1 - Grassland management practices adopted through BFSP participation

| Grassland practices | % of BETTER farmers practicing | % adopted by the BETTER farmers after joining the BFS | % adopted by discussion group farmers | % of discussion group farmers positively influenced by the BETTER farmer |
|--|--------------------------------|---|---------------------------------------|--|
| Grass measuring | 100 | 88 | 7 | 1 |
| Grass budgeting | 100 | 88 | 7 | 1 |
| Rotational grazing | 100 | 88 | 84 | 6 |
| Creation of more paddocks/ temporary divisions | 100 | 75 | 86 | 15 |
| Autumn closing plan | 100 | 50 | 94 | 1 |
| Reseeding | 100 | 13 | 91 | 4 |
| Soil testing | 100 | 13 | 96 | 0 |
| Silage testing | 100 | 50 | 54 | 1 |

The influence of the BETTER farmers on their discussion group peers

Overall, 61% of farmers stated that the BETTER farmer in their discussion group had an influence on them to make a change. Newer members to the discussion groups were the most likely to be influenced by the BETTER farmer to adopt grassland management and breeding practices. The following sections will focus this on the influence of the BETTER farmers on their peers in more detail.

Grassland management

The greatest influence was in relation to grassland management with 45% of farmers having implemented at least one on-farm change in relation to grassland management (Table 1).

A farmer provided an example of this influence;

"The rotational grazing end of things he has pushed me to do that...that is the main thing I picked up, splitting the bigger fields and moving them along quicker".

Furthermore, 14% of farmers were positively influenced to adopt two or more grassland practices. A number of farmers reported (18%) that they were influenced to modify or adapt technologies they had previously adopted or that were not listed;

"I am trying to keep grass short and leafy and getting slurry or fertilizer right...we spread more lime now too as he seems to be doing a lot of that".

Breeding

There was a positive influence from the BETTER farmer in terms of practice change(s) in relation to breeding technologies/practices (29%) (Table 2).

These comments give further insight into this influence;

"We introduced Belclare's and the litter size increased".

"As part of discussion with the BETTER farmer we keep homebred replacements".

One farmer commented definitively in regard to the influence of the BETTER farmer;

"Yes definitely. The type of ewe is what I was impressed with on his farm...when I saw his lowland ewes, all their mothers were horned ewes which needed less feed to maintain and their lambs were good enough. So I am trying to breed ewes similar to that".

Table 2 - Breeding related technologies/practices adopted through BFSP participation

| Breeding practices | % of BETTER farmers practicing | % adopted by the BETTER farmers after joining the BFS | % adopted by discussion group farmers | % of discussion group farmers positively influenced by the BETTER farmer |
|---|--------------------------------|---|---------------------------------------|--|
| Increase stocking rate | 100 | 63 | 49 | 0 |
| Increase litter size | 100 | 63 | 64 | 3 |
| Breed selection/change | 100 | 75 | 97 | 7 |
| Breeding ewe lambs | 63 | 13 | 64 | 0 |
| Performance recorded rams (Euro-Star ram) | 100 | 75 | 88 | 6 |
| Homebred replacements (Closed flock) | 100 | 13 | 67 | 1 |
| Ultrasound scanning of breeding ewes | 100 | 13 | 97 | 0 |
| Weight recording | 100 | 75 | 27 | 0 |
| Condition scoring | 100 | 38 | 91 | 0 |
| Tagging/identifying replacements at birth | 100 | 75 | 43 | 3 |

As can be seen by this comment, similar to the grassland technologies and practices, 9% of the respondents said that they were influenced to modify or adapt technologies they had previously adopted or that were not specified in the survey.

Flock Health

In relation to flock health practices, 26% of farmers cited the BETTER farmer as having a positive influence on them to adopt a new practice or technology (Table 3.)

The greatest influence was in relation to faecal egg counting to make treatment decisions: *"The faecal egg I have only done that twice, it is not something I do consistently, but I do see the benefit of it and that is something I got from him"*.

Again, 9% of farmers were influenced to adopt a practice that was not listed or to modify an existing practice.

Financial management and farm facilities/infrastructure

There was no influence from the BETTER sheep farmers on the use of the Teagasc e-Profit monitor. There was little influence (4%) on farm facilities/infrastructure (Table 4). A farmer quote illustrates this;

"I would have seen it (artificial rearing system) on his farm and discussed it with him, they are expensive to rear but we will try to do it properly".

Feedback from farmers shows that there are some technologies they have been exposed to through the BETTER farmer, but while awareness and interest is raised, they are not yet implementing them;

"Just about to start that now, I have the Pratley bought and the EID reader so I am going to

Table 3 - Flock health related technologies/practices adopted through BFSP participation

| Flock Health Practices | % of BETTER farmers practicing | % adopted by the BETTER farmers after joining the BFS | % adopted by discussion group farmers | % of discussion group farmers positively influenced by the BETTER farmer |
|--|--------------------------------|---|---------------------------------------|--|
| Routine foot bathing | 100 | 25 | 77 | 0 |
| Dipping | 63 | 0 | 54 | 0 |
| Vet lab for diagnosing lamb mortality | 75 | 38 | 48 | 4 |
| Faecal egg counting to make treatment decisions | 100 | 75 | 67 | 10 |
| Faecal egg counting/drench testing to check for resistance | 88 | 38 | 74 | 4 |
| Clostridia and/or Pasteurella vaccinations | 100 | 0 | 94 | 0 |
| Abortion vaccination | 75 | 50 | 46 | 4 |

be doing that next year”.

Interestingly, 64% of farmers indicated that they have spoken to their local BETTER sheep farmer at an alternative time and/or location to the discussion group meetings, for advice, guidance or help on a farming related topic;

“We have a very good group but only a few of us are measuring grass...he is one of the few that is doing the same as me, so we would often discuss grass growth and things like that... so I would ring him and talk to him”.

The majority (94%) of farmers stated that it was an advantage to have a BETTER farmer in their group;

“I think it is a good idea and you know the farmer will listen to another farmer before he will listen to an advisor, so for me that is a strong point of the BETTER farm programme...like Athenry is the perfect world with money to pay for labour, reseeding...whereas the BETTER farm programme is easier for a farmer to relate to”.

However, other farmers viewed themselves to be at a higher level:

“I was doing them all before...in our group when they picked him one of the reasons was because he was lowly stocked etc. It is a little bit unfair because had the timing been different it probably would have affected me”.

Discussion group facilitation

All of the advisors felt that the BETTER farmer contributed positively to discussion group meetings but there are interesting dynamics to note. While facilitating discussion group meetings the advisors focused on involving all group members equally in discussion and not solely focus on the BETTER farmer;

“We don't set him up as the BETTER farmer at the meeting you know but I wouldn't say he

Table 4 - Flock health related technologies/practices adopted through BFSP participation

| Financial Technologies | % of BETTER farmers practicing | % adopted by the BETTER farmers after joining the BFS | % adopted by discussion group farmers | % of discussion group farmers positively influenced by the BETTER farmer |
|--|--------------------------------|---|---------------------------------------|--|
| Profit monitor | 100 | 50 | 38 | 0 |
| Infrastructure/ Farm facilities | | | | |
| Artificial rearing system (ARS) | 75 | 38 | 45 | 3 |
| Weighing crate | 100 | 0 | 97 | 0 |
| Handling/drafting facilities | 100 | 0 | 91 | 1 |

is saying any more or any less than the others, it is a fairly good group anyway". Advisor 4
Some BETTER farmers prefer not to be talking too much at group meetings;
"Well he doesn't like to be coming in too much, he doesn't want to be seen as a know it all. I would try and involve everyone at some point in the meeting...but he is always obliging if I ask him a question". Advisor 5

Focusing on "buy-in" from the members of the local group was also an important aspect for advisor six;

"We would let the discussion group buy into it and ask them what they would like to see...we asked them what do you feel should happen on this farm? And get them to see it at the start and then we would visit once a year and they would see how he has progressed".

In regard to visiting the BETTER farm, advisors believed one visit per year was sufficient unless a major change had occurred. The reasons for this were to avoid boredom and because there is other group members that want to host meetings. Additional benefits for advisors of having a BETTER farmer in discussion groups included;

- Learning by seeing new practices and their impact over time.
- Physical and financial data from BETTER farms add credibility to the discussions being facilitated at group meetings.
- Farmers are more likely to believe information coming from a commercial farm than a research farm.
- Discussion group members can benchmark themselves against the BETTER farmer.

BETTER farmer selection

According to advisors, BETTER farmers should be selected based on their attitude, willingness to change, location and relevance to their local group and the wider farming community. Advisor eight stressed the importance of attitude;

"They recommended that he would get in more Belclare's and bring up his fertility levels a bit...he wasn't keen on it and didn't want to do it. Now that he is out of it there isn't a Belclare ram in the place and he is gone back to what he had and the fertility level has dropped. Attitude again. If they don't have it you're going nowhere with it".

In terms of improving the BFSP, farmers mentioned; having a BETTER farmer and/or discussion group for higher performing farmers, the incorporation of more practical components into meetings and discussion groups should have input into their local BETTER farm.

Discussion

This study found that participation in the BFSP accelerated practice change on the BETTER farms. The greatest numbers of changes were made in relation to grassland management, breeding and flock health respectively. These changes were facilitated by extra and more intensive advisory support which gave the BETTER farmers the confidence to make changes. This was acknowledged as the “essential” incentive of the BFSP. The financial incentive was viewed as important but more so as “compensation” for the additional workload that is expected and required of BETTER farmers. This can be seen from previous studies which suggest that monitor farmers need incentives which are usually the combination of money and the gain expected from access to expertise and advice (Bailey et al., 2006).

Increased productivity and financial performance was achieved on the BETTER farms with 31% of the increase in financial performance being attributed to increased productivity and not market price changes. Overall, these findings are consistent with other studies which reported increases in productivity and financial performance on monitor farms (B&LNZ, 2015; Sheath et al., 1999).

Prager and Creaney (2017) found that the monitor farmers were likely to benefit most in terms of learning and practice change as well as undertaking more experimentation than a non-participant. Similarly, BETTER farmers made more practice changes than their discussion group peers through participation in the BFSP. However, there was a high level of technology adoption within the discussion groups in this study which is not surprising considering discussion group membership has a positive influence on technology adoption (Hennessy and Heanue, 2012).

In addition to discussion group membership, “opinion leaders” can positively influence other individuals’ attitudes and behaviour (Rogers, 2003) and monitor farmers have been reported to initiate practice change among their peers (Campbell et al., 2006; Watson Consulting, 2014). The BETTER farmers influenced 61% of their discussion group peers to make at least one practice change.

The greatest influence was in relation to grassland management practices but there was, albeit to a lesser extent, a positive influence in relation to breeding, flock health and farm facilities/infrastructure.

The BETTER farmers and their advisors suggested that this influence is not limited to the local discussion group. Neighbours and other local farmers regularly visit and call the BETTER farmers seeking advice. Furthermore, other discussion groups and students are brought to the BETTER farms and national open days are also organised for the wider sheep farming community to attend.

Incentivised discussion group schemes that focus on technology transfer have characteristics of both linear and participatory extension approaches and such prescriptive programmes can struggle to encourage farmer-led processes (Prager and Creaney, 2017). There have been criticisms of the traditional linear model (Vanclay, 2004; Black, 2000) including that it can no longer address agricultural problems due to their scale and complexity (Wood et al., 2014). Considering the prescriptive nature of many discussion group schemes (Prager and Creaney, 2017), the advantages of participatory approaches (Roche et al., 2015) and a move towards collaborative actions between all stakeholders where learning is mutual and co-constructed (Sewell et al., 2017), there could be potential for the BFSP to have a greater influence.

International monitor farm programmes are more participatory orientated and are typically “owned and operated” by a group of local farmers (Koutsouris et al., 2017). The BFSP programme does not share these characteristics. Some farmers alluded to the fact that they should have input into the design of their local BETTER farm. However, only one advisor mentioned that he focused on this. Encouraging the local discussion

group members to have involvement in the design and practices implemented on their local BETTER farm may stimulate greater interest and “buy-in” from them. This open and flexible approach with less detailed objectives creates more potential options for experimenting and learning (Prager and Creaney, 2017).

Facilitation allows for two-way information flow between farmers and is an integral part of discussion groups, monitor farm programmes (Prager and Creaney, 2017) and other participatory extension programmes (Roche et al., 2015). BFSP facilitators were in agreement that BETTER farmers are an advantage to discussion groups and contributed positively to discussions.

That said, the respect and credibility of an “opinion leader” can be lost if they are overused and/or deviate too far from the social systems norms (Rogers, 2003). Discussion group facilitators clearly stated to avoid an over reliance on the BETTER farmer to host and contribute to group meetings. Facilitators should focus on involving all group members and not to rely on any particular farmer(s). In terms of the selection of BETTER farmers it is clear from both advisors and farmers that they should be selected based on attitude, willingness to change, location and relevance to their local group and the wider farming community.

Conclusion

The BFSP has been shown to accelerate practice change among the participating BETTER farmers, resulting in increased productivity and financial performance. Importantly, BETTER farmers have a positive influence on their discussion group peers in terms of practice change with newer discussion group members most likely to be influenced. The influence of the BETTER farmers also extends beyond their local group with neighbours, local farmers, other discussion groups, students and farmers attending open days also visiting the BETTER farms.

This paper provides a number of useful insights for the design of future programmes. Reflecting developments in wider agri-environment scheme design, such as European Innovation Partnerships (EIP), this study suggests that there may be potential for improved outcomes in terms of “buy-in”, peer-to-peer learning and practice change if discussion group members have greater input into the design and implementation of BETTER farms. Facilitators should ensure the BETTER farmer is not visited too often or overused for contributions during discussion group meetings. Finally, BETTER farmers should be selected based on attitude, willingness to change, location and relevance to their local group and the wider farming community.

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The role of agricultural extension towards facing climate change in Al-Gharbia Governorate, Egypt

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Keywords

Agricultural extension, climate change, extension centers, Al-Gharbia governorate, Egypt.

Abstract

This study aims to identify the knowledge of extension agents at extension centers of the forms, causes and effects of climate change; and to identify the role of agricultural extension in addressing climate change. This study has been conducted in all extension centers in Al-Gharbia governorate, Egypt, during December 2018. Data has been collected from 68 respondents of agricultural extension agents affiliated to 17 extension centers; 51 respondents are male and 17 respondents are female, through a personal interview questionnaire made especially for this purpose. Several statistical methods have been used such as percentage and frequency tables.

The most striking results of the study show that 9.41% of the respondents have a high level of knowledge about the forms of climate change. 76.47% have a high level of knowledge about the causes of climate change, while 73.52% have a high level of knowledge about the effects of such climate change. The most of respondent are aware of the role of agricultural extension in diminishing the causes of climate change and overcoming the effects of climate change.

The effects of climate change on agricultural extension work are as follows: difficulties in implementing the action plan due to change in rain patterns, difficulties in running farms and applying new farming techniques, growing workload put on agricultural extension agents, and an increase in costs of training.

Introduction

The whole world today is interested in the global climate change due to their impacts on human existence. Climate change has serious future effects. El-Marsafawy (2007) defines it as "the total change in the earth's surface as a result of the gas emissions which, in turn, lead to global warming and the rise in the earth's surface temperature." Climate change takes many forms; the most prominent are the increase in temperature, shortage of rainfall, windstorms and hurricanes, long periods of dryness and the failure to forecast the weather (Shankar, 2013). The reasons for these climate change can be natural or human. The latter can be divided into industrial reasons and agricultural ones. The total gas emissions from agriculture account for 15.7% of the total global warming gases resulting into climate change (Abu Hadeed, 2010). As such, agriculture has a big share in causing climate change. It is affected by these

changes as well. This appears in the decrease in crop yield and animal production; the increase in water consumption for irrigation, the increase in water levels on land, soil salt, the diminishing net farm revenue, the increase in diseases and plant insects, and the increase in the cotton yield (Abu Hadeed, 2010; EL-Marsfawy, 2009; Ifeanyi-obi et al., 2012; Nnadi et al., 2013; Al-Shaib et al. 2016; Abd Ella et al., 2018).

Agricultural extension has a vital role in facing climate change prior to their occurrence through informing farmers to amend their practices which lead to the increase in the greenhouse gases. It has also an essential role after the occurrence of climate change through informing farmers of the practices which could diminish the impact of these changes, telling them of how to adapt with the changes and lessen their side effects on the agricultural sector (Saleh, 2009; Mustapha et al., 2012; Al-Shenawy et al., 2013; AL-Shaib et al., 2016; Abd Ella et al. 2018). In light of this, it seems necessary to identify the extent to which extension agents are aware of this climate change, and the role played by agriculture extension in facing and overcoming this phenomenon.

Material and Methods

This study aims to identify the knowledge of extension agents at extension centers of the forms, causes and effects of climate change, their desire to participate in activities to overcome climate changes and to identify the role of agricultural extension in diminishing the causes of climate change and overcoming its effects. It also aims to identify the effects of climate change on agricultural extension work. This study has been conducted in all extension centers in Al-Gharbia governorate, Egypt, during December 2018. Data has been collected from 68 respondents of agricultural extension agents affiliated to 17 extension centers; 51 respondents are male and 17 respondents are female, through a personal interview questionnaire made especially for this purpose.

Research variables have been measured as follows:

- Knowledge of the features of climate change has been measured through a tool containing 13 items. Participants have been asked about their knowledge of the features of climate change.
- Knowledge of the reasons for climate change has been measured through a tool containing 14 items. Participants have been asked about their knowledge of the reasons for climate change.
- Knowledge of the impact of climate change has been measured through a tool containing 14 items. Participants have been asked about their knowledge of the impact of climate change.

They have to choose one of three options (Yes, I do not know, and No), on a scale of three (1, 2 and 3 respectively). The real range has been divided into three groups: low knowledge, average knowledge and high knowledge.

- Participants' desire to participate in the extension activities to face climate change, as well as their awareness of the role played by agricultural extension in facing them, has been studied, too.

Several statistical methods such as percentage and, frequency tables were used to analyze the data.

Results

Knowledge of the features of climate changes

Table 1 shows that 79.41% of the participants have a high level of knowledge of the features of climate change.

Table 1 - Distribution of the participants' answers for the knowledge of the features of climate change

| <i>Knowledge of the features of climate change</i> | <i>Number</i> | <i>Percentage</i> |
|--|---------------|-------------------|
| Low level of knowledge | 6 | 8.82 |
| Average level of knowledge | 8 | 11.77 |
| High level of knowledge | 54 | 79.41 |
| Total | 68 | 100 |

Knowledge of the reasons for climate change

Table 2 shows that 76.47% of the respondents have a high level of knowledge of the reasons for climate change.

Table 2 - Distribution of the respondents' answers for the knowledge of the reasons for climate change

| <i>Knowledge of the reasons for climate change</i> | <i>Number</i> | <i>Percentage</i> |
|--|---------------|-------------------|
| Low level of knowledge | 9 | 13.24 |
| Average level of knowledge | 7 | 10.29 |
| High level of knowledge | 52 | 76.47 |
| Total | 68 | 100 |

Source: Data collected and calculated from questionnaires.

Knowledge of the impacts of climate change

Table 3 shows that 73.52% of the respondents have a high level of knowledge of the impacts of climate change.

The results of tables 1, 2 and 3 indicate that the respondents have high level of knowledge of the features, reasons for, and impact of climate change. This, in turn, reflects the fruit of the training they have already received in the field of climate change.

Table 3 - Distribution of the respondents' answers for the knowledge of the impacts of climate change

| <i>Knowledge of the impacts of climate changes</i> | <i>Number</i> | <i>Percentage</i> |
|--|---------------|-------------------|
| Low level of knowledge | 9 | 13.24 |
| Average level of knowledge | 9 | 13.24 |
| High level of knowledge | 50 | 73.52 |
| Total | 68 | 100 |

Source: Data collected and calculated from questionnaires.

The desire to participate in extension activities to face climate change

Table 4 shows that 98.53% of the respondents have desire to participate in extension activities to face climate change. This is an indicator of their motivation and keen interest in achieving the goals of extension work to overcome this climate change, and diminish their negative impact on the agrarian sector.

Table 4 - Distribution of the respondents' answers for the desire to participate in extension activities to face climate change

| <i>Desire to participate in extension activities</i> | <i>Number</i> | <i>Percentage</i> |
|--|---------------|-------------------|
| Have desire | 67 | 13.24% |
| Do not have desire | 1 | 13.24% |
| Total | 68 | 100% |

Source: Data collected and calculated from questionnaires.

The role of agricultural extension in diminishing the agricultural causes of climate change

Table 5 contains the respondents' answers to the role played by agricultural extension in diminishing the agricultural causes of climate change. Top on the list of the roles played by extension agents is informing farmers of the need to stop burning rice straw, and recycling it; 61 participants (89.1%) highlighted this role. Then, 60 participants (88.23%) have mentioned the role of the need not to increase the land allocated for growing rice. Finally, 58 participants (85.29%) have pinned down the importance of informing about the environmental problems and pollution sources.

Table 5 - Distribution of respondents' answers to the role played by agricultural extension to diminish the causes of climate change

| <i>The agricultural extension role</i> | <i>Frequency</i> | | | | | | | |
|---|------------------|--------------|-----------|-------|--------|------|-------|---|
| | Always | % | Sometimes | % | Rarely | % | Never | % |
| Less use of chemical fertilizers | 54 | 79.41 | 13 | 19.12 | 1 | 1.47 | - | - |
| Amending system | 51 | 75 | 13 | 19.13 | 4 | 5.88 | - | - |
| Not increasing the land for rice | 60 | 88.23 | 7 | 10.29 | 1 | 1.47 | - | - |
| Informing of environmental problems and pollution sources | 58 | 85.29 | 10 | 14.71 | - | - | - | - |
| Informing of the need not to overuse pesticides | 52 | 76.47 | 15 | 22.06 | 1 | 1.47 | - | - |
| Informing of the need to stop burning rice straw, and to reuse it | 61 | 89.70 | 5 | 7.35 | 2 | 2.94 | - | - |
| Increasing the culture of afforestation | 52 | 76.47 | 15 | 22.06 | 6 | 8.82 | - | - |
| Informing of the need to use organic fertilizers | 47 | 69.12 | 15 | 22.06 | 6 | 8.82 | - | - |
| Banning building on agrarian land | 53 | 77.94 | 8 | 11.76 | 7 | 10.2 | - | - |
| Diffusing the integrated pest management methods | 9 | - | - | - | - | - | - | - |
| | 50 | 73.53 | 17 | 25 | 1 | 1.47 | - | - |

Source: Data collected and calculated from questionnaires.

Methods and tools used by innovation support services in Italy

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Keywords

Innovation support services, multi-actor approaches, interactive innovation, RDP, EIP- Agri.

Abstract

Since the programming period 2007-2013, the European rural development policy promotes the cooperation for innovation in agriculture. This has been strengthened by the European Innovation Partnership (EIP), which endorses the interactive model to innovation based on multi-actor and transdisciplinary approaches. Under the Rural Development Programmes 2014-2020 (RDPs) the Operational Groups (OGs) are the main tool for the implementation of the EIP-Agri. Recent studies suggest the existence of a variety of actors and organizations who are supporting innovation processes in agriculture, both at local and system levels. Considering these evidences, the aim of this study is to identify the methods and tools used by the providers of innovation support services which are partners of the Italian OGs. An online survey with the partners of OGs were used for the collection of more-in-depth qualitative and descriptive information. The results of the study highlight the existence of a variety of approaches in use within cooperation projects for innovation. However, the approaches to the interactive model for innovation differ according to the types of services' providers. An overview of approaches, methods and tools in use in Italy provides a significant advancement in literature. Moreover, the study puts in evidence insightful implications for policy makers.

How Much the Iranian Agricultural Graduates are Competent? (Investigating the employers' viewpoint)

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Keywords

Agricultural graduate- Self-sustainability- Competence- Employer- Labor market

Abstract

In contemporary working life, self-sustainability and discourses of innovation extends beyond employability and professional success and strongly depends on individuals' competencies. Competence-based education (CBE) had been designed to equip graduates with high levels of career and citizenship competencies. Based on CBE principles this quantitative study sought to investigate how Iranian agricultural graduates are equipped with technical, communicational, management, analytical, and personal skills. Governmental employers in the agricultural sectors were selected as the research population. Since there are a large number of agriculture employers in governmental sector in Iran, the major employers were opted to participate in this study (n=142). Results indicated that from viewpoints of employers, communicational skills of agricultural graduates is nearly in average level (mean= 3.16) while other skills are less than average. In the other word, Iranian agricultural graduates not competent enough to guaranty their success in the contemporary complicated working life. Therefore this study suggests to the policy makers to focus on the CBE in the agricultural education.

Introduction

One of the main missions of the higher education is offering service to the society (Morphew et al. 2018). This mission clearly expresses the role of universities in producing graduates with employable skills that will contribute to the local and regional economies. Competence Based Education (CBE) as an educational innovation had been designed in order to assist university to fulfill this role (Mulder 2017), since one of the main objectives of CBE is to equip graduates with career and citizenship competencies. Implementing CBE may be challenging for the education systems especially in developing countries. Iran's agricultural education is one of the education systems facing these challenges; previous studies show that there is a poor connection between the agricultural higher education system and the agricultural labor market in Iran. As a result, the number of agricultural higher education graduates in the agricultural labor

market is very low (Movahhedi 2017; Shojaee 2009; Movahedi et al. 2010). There are different reasons for this, but one of the main reasons is an excessive emphasis in the universities on accumulating rather than applying knowledge; in the curriculum, the abstract content is emphasized and students are not aware of the implications of whatever they are learning (Aghapour et al. 2014).

In a competence based education system, attention is paid not only to the competencies needed for job performance, but also other competencies necessary for surviving in today's society (e.g. communication, learning, etc.) have been considered (Sturing et al. 2011). Based on CBE principles, Saadvandi et al., in 2016 determined a number of competencies for agricultural graduates to meet employers' expectations in the labor market. These competencies are including:

- Communicational competencies which defined by twelve indicators considering different aspects of individual's ability to interact with others both inside and outside of the educational environment.
- Analytical competencies means applying logical thinking in the professional platform, these competencies could be measured using thirteen indicators.
- Technical competencies refer to carrying out a task associated with technical roles in the workplace. These competencies sometimes may be considered as the main criteria for employee's performance. But in CBE it is only one aspect of individual's competencies including fifteen indicators.
- Management competencies are defined as individuals' ability to work with others for others. Having these competencies could be measured by eleven indicators.
- Personal competencies include those skills that individual possess and consider their strengths. These competencies contain seventeen indicators (Saadvandi et al. 2016).

The aim of this study is to investigate that how much the Iranian agricultural graduates are competent based on the CBE principles and indicators.

Research method

Participant characteristics

This national study used a descriptive survey research design. Governmental employers in agricultural sectors were opted to investigate graduates competencies. Since there are a large number of agricultural employers in governmental sector in Iran, we identified the major employers as research population which could be categorized into seven groups (Table1).

Table 1 - Employment centers for the agricultural graduates and related operators

| <i>Employers</i> | <i>Employment destination</i> |
|---|--|
| Agricultural and Natural Resources Engineering Organization The office of organizing Jihad agriculture and extension networks | Consulting services companies |
| Plant Protection Organization | Clinic of Plant Protection |
| Water and Soil Research Institute | Soil laboratories |
| Agricultural Insurance Fund | Insurance agents |
| Agricultural Mechanization Development Center | Agricultural equipment service company |
| Central Organization for Rural Cooperatives | Production cooperatives |
| The office of organizing Jihad agriculture and extension networks | Builders Soldiers |

In order to select samples, we used stratification system developed by ministry of education. Finally 142 governmental employers from five provinces (including Tehran, Khorasan Razavi, Kermanshah, Illam, and Fars) participated in this study. The age of empolyers ranged from 28 to 60 years with an average of 43.71 years (SD = 6.65). In terms of gender, the research sample was 77.5% male (n = 110) and 22.5% female (n = 32). Employers working expereince ranged from 1 to 33 years with an average of 17.34 years (SD= 7.90).

Research Instrument

A structured questionnaire was developed to get information on the respondents' viewpoint regarding agricultural graduate's competencies. This questionnaire contain two parts; in the first part demographic information requested. The second part of the instrument sought to get information on the graduate employees' competencies; this part contains five sections: technical, communicational, management, analytical, and personal competencies.

Results

Ranking the graduates' competencies revealed that "Ability to use ICT technology" and "Possess technical knowledge" are two high ranked technical competencies among agricultural graduates. Some of the lowest ranked competencies in this category were "Preparing a business plan", "Agricultural Marketing" and "Agricultural experience". The top two ranked competencies in the communicational skills were "Oral communication" and "Social communication" while "Understanding people's differences (Sensitivity to others)" and "To know one's mental models" were the lowest ranked communicational competencies. The highly ranked competencies in the feild of mangement competencies were "Ability to recognize long-term and short- term targets" and "Evaluating employee performance". In feild of Alaytical competencies "Decision making" and "Engage in evidence-based reasoning" and in the feild of personal competencies "Manage complex tasks" and "Interpersonal Skills" were highly ranked competencies. In these two feilds " Cross- disciplinary thinking" and "Acceptance of Constructive Criticism" and "Risk taking" and " Has information about international law" were lowest ranked competencies respectively (Table 2).

Table 2 - Graduates' competencies ranked from agricultural employers' viewpoint

| | <i>Indicator</i> | <i>Mean</i> | <i>Standard Division</i> | <i>Coefficient of Variation</i> | <i>Rank</i> |
|------------------------------|--|-------------|--------------------------|---------------------------------|-------------|
| Technical competencies | Ability to use ICT technology | 3.36 | 0.80 | 0.240 | 1 |
| | Possess technical knowledge | 3.09 | 0.82 | 0.266 | 2 |
| | Ability to follow directions | 3.18 | 0.85 | 0.267 | 3 |
| | Preparing cash flow projections | 3.00 | 0.84 | 0.280 | 4 |
| | Ability to improve personal development | 3.14 | 0.89 | 0.284 | 5 |
| | Ability to apply knowledge/ skills in workplace | 2.81 | 0.83 | 0.296 | 6 |
| | Ability to display professional conduct | 2.95 | 0.89 | 0.302 | 7 |
| | Practical understanding | 2.83 | 0.86 | 0.305 | 8 |
| | Ability to maintain and increase initial capital in business | 2.66 | 0.83 | 0.313 | 9 |
| | Ability to work in a competitive professional environment | 2.94 | 0.92 | 0.314 | 10 |
| | Possess technical skill | 2.55 | 0.83 | 0.266 | 11 |
| | Work Speed | 2.88 | 0.95 | 0.329 | 12 |
| | Preparing a business plan | 2.45 | 0.88 | 0.360 | 13 |
| | Agricultural marketing | 2.41 | 0.89 | 0.371 | 14 |
| | Agricultural experience | 2.34 | 0.93 | 0.398 | 15 |
| | Total | 2.84 | 0.87 | 0.310 | 3 |
| Communicational competencies | Oral communication | 3.39 | 0.78 | 0.213 | 1 |
| | Social communication | 3.26 | 0.79 | 0.243 | 2 |
| | Communicate effectively in speech | 3.18 | 0.80 | 0.251 | 3 |
| | Listening skills | 3.26 | 0.83 | 0.256 | 4 |
| | Written communications | 3.21 | 0.83 | 0.258 | 5 |
| | Communicative interaction | 3.24 | 0.86 | 0.266 | 6 |
| | Cooperation among co-workers | 3.21 | 0.87 | 0.271 | 7 |
| | Intercultural communication skills | 3.05 | 0.83 | 0.273 | 8 |
| | Ability to cross-cultural negotiations | 3.16 | 0.86 | 0.274 | 9 |
| | Ability to work in multi-cultural workplace | 3.09 | 0.86 | 0.279 | 10 |
| | Understanding people's differences (Sensitivity to others) | 3.01 | 0.85 | 0.283 | 11 |
| | To know one's mental models | 2.86 | 0.92 | 0.321 | 12 |
| | Total | 3.16 | 0.84 | 0.267 | 1 |

Continue >

Table 2 - Graduates' competencies ranked from agricultural employers' viewpoint

| | <i>Indicator</i> | <i>Mean</i> | <i>Standard Division</i> | <i>Coefficient of Variation</i> | <i>Rank</i> |
|-------------------------|---|-------------|--------------------------|---------------------------------|-------------|
| Management competencies | Ability to recognize long- term and short-term targets | 2.83 | 0.77 | 0.274 | 1 |
| | Evaluating employee performance | 2.90 | 0.82 | 0.279 | 2 |
| | Prioritization | 3.04 | 0.91 | 0.299 | 3 |
| | Ability to identify colleagues' success factors | 2.95 | 0.89 | 0.302 | 4 |
| | Possess a variety of tools, techniques and strategies for enhancing others' capacities to perform at a high level | 3.00 | 0.91 | 0.304 | 5 |
| | Manage teamwork in the job (solving group conflicts) | 2.86 | 0.88 | 0.307 | 6 |
| | Possess change management skills | 2.64 | 0.85 | 0.322 | 7 |
| | Managing conflict | 2.61 | 0.84 | 0.322 | 8 |
| | Financial management | 2.67 | 0.86 | 0.324 | 9 |
| | Possess leadership abilities | 2.70 | 0.89 | 0.330 | 10 |
| | Try to empower others | 2.78 | 0.96 | 0.346 | 11 |
| Total | 2.82 | 0.87 | 0.310 | 4 | |
| Analytical competencies | Decision making | 2.88 | 0.71 | 0.246 | 1 |
| | Engage in evidence-based reasoning | 3.10 | 0.80 | 0.258 | 2 |
| | To be able to provide choices and alternative solutions | 2.85 | 0.76 | 0.267 | 3 |
| | Interpret data and make correct inferences | 3.07 | 0.86 | 0.28 | 4 |
| | Ability to solve problems on the job | 2.79 | 0.80 | 0.286 | 5 |
| | Analysis of differing perceptions and personal rationality | 2.97 | 0.86 | 0.290 | 6 |
| | Assessment of alternative physical and structural arrangements | 2.84 | 0.83 | 0.292 | 7 |
| | Target-setting | 2.89 | 0.86 | 0.297 | 8 |
| | Critical thinking | 3.02 | 0.91 | 0.303 | 9 |
| | Evaluate the competitive environment and identify opportunities | 2.81 | 0.86 | 0.305 | 10 |
| | Systems thinking | 2.69 | 0.85 | 0.318 | 11 |
| | Cross-disciplinary thinking | 2.83 | 0.90 | 0.319 | 12 |
| | Acceptance of constructive criticism | 2.86 | 0.97 | 0.339 | 13 |
| | Total | 2.89 | 0.84 | 0.292 | 2 |

Continue >

| | <i>Mean</i> | <i>Satandard Diviation</i> | <i>CV</i> | <i>Rank</i> |
|-------------------------------------|-------------|----------------------------|-----------|-------------|
| <i>Communicational competencies</i> | 3.16 | 0.84 | 0.267 | 1 |
| <i>Analytical competencies</i> | 2.89 | 0.84 | 0.292 | 2 |
| <i>Technical competencies</i> | 2.84 | 0.87 | 0.310 | 3 |
| <i>Management competencies</i> | 2.82 | 0.87 | 0.310 | 4 |
| <i>Personal competencies</i> | 2.91 | 0.96 | 0.335 | 5 |

Table 3. General ranking of graduates' competencies from the employers' viewpoint

| | <i>Indicator</i> | <i>Mean</i> | <i>Standard Division</i> | <i>Coefficient of Variation</i> | <i>Rank</i> |
|-----------------------|--|-------------|--------------------------|---------------------------------|-------------|
| Personal competencies | Manage complex tasks | 2.90 | 0.82 | 0.282 | 1 |
| | Interpersonal skills | 3.15 | 0.91 | 0.289 | 2 |
| | Ability to display ethical/ professional conduct | 3.20 | 0.94 | 0.295 | 3 |
| | Curiosity | 3.21 | 0.95 | 0.297 | 4 |
| | Professional qualities | 3.13 | 0.93 | 0.298 | 5 |
| | Understanding competence development needs and the value of competence | 2.95 | 0.88 | 0.299 | 6 |
| | Ability to work independently | 2.88 | 0.91 | 0.315 | 7 |
| | Ability to show initiative/ self- motivation | 2.90 | 0.92 | 0.318 | 8 |
| | Lifelong learning | 3.02 | 0.96 | 0.318 | 9 |
| | Ability to accept responsibility | 3.05 | 0.98 | 0.322 | 10 |
| | Creativity, innovation and change | 2.83 | 0.93 | 0.330 | 11 |
| | Flexibility | 3.02 | 1.04 | 0.346 | 12 |
| | Positive attitude | 2.78 | 1.06 | 0.381 | 13 |
| | Commitment to improving the lot of the rural poor | 2.69 | 1.02 | 0.382 | 14 |
| | Self- evaluation | 2.73 | 1.05 | 0.386 | 15 |
| | Risk taking | 2.64 | 1.06 | 0.402 | 16 |
| | Has information about international laws | 2.35 | 1.03 | 0.439 | 17 |
| Total | 2.91 | 0.96 | 0.335 | 5 | |

Conclusion

Results of this study indicated that from viewpoints of employers, communicational skills of agricultural graduates is nearly to an average level (mean= 3.16) while other skills are below the average (personal skills=2.91, analytical skills=2.89, technical skills=2.84, and management skills=2.82). Based on these results, agricultural graduates in Iran are not competent in high level, however, their communicational skills are near the average, but it is not enough to guaranty their success in the contemporary complicated working life.

Analysis of Iranian agricultural graduates' competencies indicated that generally, these graduates are more competent in individual performance; for example regarding technical competencies, results showed that ability to use ICT technology and technical

knowledge are in a high level compared to the other technical competencies, graduates also are more competent in following directions. But competencies that are more related to the labor market are in lower level among these graduates; in this regard, we can mention some competencies such as “preparing a business plan”, “agricultural marketing”, and “agricultural experiences”. Accordingly, it can be conducted that the performance of Iran’s agricultural higher education system does not fit to CBE. Since the main objective in CBE is connecting the education system with labor market.

Study of management and communicational competencies also confirmed the limited connection of the education system and labor market; regarding the communicational competencies, results indicated that graduates are more competent in oral and social communication competencies but they are not equipped enough with competencies required working with others. For example they are weak in understanding people’s differences and also recognizing other’s mental models. Studying management competencies revealed that graduates are almost able to recognize long- term and short- term targets; they are also competent in evaluating employee performance. But in financial management, leadership abilities and empowering others, they are not strong enough. The lowest ranked competencies in analytical and personal competencies also show the limited connection between agricultural education and the labor market. According to the results, agricultural graduates are weak at system thinking and cross-disciplinary thinking.

They are weak also in acceptance of constructive criticism. In personal competencies, the lowest ranked competencies are “risk-taking” and “has information about international laws”. These competencies could be improved among graduates through constant relation with the labor market.

Generally analysis of the findings showed that most of the low ranked competencies can be traced back to the low connection between agricultural education system and labor market. Despite that CBE emphasis on designing curriculum based on the professional problems and preparing student for dealing with these problems, Iran’s agricultural education systems rely on accumulating rather than applying knowledge, abstract content is emphasized in the curriculum and students are not aware of the implications of whatever they are learning therefore Iranian agricultural graduates fail to satisfy employer’s expectations

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Knowledge and experiences sharing in the collective support of a cheese PDO. From deconstruction of worldviews to construction of a common purpose

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Keywords

collaboration, dairy farming, socio-cognitive conflict, PDO

Abstract

This article presents the support system that was developed by the authors in collaboration with the actors (dairy farmers and processors) of the Fourme de Montbrison PDO cheese. The article illustrates the usefulness of Knowledge and Experiences Sharing (KES) in deconstructing worldviews, and as a central vehicle for elaborated support. We address the difficulty of overcoming ingrained patterns of thinking that hinder collaboration in a collective effort. The description of the support provided reviews the different steps taken to create a common strategy among the actors in order to collectively develop a shared strategy for the future. Finally, the article discusses the perspectives that this process presents in terms of support for agricultural collectives and its theoretical and epistemic implications.

RMPP Action Network: an interactive initiative from New Zealand

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Keywords

small-group extension, Action Groups, evaluation, facilitation

Abstract

New Zealand's Red Meat Profit Partnership (RMPP) is a seven-year collaborative Primary Growth Partnership designed to drive sustainable long-term profits for New Zealand's red meat sector. The RMPP Action Network, a new nationwide collaborative red meat sector extension network, is one component of the RMPP programme. This paper presents the story of RMPP Action Network, some preliminary evaluation data, and an honest account of lessons learnt during this new extension programme. RMPP Action Network uses a participatory farmer-led approach, and operates as a series of small farmer groups (Action Groups). The identification and differentiation of roles within the Action Network is a key feature of this extension model. In particular, differentiating between the facilitator and subject matter expert roles, and ensuring ongoing facilitator training and mentoring, is key to this participatory approach. Preliminary programme evaluation highlighted changes in thinking, understanding and practice among some Action Group members. At about half-way through the Action Network programme, key lessons learnt are to identify and understand the existing 'culture' of an industry extension system before a new initiative is introduced, and to establish ongoing training, support and communication within the programme

Addressing the socio-ecological context of farm safety through a co-design approach to farm safety promotion interventions

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Keywords

farm safety; discussion groups; multi-actor; intervention design; agricultural knowledge and innovation systems

Abstract

Purpose

To develop a standardised intervention protocol supporting the adoption of safe work practices, acceptable to the target population of farmer peer learning groups (PLGs), and farm advisors (intervention deliverers).

Methodology

The study employed an iterative, multi-actor process, guided by the Intervention Mapping framework. The target population were Irish dairy discussion groups (DDGs). Participant observation, semi-structured interviews, surveys, and literature review informed a theory-driven intervention design. This provided a starting point for collaborative, practice-driven development of the intervention design with multiple participants. The final design consisted of two intervention approaches, and was piloted among 76 DDGs in a controlled study between March 2018 and March 2019.

Findings

The interventions were responsive to local issues, e.g. fodder concerns, and the continuous knowledge generation processes within PLGs. The flexible design and focus on farmers as primary content

contributors and discussion leaders facilitated sensitivity to group culture and dynamics. Deliverer feedback and participant and deliverer recruitment indicated good acceptability at the initiation of the implementation phase. During this phase, implementers and participants experienced challenges in continuing with the intervention (intervention burden), while implementer retention was 78% and DDG retention was 59%, highli-

ghting that further improvements can be made.

Practical Implications

The systematic co-design process resulted in two intervention approaches, with replicable, standardised designs and scope for adaptation to group interests and schedules.

Value

The resulting designs evolved iteratively from a public health research-driven approach to a practice-driven approach in a systematic fashion through integration of co-design processes with Intervention Mapping.

Digitisation and Emerging Social Challenges: A Conceptual Framework

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Keywords

Digitisation, policy, responsible research and innovation, transition

Abstract

Digitisation is changing the way we live and work, and the next transformation, driven by artificial intelligence (AI) and other ICT innovations, will change our daily lives even faster. The social dynamics triggered by digital technologies seem to be primarily controlled by market forces, and they can generate unintended severe social consequences (i.e. unemployment, privacy issues, new inequalities, etc.). For this reason, targeted public policies seem needed to mitigate negative aspects and exploit the potential of digitisation. In particular, to influence innovation pathways, policymakers need to learn how to manage the future by mobilising public participation to anticipate impacts of technological innovation to society. This paper aims to contribute to the debate on digitisation by proposing to combine the transition theories and the responsible research frame on the issue of digitisation. In particular, we argue that technology niches (which are changing the existing sociotechnical regime) are fuelled mainly by the knowledge produced by public institutions. For this reason, policies should support niches following the principle of Responsible Research and Innovation (RRI) framework to face the emerging societal challenges produced by digitisation. Focusing on the agricultural field, the concept of socio-cyber-physical system will be proposed as a frame useful to pinpoint problematic aspects of the digitisation process. In this light, the document will discuss solutions to manage challenges and opportunities of the digital change.

Introduction

Digitisation refers to the integration process of digital technologies, data and their interconnection in social practices, which is determining new social activities or changing the existing ones. Digital transformation is spreading fast through the use of Internet infrastructure and, in the so-called 'network society' (Castells 2001; Finnemann 2000), information are more easily to archive (in local or remote databases), readily access, shareable (through the internet infrastructure or wireless systems) and available for processing even for portable or wearable devices (smartphones, smartwatches, laptops, etc.) by an increased number of people. In addition to higher penetration of digital tools, new applications – i.e., the Internet of Things (IoT), Artificial Intelligence (AI), Augmented Reality (AR), etc. – are becoming to influence many aspects of everyday life.

As it has been widely highlighted by some international agencies, like the OECD (2019a, 2019b), digitisation dramatically changes the social interacts in every aspect of our life. Many examples can be reported about these transformations. The impacts of digitisation on labour market can improve job matching with people increasingly searching for works online.

Emails or sharing document platforms allow forms of teleworking and augmented reality tools reduce design cost, increase job efficiency and reduce professional hazards. Moreover, in the e-commerce platforms is possible to find best item deals and detailed item reviews written by other customers reducing transaction costs, while commercial, postal and financial agencies provide personalized and efficiency services on their web platforms. Also, digitisation is transforming our social lives: people interact with each other and build communities in blogs or social media.

On the other hand, digitisation comes with new risks and problems (i.e., privacy issues, cyber-bullying phenomena, data ownership, etc.). Notably, scholars (Floridi 2014; Scholz et al. 2018; Saleminck et al. 2017) observe that the digital gap – namely the lack of specific skills to manage digital tools efficiently, safely and profitably – is not the sole problem with this recent sociotechnical transformation: the digitalization process leads several unintended side and problematic ethical issues. The AI, for example, is designed to support better decisions in an almost autonomous way for robots, software or other contrivances, but the AI decisions have more impact than human actors and the liability issue are largely unexplained or unclear (e.i, the self-driving cars, IA-combat drones). The IoT leads to pervasive computing in all social domains to extending human actions; however, there are unknown systemic risks of operation and maintenance. Networked ICT, projected to obtain more and better information or more extensive social contacts, can determinate fragmented social-psychological life, internet addiction and so on. Big Data analysis allows us to produce more accurate and detailed forecasts for various aspects (i.e., buying behaviour, the effects of the weather on the territory, etc.). However, they pose an ethical and privacy problem on the ownership of the data, its production and its use (i.e., Cambridge Analytica scandal).

In short, new digital technologies are game changers; they contribute to the reconfiguring of social practices and life, generating both opportunities and threats. As it has been pointed out (Owen et al. 2012; 2013), to minimize digitisation problems, policies should promote actions to anticipate them and improve the adaptive capacity to technological novelties. In this respect, the Responsible Research and Innovation (RRI) framework indicates strategies to engage stakeholders (researchers, public authorities, civil society, industries, etc.) through an inclusive, participatory methodology, to tackle the complex ethically and societally aspects involved in the development of techno-sciences. In this perspective, we try to contribute to the debate on digitisation combining transition theories and RRI to the issue of digitisation. Transition theories offer categories to describe social and technical elements involved in a changing scenario, also reflecting on governance processes, while RRI provides a methodology to manage in an anticipatory way the innovations. Focusing on the agricultural sector, it will be proposed the concept of socio-cyber-physical system as a frame useful to pinpoint problematic aspects of the digitisation process.

In the following is reported the debate on the sociotechnical transition focusing mainly on the transition management issues (second paragraph), then the usefulness of the RRI will be addressed to the scenario of the agriculture digitalization (third paragraph). In the fourth paragraph will be reported a current ongoing projects: DESIRA. This project focuses on the digital agriculture in the anticipatory and inclusive way based on the RRI frame.

Sociotechnical Transition and Transition Management

In the last years, social sciences have investigated the issue of sociotechnical transition focusing particularly on the socio-environment sustainability. The political and scientific question is how to promote a sociotechnical change combining economic well-being and environmental protection. On this complex issue, the Multi-Level Perspective (MLP) emerge as main framework. Particularly developed by Geels (2010), the MLP sees system innovations and transition as emerging through vertical realignments of three sociotechnical levels: 'niches' (the site for radical innovations, like research institutes, R&D department of large corporations, etc.), 'regimes' (the locus of established practices and associated rules that stabilize existing systems, such as the food chain, the energy provision model, etc.) and an exogenous 'landscape' (i.e., the stock of available natural resources). Normally, regimes change incrementally to become more efficient, but occasionally some challenges from the landscape lead to a regime shift (Geels and Schot 2007). Transition is seen as result of external landscape pressures (i.e., climate change) exerting upon incumbent regimes (i.e., the fossil-fuel based energy system). This condition opens up opportunities to solve the critical state of regimes by radical innovations developed in niches (i.e., renewable energy technologies).

Following the MLP scheme have been developed frame on policy-making and management frames, such as Transition Management (TM) (Kemp et al. 2007) and Strategic Niche Management (SNM) (Kemp et al. 1998). In these studies, are pointed the importance of nurturing innovations within niches (i.e., by preserving them from markets pressures), seeking to influence landscape processes (i.e., by interpreting landscape trends in ways that challenge dominant regimes) and trying to reconfigure existing regimes (for example, through lobbying activities or proposing new future visions) (Smith 2012).

Despite the MLP appears as a flexible and powerful framework, scholars highlight troublesome aspects. This frame has less conceptualised the agency and social power issues, so the regimes 'resistances' against radical innovations appears not adequately inquired (Genus and Coles 2008)¹. Social Practice Theory (SPT) scholars (Shove and Walker 2007, 2010)² highlighted that MLP-based studies focus on the transition process in specific regimes (energy system, food system, etc.), ignoring that innovations involve elements across several regimes (i.e., eating implies food, energy, housing systems and so on). Focusing on specific regimes, MLP overlooks the wider systems interactions that maintain the 'normal social order' (Pantzar and Shove 2010). What is more, Shove and Walker (2007) pose four specific remarks on the TM and SNM, which suggest strategies to anticipate turning points and moments when strategic nudging has the potential to change the trajectory of regimes. In particular:

- Transition politics appear an obscure point. Who are transition actors, on what authority and on whose behalf do they act? Although policies are inspired by deliberate management strategy, transition management is partially inclusive, contingent and unstable.
- Managing the transition paths is unclear. Although TM or SNM scholars recognise change drives, they do not specify what is to be monitored and how frequently. How to identify early signals of trajectories of changes? How to respond when relevant dynamic processes speed up or slow down?
- Undesirable transition processes are not taken into consideration. Specifically, how to respond to transitions that are heading in an undesirable direction? Is it possible preventing unwanted transition paths?
- Researches focus mainly on technical systems and infrastructures. In these studies, seem less stressed social values or social expectations on innovations.

Some works replay to SPT critical remarks (Rotmans and Kemp 2008) and others (Har-

greaves et al. 2013) propose to combine MLP and SPT to design a better model on sociotechnical transition. However, the main problem appears still on the table: how is possible to manage innovations, like the digitalization, avoiding social risks? Some study on the digitalization of agro-forestry sector and rural community have stressed that RRI as a possible solution to face in an anticipatory way wider social problems and unintentional side effects of the sociotechnical innovations (Bronson 2018; Eastwood et al. 2017; Saleminck et al. 2017).

RRI and Challenges of Digital Agriculture

Introduced by science policy makers and various funding agencies mostly within the European Commission³³, the term Responsible Research and Innovation (RRI) refers to scientific research and technological development processes that take into account effects and potential impacts on the environment and society beyond their market benefits-&risks (Burget et al. 2016; Owen et al. 2012; von Schomberg 2013). The RRI is proposed as a scheme to involve scientific, market and civil society stakeholders to anticipate research and innovation outcomes in order to face the challenges of our time in responsible and responsive way. More precisely, the literature (Burget et al. 2017; von Schomberg 2012) highlighted two definitions of the RRI which clarify its purposes: the administrative definition (i.e., by EU documents⁴⁴) and the academic one (i.e., by University researches).

The first one emphasizes that RRI dimensions (inclusiveness, participatory governance, anticipation, adaption and the importance of prioritizing societal, ethical and environmental impacts) are embedded into a strategic process that ends in 'marketable products'. The second definition stresses that RRI is an attempt to govern the research and innovation process including all parties concerned in anticipating (imagining the future consequences) and discerning (judging its desirability) how novelties can or could affect society. In the administrative viewpoint, the focus is on the way to produce economic competitiveness; in the second case, the interest is on the way to determine a democratic decision-making process. Despite their differences, these definitions are complementary, and experiences of RRI move along these two poles.

Some indications have been also proposed (i.e., guidelines, toolkits) to clarifying in which way is possible to implement and to monitoring the RRI methodology and effects in several contexts⁵⁵. They report suggestions, best practices or indicators in order to indicate how to implement the four RRI principles:

- Diversity and inclusion (how can include diverse voices and make results beneficial to a wider community);
- Anticipation and reflection (how to think on the purposes and possible implications of research and its outcomes);
- Openness and transparency (how to share objectives, methods and, whenever possible and appropriate, results, and inform about potential conflicts of interests);
- Responsiveness and adaptive change (how to be responsive to changes and external inputs, adapting your research plans to changing social values and expectations).

Despite researches on the sociotechnical transition related to the digitisation of agriculture and rural communities have highlighted the importance in considering RRI as a pivotal scheme in order to actively prevent undesirable outcomes, shaping innovation trajectories (Bronson

2018; Eastwood et al. 2017); some works remark that on this topic further investigations are needed. In particular, according to Rose and Chilvers (2018), RRI to agri-tech revolution (particularly ad a wide space of participation of agro-key stakeholders on rural future and vision) needs to prove if and how it can socially shape or change innovation trajectories. Specifically, RRI should allow questions to be led, and opened out,

by those who could be affected by technological innovations (i.e., farmers, rural vulnerable communities and so on). These subjects should be able to question and contest if benefits to productivity should supersede socio-ethical or environmental concerns, and be able to convince innovators and policy-makers to change the directions of innovations.

Digital technologies are game changers that deeply reconfigure social routines, business models, service provision, learning processes in the agro-rural domain. For this reason communities need to improve their capacity to understand which game is being changed developing appropriate legal, organizational, educational, investment, as well as, support strategies in order to prevent digitisation side effects. However, research and innovation do not allow communication between scientific and lay knowledge, tending to underestimate the unintended consequences of innovation choices. As transition studies have highlighted, niche innovations are addressed by sociotechnical regimes, but institutional actors (i.e., researchers, funding and political institutions), who promote innovation process, need to improve their capacity to listen to the voices of the potential winners, losers, and opponents. As RRI suggest, innovation promoters should explore together with them possible future scenarios, to justify possible consequences of innovation in the light of recognized ethical standards, and to be ready to change the course of innovation in light of new information.

In short, how to perform a RRI research in a case of transition process, like the digitisation in the agro-forestry and rural community domains? On this topic, researches indicate some interesting insight, however they seem to need a more comprehensive framework to conceptualized (and manage) this current transformation. Following, reporting the ongoing project research DESIRA, we will explain an example of a RRI research through which the concept framework of socio-cyber-physical systems is proposed for the agro-forestry and rural community domains.

DESIRA: An RRI Research on the Digital Agriculture

Consideration on Digital Agriculture and DESIRA Conceptual Framework

Some statistics forecast an impressive increase in the digitisation of agricultural activities. For example, from 2018 to 2023, the world market of precision farming (precision irrigation, field monitoring, precision spraying, etc.) would increase by 87%, for an estimated worth at around 9 billion US dollars. On the other hand, the agriculture IoT (precision crop farming, livestock monitoring and management, indoor farming, etc.) in the same period would duplicate its worth reaching 28.64 US dollars⁶. This trend seems strictly related to the crucial benefits that come with the adoption of the precision agriculture technologies (i.e., the efficiency in use of resources like chemicals, fertilizers, water, fuel; the improvement of quantity and quality of production; the reduction of environmental footprint, higher yield in same amount of land, etc.), which add an essential amount of value to the production process. However, the adoption of digital technologies is different among territories and affects in a different way social groups.

According to the integration of digital technologies in business activities of the DESI Index⁷, not only few EU companies are highly digitised (about 20%), but it varies a lot among European countries (i.e., around 10% in Bulgaria or Romania and 40% in Denmark or Netherlands). Even social groups have a different use of ICT technologies. In 2017, the 43% of the EU population had an insufficient level of digital skill, particularly women, low- educated level and elder people have low digital competences (source: DESI – Human Capital index). In short, despite digitalization comes with opportunities, its benefits are associated with access to digital opportunities (the distribution of physical, social and human capital necessary to get access to digital opportunities).

The 'access conditions' are asymmetrically present among social groups and territories and non-adoption or late adoption may enlarge socio-territorial gaps generating or worsening marginalization. Agriculture and rural areas are domains where the digital divide has a high level of incidence. In rural areas, the risks of negative impacts are higher than in urban areas, as there are infrastructural, social and human capital reasons that contribute to create a deep digital divide between territories. However, not all threats (and opportunities) can be associated with access conditions. We should consider two other sets of conditions: the design of ICT solutions and system complexity (table 1). The first one refers to the changes technology design aims to generate. For example, robots are designed to reduce labour costs and design-related risks are generated by the innovation itself (i.e., the obsolescence of human skills and consequent unemployment, privacy issues, etc.). The second one refers to the integration between technologies and social organization.

The more that ICT solutions (data, platforms, applications, tools, etc.) permeate our lives, the more legal and social adaptation are required in order to prevent the loss of human control over machines (i.e., digital addiction, virality of fake news). Failure of adaptation may generate digital traps.

Starts from these assumptions, the project DESIRA, funding by the EU Horizon 2020 program, considers the impact of digitisation as strongly affected by the conditions of the context in which it applies. Focusing on the digitisation in agriculture, forestry and rural areas, DESIRA aims to make a comprehensive assessment of opportunities and threats taking Sustainable Development Goals (SDGs) as points of reference. In particular, SDGs and RRI principles converge in large part stressing the importance of multi-stakeholder partnerships and the principle of 'leaving no one behind' in order to achieve a socio-economic and ecological sustainable development in a participate and

Table 1 Socio - economic impact in relation to context conditions

| | <i>Positive</i> | <i>Negative</i> |
|------------|---|----------------------|
| Access | Opportunities related to an equal access to ICTs | Digital divide |
| Design | Solutions that anticipate unintended consequences | Design-related risks |
| Complexity | Synergies between digital game changers | Digital traps |

responsible way. The project aims to design political and ethical recommendation in order to rethink the relations among research processes and communities in order to reduce digital risks in agricultural field and rural communities.

The key to understanding the present and future socio-economic impacts of digitisation is linked to appropriate analytical instrument, which should be able to show how digital game changers connect things, data, people, and plants and animals into hybrid systems. In the ICT literature (Monostori 2014; Wolfert et al. 2017; Wu et al. 2011), the paradigm of Cyber- Physical Systems of Systems has been introduced to describe the relations among software and hardware tools, which provides systems with increasing levels of complexity characterized by a large spatial distribution. Smart devices extend conventional tools (e.g. rain gauge, tractor, notebook) by adding (semi-)autonomous context-awareness by all kind of sensors, built-in intelligence capable of executing autonomous actions or being remotely controlled. This picture suggested that robots can play an important role in control agricultural parameters and it can be expected that the role of humans in analysis and planning is increasingly assisted by machines so that, by the time, the cyber-physical cycle becomes autonomous. Despite some interesting insights (Conti et al. 2017), in the cyber-physical systems

scheme seems not sufficiently take into account the interconnection with the social world. Following transition theories (see paragraph 2), human systems, as sociotechnical regimes, appear inseparable – in many way ‘telecoupled’ (Liu et al. 2013) – from the physical and digital systems to which they interacting and influencing each other. With digitisation these interaction become increasingly steered by cyber systems, that have repercussions on physical and social systems. Digitisation requires a human response in the form of reflection, anticipation, responsiveness, and adaptation, in order to look at how future social systems are placed within cyber-physical systems and what they look like in order to counteract undesired effects for enhancing inclusion, diversity, and gender.

For this reason, here it is propose the Socio-Cyber-Physical Systems scheme (Figure 1). This schema allows us to answer the following questions: how do ICTs affect social configurations? Which ICT-based solutions have the characteristics of game changers? How can different social configurations benefit differently from ICTs? How can ICT configurations be designed to maximize socio-economic benefits and minimize risks? Using this schema as reference for a RRI research seems possible to understand the present situation in a variety of agriculture, forestry and rural domains, and to explore possible digitisation- related futures. In short, as reported in table 2, the DESIRA goal is to improve the capacity of society and of political bodies to respond to the challenges that digitisation generates in rural areas, agriculture and forestry in the next ten years. To achieve this goal, it will be build a knowledge and methodological base that increases the capacity of a wide range of actors to assess socio-economic impact of ICT-related innovation, to embody Responsible Research and Innovation into researchers’, developers’, users’ practices and policies, and finally offer mechanisms and tools that will support decision-making to challenges and opportunities related to digitation. DESIRA is based on an interdisciplinary, and transdisciplinary approach, which are keys to RRI. The research is designed for an interaction of a multi-actor, three-level network, which involve academic and expert actors, as well as, non-academic partners. These last ones will be fully involved in all phases of the project, including the development of the conceptual and analytical framework, through facilitated interaction during project meetings and online interaction. In particular the three-level network include:

- A multi-actor and multi-disciplinary community of 6 European Universities, 9 research

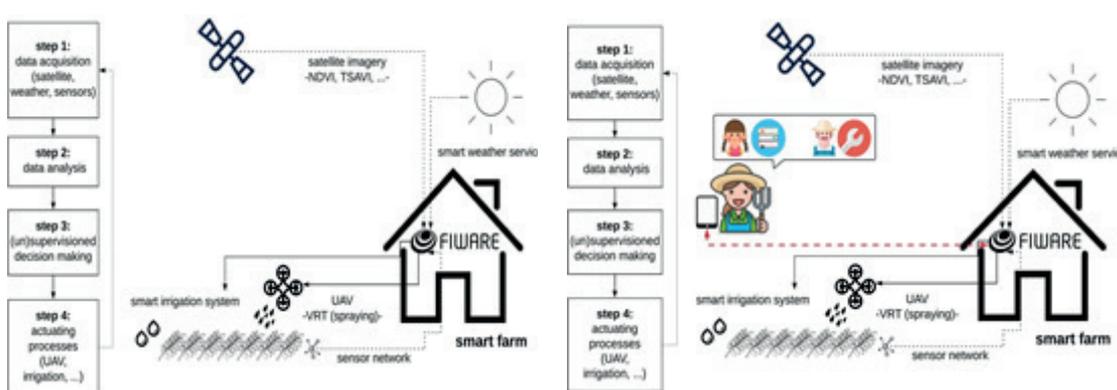


Figure 1 Representation of Cyber-Physical Systems and Socio-Cyber-Physical Systems

ch organizations, 5 SMEs and private for profit, 2 NGOs, 3 development agencies distributed across 16 EU countries.

- 20 Living Labs (LLs), defined as “user-centered, open innovation ecosystems based on systematic user co-creation approach, integrating research and innovation processes in real life communities and settings” (<https://enoll.org/about-us/>). LLs will be

networks of rural businesses and services, public authorities, citizen groups, digital technology operators, farmers, media operators and researchers who co-develop ideas, scenarios, and socio-technical solutions related to digitisation in specific national case-studies (see figure 2).

- An EU-level Rural Digitisation Forum (RDF) and representatives of other relevant project networks (in particular RUR-01 and RUR-12). It will be organized into four interacting working groups: three thematic working groups agriculture, forestry, rural life, and one transversal working group policies.

Together with this multi-level network, DESIRA aims to integrate different types of knowledge and testing research achievements in a variety of agricultural, rural, and forestry domains. Focusing around a focal question (e.i.: how to reduce the risk of forest fires?), Lls will co-develop ideas, scenarios, digital storytelling outputs, and socio-technical solutions related to digitisation. LLs will also have a key role in providing information and opinions, validating methodologies, developing scenarios and co-designing project tolls, like the Virtual Farm Platform⁸

While the LLs will focus on the assessment in specific domains (agricultural, forestry

Table - 2 DESIRA ambitions

| | <i>Positive</i> | <i>Negative</i> |
|------------|---|----------------------|
| Access | Opportunities related to an equal access to ICTs | Digital divide |
| Design | Solutions that anticipate unintended consequences | Design-related risks |
| Complexity | Synergies between digital game changers | Digital traps |

or rural areas), the RDF will take into consideration broader digitisation scenarios and will analyze common issues, specificities of the contexts, gaps and contradictions. The RDF will also support researchers in identifying the game changers, building the conceptual framework, by providing expertise and contacts in the field and by developing the socio-economic impact assessment reports. The RDF will validate methodologies, compare findings from different Living Labs, carry out a European-level scenario exercise, and contribute to the development of policy recommendations.

Interaction in the network will be based on both face-to-face and online activities. Face-to-face activities will consist of interviews, periodic Living Lab workshops, and yearly Rural Digitisation Forum meetings. Online interaction will include a collaboration platform hosting all the modern tools for collaborative knowledge and data building, sharing and analyzing, and will be organized through a 'Virtual Research Environment' (VRE), an online knowledge infrastructure that will allow constituting Living Labs and the Rural Digitisation Forum as virtual communities, and that will be integrated with OpenAire European infrastructure for Open Access.

The activity of the consortium and its network will move from the abstract to the concrete. In coherence with the conceptual framework will be build a taxonomy and inventory of digital game changers, to provide an up-to-date reference to ICTs in agriculture, forestry and rural life and its potential impact on the social system. These resources will define hypotheses, key research questions and knowledge base to carry out a socio-economic assessment of past and current digitisation trends, which will be followed by an assessment of future digitisation scenarios.

At the end of the scenario development phase, five LLs will be selected to develop five 'use cases', which will propose one or more ICT pathways to achieve the objectives set

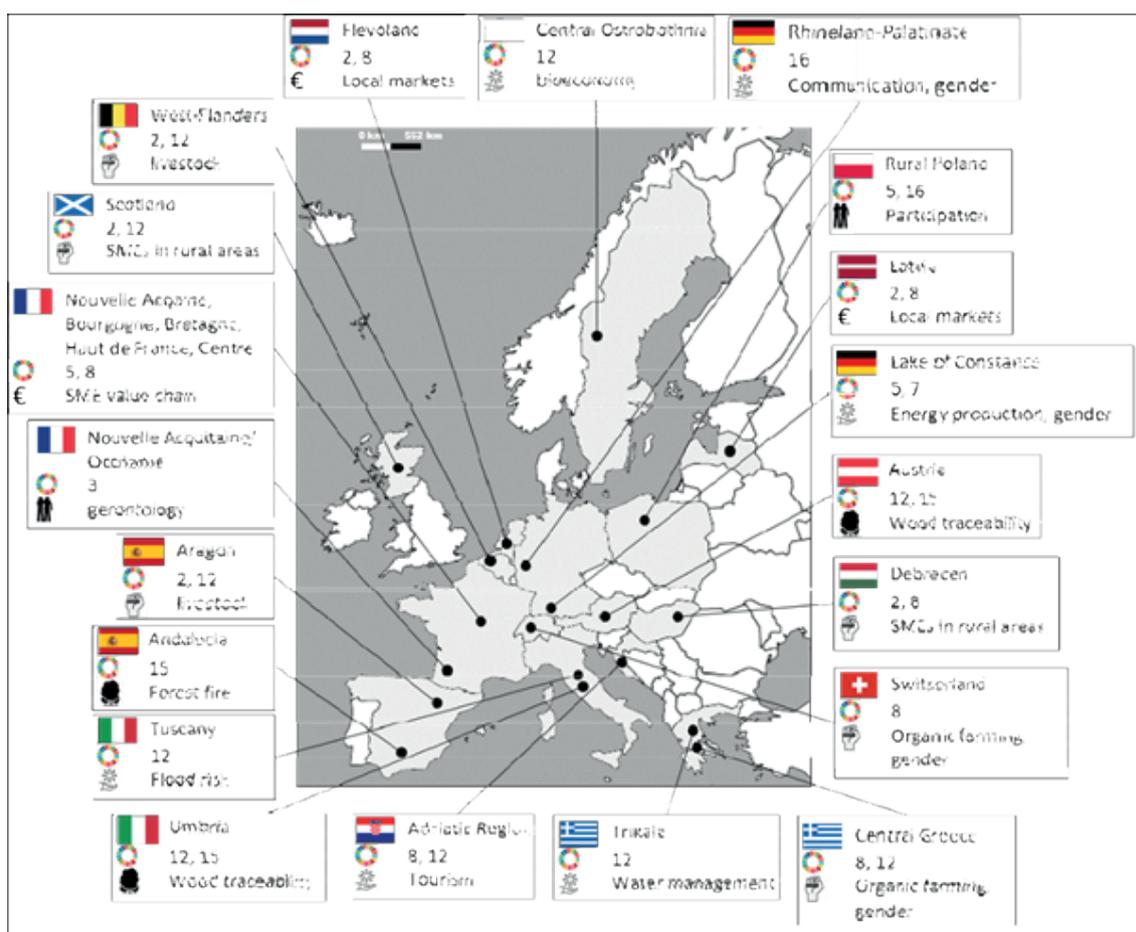


Figure 2 Geographical distribution of the 20 living labs

out by the Living Labs, thus embodying the RRI methodology to increase social acceptability and reduce the possibility of unintended consequences. Finally, the expertise of ICT partners will allow for the creation of two 'showcase technologies', including a Virtual Farm Platform, a proof of concept aimed at demonstrating the application of RRI-based design.

Organized reflection on the process, with the involvement of policy makers at regional and European level, will allow to identify legal and policy frames, gaps and incoherencies into policy analysis and roadmap, and to propose an ethical code for ICT developers and policy makers aimed at anticipating the risks and reaping the benefits of digitisation.

The project will entail an intense learning activity within the consortium and with its external circles, which will consolidate into a training kit and student academies. Across the whole research project a collective reflection on main messages to be communicated will be organized, and a dissemination, engagement and communication strategy will allow us to maximize the expected impacts.

Final Short Remarks

Through the definition of the concept of Socio-Cyber-Physical System, the DESIRA research project intends to offer policy indications to adopt and to mitigate the effects of digitisation with respect to the rural context and agro-forestry activities. The frame takes into account the reflections developed in the debate on the sociotechnical transition and on the need to involve those who are going to be affected by the transfor-

mations brought by technological innovation. Using the RRI, the research will involve a wide spectrum of expert actors and 'lay knowledge'. The aim is to understand both the most desirable future scenarios for those living / acting in the agro-forestry sector and in rural contexts (to respond to their needs and to limit the possible negative effects of digitisation) and the directions in which ICT research should be directed. In this sense, the ethical issues related to the process of increasing pervasiveness of digital technologies (i.e., privacy, data ownership, data use) will be taken into account trying to identifying possible solutions to this delicate issue.

In this sense, the project intends to offer a scheme able to considering the interactions between technical-informatics systems, the natural environment and the social context, considering them as interconnected and interdependent. The conceptual framework allows, therefore, to better understand the interactions and possible outcomes of digitisation.

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The Dynamic Action Plan as a tool for network development and project management in the NEFERTITI project

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Keywords

Dynamics Action Plan, Network development, Innovation networks, Farm demonstration networks, Project management

Abstract

In this paper we describe the development and use of a tool, the Dynamic Action Plan (DAP) guide within the frame of NEFERTITI. NEFERTITI is a H2020- project (2018- 2022) that aims to support peer-to-peer learning, cross-fertilization and innovation uptake by setting up 10 thematic networks of demonstration farmers and other innovation actors in 17 countries. Literature on network establishment and innovation was used to define 6 key factors for network establishment (Network goals, identity and values; Governance: network formation and hierarchies; Knowledge exchange and learning activities; Infrastructure and resources; Monitoring and evaluation; Network maintenance), which we integrated in a template/guide for the DAP. Each of the 10 NEFERTITI networks used the guide to reflect on their goals, the challenges related to these goals and the provided actions they will take to anticipate on the challenges. The analysis of the DAPs reveals the challenges that developing demonstration networks for innovation face, but also how the executive team of the overall project can support the networks in dealing with these challenges. The results show that innovation networks benefit most from tools, guides and procedures for knowledge exchange and learning, infrastructure and resources and network monitoring and evaluation. A lot of these tools, guides and procedures are also useful for non-NEFERTITI networks. This paper suggests that multi-level projects with an overall executive team and a practical implementation level (e.g. networks) can benefit from the use of a reflection tool at key stages in the project, to inform the executive team regarding the type of support necessary for project delivery.

Interactive knowledge creation during on-farm demonstrations to learn about sustainable agriculture

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Abbreviations

OFD: on-farm demonstration

SA: sustainable agriculture

Introduction

On-farm demonstrations (OFDs) are events with the potential to support sustainable development in agriculture, through sharing, showing and discussing new knowledge and skills on innovations with its attendees, mainly farmers (SAI Platform, 2015). Also, participatory approaches and methods in agricultural advisory practices have been associated with a number of benefits (Ingram et al., 2018), including higher rates of adoption and practice change; positive effects on yield, income and productivity; increased knowledge and skills associated with empowerment; and the availability of peer support (Coutts, Roberts, Frost, & Coutts, 2005). Rather than a more traditional linear model of top-down transfer of innovation (Leeuwis & Van den Ban, 2004), bottom-up solutions co-creation is crucial because it creates real ownership and commitment from the farmers. Klerkx and Jansen (2010) state that: 'It is now recognized that, to achieve more sustainable agricultural practice, advisors and farmers, as well as other stakeholders, need to engage in a process of joint experiential learning to which all parties equally contribute knowledge (Millar and Curtis, 1999; Pretty & Buck, 2002; Schneider, Ledermann, Rist, & Fry, 2009)'. If the change is "required" or imposed top-down, chances on lasting uptake are lower (SAI Platform, 2015). A bottom-up approach is thus recognised as facilitating knowledge exchange and dissemination processes, mainly because trust in knowledge of relatable peers is easier to establish (Ministry for Primary Industries, 2015). OFDs as an established component of a number of agricultural extension activities (Vanclay, 2004) can fit in this shift towards participatory, interactive approaches, providing the opportunity for farmers to: 1) physically gather, 2) discuss together on equal basis with both peers and experts, 3) jointly solve problems, 4) monitor experiments, 5) observe and compare practices in similar contexts to their own, as well as 6) experience hands-on activities (Ingram et al., 2018). We define an OFD, based on the Horizon 2020 project AgriDemo-F2F analytical framework (Koutsouris et al., 2017), as a demonstration activity (or event) for providing farmers with "an explanation, display, illustration, or experiment showing how something works" (Collins English Dictionary) that can be subsequently applied in their own farming practices to bring about positive changes on their farm. OFDs, as the word implicates, take place preferably on actual commercial farms so the demonstration can be visualized in real life conditions. However, it is not known to what extent organisers of OFDs focus on sustainable agriculture (SA), and how OFDs should be designed to support learning about sustainable agriculture. Hence, we first examined if the OFDs we observed, as part of case studies conducted within the Horizon 2020 AgriDemo-F2F project, deliberately support learning about SA and if the organisation of the OFD happened bottom-up or top-down. Secondly, we examined if key aspects underpinning interactive knowledge creation during an OFD (such as being able to carry out hands-on experiences) contribute to learning about SA and motivate to undertake action towards SA.

Interactive knowledge creation supporting learning for sustainable agriculture

Sustainability is often graphically represented around three linked dimensions or pillars: economic, social and environmental (Tavanti, 2010). Wals et al. (2007) points out that each of these three dimensions may be understood in various ways, regardless of the domain it's been applied to, such as agriculture. Sustainability is an "inevitably ill-defined and ill-structured concept, representing what some refer to as wicked problems" (Gibson & Fox, 2013). SA may thus accommodate potentially conflicting values, beliefs and points of view of different stakeholders with different interpretations on the desirable and feasible thing to do. Therefore, we decided not to define in-depth what sustainable agriculture includes or not in this paper. To illustrate, this could include topics

such as climate change, biodiversity and strategies to minimize antibiotic resistance, among others. However, we do take into account the distinction between the three pillars (Tavanti, 2010), but we don't investigate participants' interpretations of sustainable agriculture in our study. What we put central is what we believe to be key aspects of learning about complex topics such as SA.

Conceptually, our starting point for the key aspects is a framework developed in a previous paper to investigate the role of peer learning processes at on-farm demonstrations in the light of SA, based on an exploratory narrative conceptual literature review (Cooreman et al., 2018). In that paper, the three main subfields that were focussed on were peer learning, social learning for sustainable development (in agriculture) and adult learning. For each of the subfields, descriptions of effective learning processes were given. As a guide for our research in this paper, we chose to reflect upon one of the core processes, modified based on the core processes of the original conceptual framework (Cooreman et al., 2018), namely Interactive knowledge creation (Figure 1). The core process of Interactive knowledge creation aims to capture the importance of effective key aspects of OFDs as learning environments, namely: hands-on experimentation, scaffolding knowledge, open discussions and negotiating conflict. In conclusion, we aim to compare key aspects of Interactive knowledge creation with the outcomes we defined as learning about sustainable agriculture, and motivation to undertake action towards SA, during OFDs that deliberately include SA, while reflecting on the role of bottom-up organisation of the OFD.

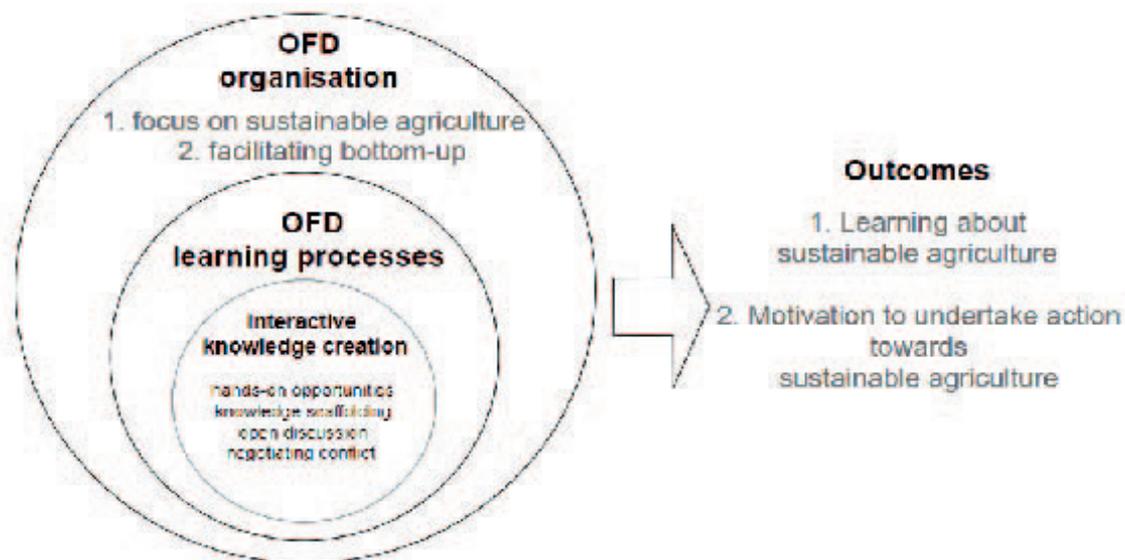


Figure 1 Conceptual framework adapted from Cooreman et al. (2018)

Hands-on opportunities

Providing real-life, interactive hands-on opportunities for farmers to learn by doing is one of the most preferred and successful ways to learn by farmers, to achieve change, also in relation to sustainable agriculture (Millar & Curtis, 1997; Franz & Westbrook, 2010; Lankester, 2013; SAI Platform, 2015). Hands-on opportunities could include examining soil samples and plants with own hands, trying out new machinery, and so on. Our first hypothesis is thus that OFD participants in our cases will be more likely to learn about and feel motivated to undertake action towards SA if they can take part in hands-on opportunities related to the central topic(s) of the OFD.

Knowledge scaffolding

In Cooreman et al. (2018), knowledge scaffolding (Vygotsky, 1978) was explained as the mediation of learning content. This means offering the content in chunks that are small and clear enough to be comprehensible for the learner, but still causing the learner to reach a new level of knowledge or skill, with the help from a more competent other. Translated into the context of OFDs, our second hypothesis is that a prerequisite for learning about and feeling motivated to undertake action towards SA by attendees is that they obtain a better understanding of the central topic(s) of the OFD.

Open discussions and negotiating conflict

Processes of bottom-up negotiation of knowledge and values to become shared, through open dialogue and discussions is widely recognised as crucial in learning about and for sustainable agriculture (SAI Platform, 2015; Tilbury, 2011; Wals, Dyball, Brown, & Keen, 2007; Wals, 2015). Wildemeersch (2017) additionally pointed out the importance to create space and time for open peer discussion regarding sustainability education: "Good critical environmental and sustainability education creates in-between spaces for individual and social transformation, where participants speak and are spoken to, on an equal basis and with respect for their uniqueness, about their concerns for the environmental commons." In consequence, our third hypothesis encompasses that participants are more likely to learn about and feel more motivated to undertake action towards SA if the OFD exposes them to open discussions.

Subsequently, guidance and facilitation of discussions, assisting in negotiating conflictual points of view during OFDs is widely suggested to support learning (Cooreman et al., 2018; EIP-AGRI, 2015; Ingram et al., 2018). Our fourth hypothesis is that the availability of someone who takes up this role as facilitator during an OFD supports learning about and feeling motivated to undertake action towards SA by OFD participants.

thes

Methodology

This research was designed to answer two questions on two main levels. Firstly, to what extent OFDs stimulate learning about SA and to what extent the organisation happened bottom-up or top-down. Secondly, we examine if key aspects underpinning interactive knowledge creation during an OFD contribute to learning about SA and feeling motivated to undertake action towards SA. The starting point for this research were 30 cases investigating each one OFD using different tools (surveys, observation form and interviews) within the Horizon 2020 research project AgriDemo-F2F, that together with its sister project PLAID, aims at building an online inventory of on-farm demonstrations (OFDs) across Europe, and investigating how their impact can be maximised. The rationale for both projects is the awareness that best practices for sustainable farming often remain tacit knowledge within local communities and are not well spread across the EU territory or made known to researchers (European Union, 2017).

Participants and procedure

We carried out 53 interviews before OFDs took place, with main actors on Farm or Programme level of one of the 30 case studies. In total, there were 345 participants attending one of 30 OFDs in 12 different countries who completed at least a post survey. Attendees were briefed about the purpose of the study at the beginning of the OFD, explaining them it was about effective farmer-to-farmer learning processes during OFDs. Attendees were asked to fill in two surveys. One right before the OFD, the pre survey, which took about five minutes to complete, and a second one right after the OFD, the post survey, which took about 10 to 15 minutes to complete. Surveys were translated beforehand into the local language. The obtained sample thus included attendees who wanted to complete both surveys on a voluntary basis, motivated by the observing researcher who explained them the importance of their participation. After completion, the participants were thanked verbally for their participation. All participants had to sign an informed consent. Since this paper focuses on questions that were part of the post survey, we only included participants in this sample who at least completed the post survey.

Additionally, an observation tool was completed for each OFD by at least one observing researcher, and for 26 of the 30 OFDs, at least one demonstrator completed a post survey, designed as an equivalent to the post survey for attendees.

Materials

To answer questions on both levels, 1) to what extent OFDs stimulate learning about SA and are organised bottom-up, and 2) if key aspects underpinning interactive knowledge creation during an OFD contribute to learning about SA and motivation to undertake action towards SA, we analysed and compared data gathered from four different actors and thus covering four different perspectives: of demonstrators, organisers on farm or programme level, observing researchers and OFD attendees. All data sources used, except for the interview guidelines for the organisers on farm or programme level, were part of tools created based on the conceptual framework constructed by Cooreman et al. (2018), to study on-farm demonstrations as learning environments for sustainable development in agriculture. The interview guidelines as data collection source were created as part of the AgriDemo-F2F project. These interviews were only used in this paper to answer the question to what extent the organisation of the OFD happened bottom-up or top-down.

The second data collection source we investigated was the post survey for attendees, which was designed to measure learning processes stimulated by the attended OFD. This survey consisted of four closed questions asking for the answer 'yes' or 'no', 46 closed 4-point ordinal scale questions from 'strongly disagree' to 'strongly agree', with the extra possibilities to answer 'not applicable' and add remarks. Three open questions were also included. To address the first research question, we investigated answers to the 'yes' or 'no' question 'I learnt something about sustainable agriculture' and the 4-point ordinal scale question 'I feel motivated to undertake some sort of action towards sustainable agriculture' for each case study. To address the second research question we additionally investigated answers to questions on key aspects underlying each of the key aspects of interactive knowledge creation, for example: 'I participated in an interactive experience during the demo (e.g.: try out machinery, feel soil differences,...)'. The answers 'not applicable' on one of the questions we investigated were excluded.

The third data collection source was the post survey for demonstrators, which was designed to measure which learning processes the demonstrator intended to stimulate during the OFD. This survey consisted of four closed questions asking for the answer

'yes' or 'no', 31 closed 4-point ordinal scale questions from 'strongly disagree' to 'strongly agree', with the extra possibilities to answer 'not applicable' and add remarks. Again, three open questions were also included. To answer the first research question, we investigated answers to the question 'I included the topic 'sustainable agriculture' in the demonstration' and the question 'I encouraged the participants to undertake action towards sustainable agriculture'.

The fourth data collection source was the observation tool, which was designed to measure learning processes stimulated by the attended OFD as observed by an attending researcher. 23 items of the observation tool are designed as a general rubric with an analytical scoring approach (Dawson, 2017) and an additional open argumentation. These items consist of four ordinal levels and each level contains a quality definition to ensure the validity. A fifth option 'not applicable' was added. Apart from the rubric-items, 12 open questions were included in the observation tool. To answer our first research question, we analysed three rubric-items on sustainability, of which one example: Values and theories regarding ENVIRONMENTAL SUSTAINABILITY were (...)

- a. ...not mentioned.
- b. ...mentioned once or twice, but not part of the main goals of the demo.
- c. ...mentioned frequently, but not part of the main goals of the demo.
- d. ...mentioned frequently. Included in main goals of the demo.
- e. N/A

Illustrate: ...

The letters referring to an answer on these questions are replacing the answers in Figure 2. To investigate if OFDs are organised top-down or bottom-up, we looked at the open question, in the observation tool, describing the role of the host farmer. More specifically, we looked at the observation if the host farmer was one of the demonstrators (or the main demonstrator) or not.

Data analysis

To address the first level questions we compared across the 30 cases stimulating learning about SA as interpreted by the three different perspectives. Additionally, based on 53 interviews and an observation tool for each of the 30 cases, we evaluated the bottom-up or top-down extent of organisation. We listed these results in Excel, as shown in Figure 2.

Data for the second step was analysed using the software SPSS statistics 25. We opted for non-parametric tests since the data are nominal and ordinal. Depending on the scale of the data of the survey questions we compared, we used the Chi-square test of independence (Mchugh, 2013), the Mann-Whitney U test (Nachar, 2016) or Spearman's rho (Salkind, 2012).

Results

To know to what extent OFDs stimulate learning about SA, we compared three perspectives for each case: namely the perspectives of the observing researcher, of one or multiple demonstrators and of the attendees who completed a post survey. This resulted in the list shown in Figure 2.

Of all the cases, 15 were recognised by the observing researchers as having included values and theories regarding profitability as a pillar of sustainable agriculture in the main goals of their OFD, 14 as having included values and theories regarding environmental sustainability and 2 as having included values and theories regarding social sustainability. 9 of the OFDs were recognised as addressing more than one of these pillars.

For 22 out of 30 OFDs, demonstrators state to have included 'sustainable agriculture'

in the demonstration. All post survey participants of 12 OFDs and more than half of the post survey participants of 26 OFDs state to have learnt about sustainable agriculture.

| Code | Topic | Communication approach | Sustainability | | | | | | | | |
|-----------|--|------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|-----------|-----------------|-----------|------|
| | | | Feasibility | | | Economic | | Practice | | | |
| | | | Environment | Social | Technical | Included | Mediated to act | Incentive | Mediated to act | Incentive | |
| Frequency | Frequency | Frequency | % agreed + strongly agreed | | | | |
| ACT1 | No tillage + manure composting + agroforestry and flower strips | yes | mostly top-down | b | d | c | yes | 100% | 100% | 100% | 100% |
| ACT2 | Care of orchards | no | top-down | b | d | d | yes | 100% | 100% | 100% | 100% |
| ACT3 | Success management to improve orchard and yield/quality | yes | bottom-up | d | d | n.m.* | n.m.* | n.m.* | 100% | 100% | 100% |
| ACT4 | Success in orchard fields | yes | partially bottom-up | b | d | b | n.m.* | n.m.* | 100% | 100% | 100% |
| ACT5 | Agroforestry - not trees | yes | mostly top-down | d | d | b | yes | 100% | 100% | 100% | 75% |
| ACT6 | Fluctuating crop in Cereals-La Mancha (Spain) | yes | mostly top-down | d | a | c | yes | 100% | 100% | 100% | 100% |
| ACT7 | Transition on better alternative methods for wintering cover crops | yes | bottom-up | b | b | c | yes | 100% | 100% | 100% | 100% |
| ACT8 | Alternative spraying tools and equipment + farmer health and awareness promotion | no | top-down | d | d | n.m.* | yes | 100% | 100% | 85% | 85% |
| ACT9 | Agroforestry - establishment system in management | yes | top-down | d | n.m.* | n.m.* | yes | 0% | 100% | 85% | 85% |
| ACT10 | Success story: wheat, winter wheat, up and winter wheat | yes | mostly top-down | b | b | c | yes | 100% | 100% | 75% | 100% |
| ACT11 | Decision framing in winter wheat | yes | mostly top-down | a | b | b | yes | 100% | 100% | 85% | 100% |
| ACT12 | Production of milk and other dairy products | yes | partially bottom-up | d | d | n.m.* | n.m.* | n.m.* | 85% | 85% | 85% |
| ACT13 | Conventional and organic farming | yes | mostly top-down | d | d | c | yes | 100% | 85% | 85% | 85% |
| ACT14 | Mechanical weed control in maize | no | partially bottom-up | b | d | a | yes | 100% | 85% | 75% | 85% |
| ACT15 | Organic cereal production + cereal processing | yes | top-down | d | d | a | yes | 100% | 85% | 85% | 100% |
| ACT16 | Specialized organic vegetable production | yes | mostly top-down | b | a | b | yes | 100% | 85% | 75% | 100% |
| ACT17 | Diets on fertilization and water use in winter crops, winter barley | yes | mostly top-down | a | b | b | yes | 100% | 85% | 85% | 85% |
| ACT18 | Winter wheat or grain maize | yes | top-down | d | b | a | yes | n.m.* | 85% | 85% | 85% |
| ACT19 | Calculation tool dairy farm management + new dairy farm | yes | mostly top-down | b | b | b | yes | 100% | 85% | 85% | 85% |
| ACT20 | Milk production: decision | yes | mostly top-down | d | b | b | yes | 85% | 85% | 75% | 85% |
| ACT21 | Organic system for conventional with success and environmental analysis | yes | mostly top-down | d | b | b | yes | 85% | 85% | 75% | 85% |
| ACT22 | Ewe production and wool marketing | no | top-down | d | b | b | yes | 100% | 85% | 75% | 85% |
| ACT23 | Strategy for organic milk cows | no | mostly top-down | d | a | n.m.* | no | 85% | 75% | 75% | 75% |
| ACT24 | Open Greenhouse Days - End supply | yes | top-down | a | d | d | yes | 0% | 75% | 85% | 85% |
| ACT25 | Experimental vegetable farm tour | no | mostly top-down | d | d | d | yes | 100% | 85% | 85% | 100% |
| ACT26 | Grower's tour - Virtual | yes | partially bottom-up | d | d | a | yes | 100% | 85% | 85% | 85% |
| ACT27 | Realistic agroforestry | yes | bottom-up | d | b | a | n.m.* | n.m.* | 85% | 85% | 85% |
| ACT28 | Event marketing in winter wheat | yes | bottom-up | b | b | a | n.m.* | n.m.* | 85% | 85% | 85% |
| ACT29 | Cereal production | no | top-down | b | a | n.m.* | no | n.m.* | 85% | 75% | 85% |
| ACT30 | Integrating better access New farm, farmer co-working | no | top-down | a | d | a | no | 0% | 85% | 75% | 85% |
| ACT31 | Wool and grazing | yes | top-down | a | a | a | no | 0% | 15% | 85% | 85% |

Figure 2 On-farm demonstrations (OFDs) stimulating learning about sustainable agriculture (SA) according to three actor perspectives

*n.m.: not mentioned (missing data)

**n.a.: marked as 'not applicable'

*** values and theories regarding...sustainability were: a = not mentioned; b = mentioned once or twice, but not part of the main goals of the demo; c = mentioned frequently, but not part of the main goals of the demo; d = mentioned frequently. Included in main goals of the demo.

Since we were interested in learning about SA, it is only reasonable to investigate answers of attendees of OFDs which also included this topic as part of the goal(s) of the OFD. Therefore, we decided to exclude OFDs for which the demonstrators clearly state 'no' in the survey on the question: 'I included the topic 'sustainable agriculture' in the demonstration. This excludes case FR1, GR3, DK1. For FR1 and GR3, this decision is also supported by the perspectives of the observing researchers and the participants, of which less than half state to have learnt about sustainable agriculture. For DK1, all 3 different demonstrators who completed a post survey answered 'no'. Since demonstrators are usually the ones communicating the goals of the OFD towards the participants, we decided to give more weight to their perspective as opposed to the 75 percent of the participants of that OFD stating to have learnt about sustainable agriculture.

Secondly, we decided to exclude cases where the observing researchers didn't circle 'd' (meaning a pillar was recognised as part of the main goals, as presented in the methodology and clarified underneath Figure 2) for one of the three sustainability pillars, for the cases for which we don't have a clear answer from the demonstrator(s). However, all five of these cases had one of the pillars explicitly included in one of the main goals of the event according to the observing researchers.

Only for the 27 remaining cases, measuring what learning processes can support learning for sustainable agriculture is appropriate.

Investigating the organisation of these 27 remaining cases, more specifically if the OFD happened top-down or bottom-up, we distinguished between four categories: top-down (8 cases), mostly top-down (11), partially bottom-up (5) or bottom-up (3). Top-down cases are organised by governments, (research) institutions or an advisers' organisation, without including clear participation of farmers. Mostly top-down cases are also organised by governments or (research) institutions, but the demo they organise tries to answer a bottom-up request. Partially bottom-up are cases organised in cooperation between farmers i.e farm network and governments, institutions or advisers' organisations. For example, BE2 was organised by an advisers' organisation, but on the request of an operational group, consisting of mostly farmers. The demo itself was led by an adviser with close relationships with farmers from the attending farming community. Bottom-up cases are organised mainly by the host farmer or by a farmers' organisation. Of the 19 cases happening top-down or mostly top-down, 14 cases did include the host farmer as a demonstrator. 6 on 8 cases happening (partially) bottom-up included the host farmer as a demonstrator. Results based on the variables included in this paper don't indicate a relationship with learning outcomes from participants.

In the following paragraphs, we investigate post demonstration survey answers from participants, regarding what we considered the four key aspects of interactive knowledge creation: hands-on opportunities, knowledge scaffolding, discussion and negotiating conflict.

Hands-on opportunities

Hands-on opportunities observed include for example participants of a case who could examine soil quality by touching the soil and feel if it was rather humid or dry, and could try out, smell and taste fruits on their consistency and development. The chi-square test of independence was performed to examine the relation between hands-on opportunities and learning about sustainable agriculture (comparing answers to 2 yes or no questions: 'I participated in an interactive experience during the demo' (e.g.: try out machinery, feel soil differences,...)) and 'I learnt about sustainable agriculture'). The relation between these variables was significant, $\chi^2(1, N = 258) = 5.16, p < .05$. Participants who stated they had learnt about sustainable agriculture were more likely to also have participated in an interactive experience during the OFD.

The Mann-Whitney U test indicated that there was a significant difference in participants who stated having participated in an interactive experience (Mdn = 4) or not (Mdn = 3) and if they felt motivated to act towards sustainable agriculture because of the OFD, $U = 5265,0$, $p < .001$, $r = -.31$. The effect size of this difference was medium (Cohen, 1988).

Knowledge scaffolding

The Mann-Whitney U test indicated that there was no significant difference in participants who stated having learnt about sustainable agriculture (Mdn = 3) or not (Mdn = 3) and if they obtained a clearer understanding of the demonstrated topics, $U = 3036,0$, $p = .127$, $r = -.09$.

Additionally, the Spearman's rho revealed a statistically significant relationship between feeling motivated to undertake some sort of action towards sustainable agriculture because of the OFD and having obtained a clearer understanding of the topics demonstrated ($r_s[277] = .30$, $p < .001$). The effect size of this relationship was medium (Cohen, 1988).

Open discussions

The Mann-Whitney test indicated that participants who stated they learnt about sustainable agriculture (Mdn = 3) were more likely to state that they thought there were interesting discussions, compared to participants who state they didn't learn about sustainable agriculture (Mdn = 3), $U = 2688.5$, $p = .037$, $r = -.12$. The effect size of this difference was small (Cohen, 1988).

Additionally, The Spearman's rho revealed a statistically significant relationship between feeling motivated to undertake some sort of action towards sustainable agriculture because of the OFD and stating there were interesting discussions ($r_s[275] = .38$, $p < .001$). The effect size of this relationship was medium (Cohen, 1988).

Negotiating conflict

A Mann-Whitney test indicated that participants who stated they learnt about sustainable agriculture (Mdn = 3) were more likely to state that 'somebody tried to reach consensus between participants, if they didn't agree with each other during discussions', compared to participants who state they didn't learn about sustainable agriculture (Mdn = 2,5), $U = 1147.5$, $p = .014$, $r = -.20$. The effect size of this difference was small (Cohen, 1988).

Additionally, The Spearman's rho revealed a statistically significant relationship between feeling motivated to undertake some sort of action towards sustainable agriculture because of the OFD and stating that somebody tried to reach consensus between participants, if they didn't agree with each other during discussions ($r_s[207] = .40$, $p < .001$). The effect size of this relationship was medium (Cohen, 1988).

Discussion and conclusion

This is the first time to our knowledge that interviews with organisers and post surveys or exit poll surveys from participants and demonstrators are combined with observations during OFDs on a large European scale, with the intention to grasp effective processes supporting learning about and motivation towards SA. Our findings mainly confirm, but also build further on what was known from previous research.

First of all, only three of our 30 cases investigated in this paper were categorised as organised bottom-up. This finding could be considered as not in line with the contemporary tendency to recognise a bottom-up approach to be more beneficial for long lasting

innovation uptake, since it's easier to create ownership and commitment of farmers and other stakeholders, compared to more top-down approaches (SAI Platform, 2015). Reasons for this could be divers, for example coincidence in selecting the case studies, or that bottom-up OFDs tend to stay more under the radar, even though AgriDemo-F2F includes partners in farmers' organisations. Another reason could be that bottom-up initiatives lack time, skills or financial means to organise OFDs, compared to advisory services, which are often funded by requests and initiatives of authorities to organise OFDs as a part of their services. Future research is needed to investigate this more in-depth.

Secondly, when interpreting the results, one should be careful since we categorised qualitative data. For example, regarding the rating the observing researcher(s) gave on the mentioning of one of the three sustainability pillars during the OFD. When taking a closer look at the UK1 case, we conclude that the observing researcher(s) state that not one theory or value regarding sustainability was mentioned, even though the demonstrator states to have included the topic deliberately, and all participants in this case state having learnt about sustainable agriculture. Since this is a curious finding, we asked the observing researchers of UK1 if they could think of an underlying reason for this. They stated that this case could be definitely determined as 'under the sustainable agriculture umbrella', in fact it was presumed that the case was embedded in this theme in such a way, that the overarching sustainable agriculture rhetoric was not mentioned anymore. Related to the same concept of SA, it could be argued that not every participant shares our broad interpretation. Some cases are more straightforward compared to others when it comes to defining if they support SA or not. For example, when it comes to topics such as biodiversity, it is relatively easy to distinguish between sustainable and unsustainable practices. At the same time, the perception of the concept sustainable agriculture differs even between regions, e.g. depending on the policy in the last years, the latest communicated scientific research, economic situation, etc. Often people talking about sustainability use other jargon, for example in some regions now the ambiguous word 'circular' is in fashion: some believe that pig husbandry is non circular because of the high amounts of manure, while others claim it's circular because of the reuse of "wastes" from agricultural food production. These notes on the complex concept of sustainability point out weak spots in the observation and survey questions, but at the same time endorses our decision to compare three perspectives before categorising which cases aimed at stimulating learning about sustainable agriculture.

Thirdly, results indicate significant positive relationships between participants' learning about and motivation towards SA, and taking part in interactive experiences. This confirms our first hypothesis and reaffirms statements of previous studies (Millar & Curtis, 1997; Franz & Westbrook, 2010; Lankester, 2013; SAI Platform, 2015). The relationships in this paper are not intended to imply strict causality. For example, interactive experiences could support many different outcomes, such as better learning of participants in general, with learning about sustainable agriculture as a part of the stimulated outcomes. Another explanation could be that hands-on opportunities on a practical level stimulate farmers to engage and interact with each other, which creates a more open environment and sparks discussion. This indicates a more indirect positive influence of hands-on opportunities on learning about sustainable agriculture.

Our second hypothesis on the prerequisite that attendees need to obtain a better understanding of the central topic(s) of the OFD, to achieve learning and motivation towards SA, was only partially confirmed. A better understanding of the demonstrated topics related significantly with more motivation to undertake action towards SA, but not with learning about SA. An explanation could be that attendees do not necessary always learn something new during OFDs, but that an OFD can affirm and strengthen what

they already knew, which can intensify their motivation. The same explanation is suggested by our third and fourth hypothesis, which is confirmed by our results. The third one stated that participants are more likely to learn about and feel more motivated to act towards SA if the OFD exposes them to open discussions. The effect size for open discussions related to motivation was medium, while the one related to learning was small. Again, it seems that an attendee doesn't necessarily need to learn something about SA during an OFD, to be able to feel more motivated to undertake action towards SA. Additionally, farmers negotiating and discussing issues about SA with each other is a crucial process in solving complex (local) sustainable farming challenges (SAI Platform, 2015; Tilbury, 2011; Wals, Dyball, Brown, & Keen, 2007; Wals, 2015; Wildemeersch, 2017). OFDs are potentially effective 'fora' to facilitate this.

Our fourth hypothesis, that the availability of someone who takes up the role as facilitator during an OFD supports learning about and feeling motivated to act towards SA, was confirmed similar to our third hypothesis. A small positive effect size was found between a facilitator and learning about SA, and a medium effect size between a facilitator and feeling motivated to act towards SA. A facilitator could be a strong tool to stimulate and guide interaction in a trusted environment. A good facilitator nourishes trust between participants and an open learning climate in which participants feel free to share opinions and experiences. Additionally, facilitators could have an important role in enabling participants to reflect upon agricultural practices, and for example evaluate to what extent they contribute to sustainable agriculture. Our results build further on previously stated findings on the value of facilitators (EIP-AGRI, 2015), by indicating that somebody available to guide negotiations on conflictual positions potentially stimulates the feeling of motivation to undertake actions towards sustainable agriculture. Suggestions for future research include further in-depth research into the influence of the extent of bottom-up or top-down organisation of OFDs and if this influences learning about SA. We also propose longitudinal research on attending OFDs and changes in practices of farmers towards SA.

In conclusion, our core process of interactive knowledge creation indicated a positive relationship with learning about SA during OFDs, except for the knowledge scaffolding aspect. Secondly, all key aspects indicated a positive relationship with feeling motivated to undertake action towards SA. These findings confirm and build on indications found in previous research.

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Learning and anchoring processes initiated by agricultural demonstration activities in Switzerland

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Keywords

Agriculture, Education and Extension, Demonstration Events, Learning, Anchoring, Switzerland

Abstract

Embedded in the agricultural knowledge and innovation system (AKIS), demonstration events on farms play an important role in diffusion of innovation and in farmers' training. These can take various forms, with different AKI Sectors involved (such as advisors, researchers, farmers organizations and farmers themselves). While such demonstration events have some tradition, insight is missing in how effective these events actually are. Going beyond the question of how learning occurs at the demo events themselves, this paper addresses the topic of longer-term effects of learning and looks into ways in which anchoring of the new knowledge is promoted.

This paper studies the learning processes and the anchoring of the contents, which are conveyed at such agricultural demonstration activities by looking at two case studies in Switzerland. The first case study is the Organic Cattle Day, a national demonstration event on organic cattle and animal husbandry, which was first held in 2018 in Central Switzerland. The second case study is the Arenenberg Arable Day, a regional event on arable farming, which takes place on a yearly basis in the Eastern part of the country. Both events focus on exchange of agricultural practice, extension and research regarding the respective topics. The topics include various aspects of sustainability such as biodiversity, soil erosion, animal husbandry conditions, fodder, or the use of plant protection products and antibiotics. Both events took place on commercial farms where thematic sessions were held to convey the different topics using a broad range of mediation techniques.

In order to analyze the learning and anchoring processes, surveys and in-depth interviews were conducted with the participants of the demonstration events. The quantitative surveys were conducted with more than 100 visitors during the demonstration events and focused on the immediate learning processes of the visitors.

About six months after the events, about 20 qualitative in-depth interviews focusing on which contents have been anchored and why were carried out. The collected data was analyzed by using a mixed deductive and inductive coding approach. The findings suggest a number of key factors, which influence the outcomes of learning from demonstration activities and the extent to which the learned is anchored in the long-term:

- Active involvement of the visitors by providing opportunities to discuss and to share experiences with experts as well as with peers;
- Giving the visitors the possibility to identify the relevance of the content for the own-farm and to flexibly decide, which sessions to attend;
- Choice of topics being based on consultation of target group but also including promising novelties and innovations, which are not known yet;
- Inclusion of trials, also of such which have not been successful and allow for discussions about why they were not successful and how it could be done differently.

Based on these success factors, the paper gives recommendations for advisors and farmers on how to design demonstration events in order to ensure that the visitors learn and anchor the conveyed contents in the long-term.

Key characteristics to organise on-farm demonstration stimulating effective peer-to-peer learning

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Keywords

key characteristics, methodological approach, on-farm demonstrations

Abstract

Although on-farm demonstrations are currently commonly organised, their effectiveness including learning outcomes is not guaranteed yet. Therefore, we aim to identify key characteristics of effective on-farm demonstrations. Qualitative data collection tools were developed consisting of semi-structured interviews, an observation tool, and a set of pre- and post-surveys. Data was collected resulting in 35 case studies across 12 European countries. The 35 validated case study reports and 10 regional workshop reports were analysed and cross compared resulting in a range of characteristics that were structured into key characteristics. The resulting key characteristics are grouped into seven categories, namely context, goal of the demonstration, host farm & logistics, demonstration set-up, recruitment, learning & interaction methods and follow-up and evaluation. In a next step, the key characteristics will be translated into a field guide for practitioners as a mean to organise effective on-farm demonstrations. Our study shows that although demonstrations are very diverse and scattered, key characteristics can be identified supporting the organisations of demonstration events.

Extension Education and Agricultural Technologies Among Smallholder Farmers in Western Kenya

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Keywords

Adoption of innovation, Food security, Agro-economic systems, Extension Education

Abstract

Background and Objectives: Scaling up the use of agricultural technologies, through extension education among smallholder farmers, is key in unlocking the slow agricultural growth that smallholder farmers experience in developing countries (Doss et al., 2003; Suvedi et al., 2017). Agricultural education and training of farmers through extension is critical in the adoption of improved farming practices in developing countries. Effective agricultural advisory services help farmers increase their agricultural output and harnessing overall efficiency gains. The deployment of a sustainable agricultural extension education practices is a necessary determinant in the spread and adoption of those practices among smallholder farming communities in developing countries, where the adoption rate of new agricultural practices and technologies is currently lower compared to efforts made towards their promotion. Increasing the adoption of new agricultural practices among smallholder farmers in developing countries preoccupies all agricultural development stakeholders (Doss et al., 2003). **Study Design:** Applying the adoption of innovation theory, this study assessed the contribution of advisory services among smallholder farmers in Kakamega County, Kenya. The theoretical framework follows Rogers (2003), where diffusion of innovation is defined as a process in the spread of innovation through various defined channels over time over time among members of a social system. For a study such as this that seeks to understand how advisory services influence individual farmer decision-making processes, focus group discussions (FGD) presented a good understanding of how farmers adopt these technologies and extension education and training may play a role in farmer support. Findings from the study identified factors that contribute to failure to take up advisory services, even when extension education and training about yield-enhancing practices among farmers in the region. **Participants in the study:** The research data (N=78) were collected in June and July 2018 through randomly selection of smallholder farmer households in Kakamega County, Kenya. Participating households were from seven out of the 12 sub-counties of Kakamega County, Kenya. Farm sizes for participating households did not exceed 3 hectares. The main respondents from the households was the household head. **Summary of Methods:** The study applied a mixed methods design to estimate factors influencing agricultural technology uptake among smallholder farmers.

A logistic regression was estimated to determine factors that influence the adoption of newly promoted extension services promoted among farmers. The model innovates by

utilizing farmer intentions as one of the explanatory variables, in addition to conventional demographic ones. Results: The results are consistent with the theory of adoption of innovation. Farmer intention to apply new agricultural practices based on the prevailing agro ecological zone. Some demographic factors, such as level of education, directly influence the response variable. Conclusions: The study found some links between demographic factors and the adoption of extension education and training practices. Membership in farmer groups was significant in determining agricultural technology adoption, also evident in Cavanagh et al. (2017). Thus, it is important to promote and strengthen local agricultural extension service networks. Better training of agricultural extension personnel would have to be integrated to the needs of smallholder farmers as a means of providing relevant education and training content and fostering effective communication.

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Extension Education and Agricultural Will Saudi Arabian farmers adopt the electronic commerce to trade their agricultural products?

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Keywords

Agricultural Extension, Adoption, Electronic Marketing, eCommerce, Saudi Arabia

Abstract

The electronic marketing or electronic commerce (e-marketing / e-commerce) is the marketing of products or services using digital technologies, mainly on the internet, but also including mobile phones, display advertising, and any other digital medium. The Ministry of Environment, Water and Agriculture plan establishment of “a project of e-commerce for sale and purchase of agricultural products and services”. The purpose of this research is to determine farmers’ e-marketing behaviors through identifying their current situation and future intention to trade their agricultural products electronically. Data were collected using an internet-based questionnaire form 503 farmers from the various regions of the Kingdom during the period from May-June 2018. Frequencies and percentages were used for data presentation. The most popular areas in the agricultural field have the highest representation among the respondents, i.e. 20.1% from Riyadh, 16.9% from eastern region and 16.3% from Qassim. Majority of respondents (58.6%) were 30 to less than 50 years old. Most cultivated crop was Date Palm as mentioned by 57.5% of respondents, followed by vegetables and raising cattle as mentioned by 48.1%. Findings revealed that more than one third only of respondents (35%) were experienced on electronic buying of products, while less than one fifth of them (19.3%) have the experience of the electronic selling of products. With regard to characteristics of e-commerce technology, results also showed that “save time and effort” was mentioned by all of respondents, “low cost” was mentioned by 55.47%, “trialability” was mentioned by 28.43%. The overall evaluation of the technology, results in the same table show that most of respondents (89.4%) considered the electronic marketing as good to excellent technology. With regard to farmers’ intentions to adopt the e-commerce, findings revealed that the majority of respondents (63.2%) have the intention to adopt the electronic marketing once the technology was broadcasted, near one third of

them (30.4%) have the intention to adopt is in short or medium time, while only 2.6% did not have the intention to adopt the new technology. Date Palm was the most candidate crop to be electronically marketed as mentioned by 83.7% of respondents followed by Vegetables and Fruits as mentioned by 53.9% and 52.1% of respondents, respectively. Finally, it could be concluded the highly potentiality of e-marketing the agricultural products in KSA, some advantages were concluded.

Introduction

Saudi Arabia is home to 32.94 million individuals, it is a high-income country with a population growth of 1.9% in 2018. Genuine Gross domestic product (GDP) growth at 2.2% was slower and real GDP per capita at US\$21,062 was higher than average in 2018 (statista.com, 2019a). In 2017, more than three-quarters of the population had Internet access, and around nine of every ten adults owned a smartphone. Internet-enabled mobile phones play an important role in the development of Electronic Commerce (e-commerce) in Saudi Arabia. With most individuals using a smartphone to go online, nearly all of online shoppers made a purchase using this device (yStats.com, 2018).

Markets are real or virtual meeting places where purchasers, venders and mediators meet to trade items between seller and buyer. In the exchange process, sellers, buyers and intermediaries face many counter-party risks, like delivery failures, substandard quality and delay in payments (Reddy, 2018).

Khizer (2017) mentioned that agricultural markets in Saudi Arabia are grouped in to five regions as: 1) Western region, 2) Central region, 3) Eastern region, 4) Northern region, and 5) Southern region. In collection and dissemination of agricultural market data, one of the important aspects is to understand the types of markets. One can group the agriculture markets in the following five ways:

1) First method of grouping agricultural markets is based on geographic extent of markets, which classifies markets in to the following six categories: 1) Local Market, 2) Regional Market, 3) Province or State Market, 4) National Market, 5) Continental Markets (Export Markets), and 6) Global or World Market (Export Markets).

2) Second way of classifying agricultural markets is based on volume of sales in the market, which gives following four types: 1) Retail Market (Grocery Shops, Malls, Stores), 2) Aggregate Market, 3) Whole Sale Market, and 4) Super Whole Sale Market.

3) Third practice of grouping agriculture markets is based on the type of control; agricultural markets can be of following type: 1) 1. Unorganized or Open Markets, 2) Organized Markets (Government Markets, and Markets governed by Marketing Board, Marketing Societies and Cooperatives).

4) The time period of operation of market is the fourth way, it puts the agriculture markets into the following two types: 1) Regular Markets, 2) Seasonal Markets.

5) Fifth way of classifying agriculture markets is based on the type commodities traded in the market: 1) Cereals Market, 2) Flower Market, 3) Vegetable Market, 4) Fruit Market, etc... The Saudi Arabian economy has experienced unprecedented growth over the past several years.

The National Transformation Program (NTP) and Vision 2030 together envisage a multifaceted development of the economy, with both laying out significant plans to help make this happen. Enabling economic diversification, driving growth of the small and medium- sized enterprise (SME) segment, and fostering innovation and entrepreneur-

ship are at the core of these objectives, and developing the e-commerce sector as part of the NTP will add further fuel to these economic development plans (CITC, 2018).

Digital Transformation is upending industries globally and the retail part, once resistance to waves of disruption, is now under immense pressure following the rise of e-commerce. However, the Gulf Cooperation Countries region, particularly Saudi Arabia, are playing catch up with the rest of the world and some companies recognize the need to stay ahead of the curve and pre-empt the digital revolution. Digital is changing marketplaces worldwide with new business models emerging. Retail companies don't own point of sales, big logistics providers don't own vehicles and the largest content providers don't own internet infrastructure (Garrós, 2019).

Retailers are already suffering from customers migrating from offline to online and the e-commerce boom in countries like the US has already flattened malls profitability as e-commerce penetration reached 11.4% last year. Saudi Arabia's penetration in 2017 was 1.4%, which is less than half the US' in 2005. Saudi Arabia has a high e-commerce readiness index that's not reflected in e-commerce growth. Aside from regulations that are not particularly favorable for online businesses, the Saudi population is skeptical of online shopping due to previously poor buying experience, concerns about the online payment process and delivery deficiencies (Garrós, 2019).

Digital marketing (also known as data-driven marketing) is an umbrella term for the marketing of products or services using digital technologies, mainly on the Internet, but also including mobile phones, display advertising, and any other digital medium. Digital marketing has changed the way brands and businesses utilize technology for marketing. As digital platforms are increasingly incorporated into marketing plans and everyday life, and as people use digital devices instead of visiting physical shops, digital marketing campaigns are becoming more prevalent and efficient (Mandal, 2016). E-commerce is a relatively new concept and has crept into the business vocabulary no sooner than the 1970s (Wigand, 1997), it is a powerful concept and process that has fundamentally changed the current of human life. Electronic commerce is one of the main criteria of revolution of Information Technology and communication in the field of economy. This style of trading due to the enormous benefits for human has spread rapidly. Certainly, can be claimed that electronic commerce is canceled many of the limitations of traditional business (Nanehkaran, 2013).

Revenue in the Saudi Arabian eCommerce market amounts to US\$7,141m in 2019, it is expected to show an annual growth rate (CAGR 2019-2023) of 9.5%, resulting in a market volume of US\$10,266m by 2023. The market's largest segment is Toys, Hobby & DIY with a market volume of US\$2,028m in 2019. User penetration is 65.5% in 2019 and is expected to hit 68.6% by 2023. The average revenue per user (ARPU) currently amounts to US\$319.47 (statista.com, 2019b).

A significant challenge facing rural development is inefficiency in agricultural markets. One major driver of such inefficiency is farmers lacking information about the national market for their crops and therefore selling in local markets at suboptimal prices. The result is not only lower prices for farmers but also intra-seasonal and cross-locational price fluctuations that distort the market and reduce incentives for investing in productivity enhancing inputs (Newman, et al., 2018).

An important trend affecting the growth of online retail in Saudi Arabia is social commerce, consumers in Saudi Arabia are active social media users, with Facebook, Twitter and Instagram ranking among the ten most visited websites in the country (Alsaghan, et al., 2017). It has been widely recognized that the adoption of eCommerce by businesses in developing countries is an important economic indicator of growth due to the perceived potential of the internet in reducing transaction cost (Al-Hudhaif, & Alkubeyyer, 2011).

Several researches have been conducted to study eCommerce in many economic sectors of Saudi Arabia (i.e. Al-Hudhaif, & Alkubeyyer, 2011; Almousa, 2011 & 2013; Ahmad & Agrawal, 2012). Such studies vary between focusing on general perspectives like social issues, and particular perspectives like online payment methods, trust, government role and delivery systems, but no one of these studies was focused in eCommerce in agricultural sector.

Among the numerous initiatives taken by the kingdom to achieve 2030 vision and promote modern agriculture, the prominent ones include establishment of “a project of e-commerce for sale and purchase of agricultural products and services”. The project will contribute to the creation of an efficient, effective and flexible website that will suit all levels of its visitors, enabling farmers to publish their products and services on the platform along with all details and budget of their products. If the customer finds any offer that matches his budget, they are contacted directly. Once the transaction is completed, the customer deposits the amount of the guarantee with the management of the project. The team will then release the amount and deduct the fees due. The transfer process will also be used to determine the efficiency of the product movement. The purpose of this research is to determine farmers’ e-marketing behaviors through the following:

1. Identify farmers’ previous experiences on the electronic marketing
2. Investigate farmers; evaluation of the electronic marketing
3. Determine farmers’ future intention to trade their agricultural products electronically

Methodology

Data were collected using an internet-based questionnaire form 503 farmers represent the various regions of the Kingdom during the period from May-June 2018. Respondents were distributed among thirteen regions around the kingdom. The most popular areas in the agricultural field have the highest representation among the respondents, i.e. 20.1% from Riyadh, 16.9% from eastern region and 16.3% from Qassim. The rest of the regions were represented in corresponding percentages for each region as shown in table 1.

Findings in table 1 also show that majority of respondents (58.6%) were 30 to less than 50 years old, while 37.7% of them were 50 years and more. With regard to crop pattern, findings in the same table show that the most cultivated crop was Date Palm as mentioned by 57.5% of respondents, followed by vegetables and raising cattle as mentioned by 48.1% and 27.6% of respondents, respectively. More details on respondents’ characteristics were mentioned in the same table.

Table 1

| <i>Characteristic</i> | <i>Frequencies</i> | <i>%</i> |
|-----------------------|--------------------|----------|
| Regions | | |
| ElBaha | 7 | 1.39 |
| Elgawf | 25 | 4.97 |
| Northern borders | 6 | 1.19 |
| Riyadh | 101 | 20.08 |
| Eastern region | 85 | 16.90 |
| Qassim | 82 | 16.30 |
| Medina | 29 | 5.77 |
| Tabuk | 31 | 6.16 |
| Jazan | 38 | 7.55 |
| Hail | 29 | 5.77 |
| Asseer | 42 | 8.35 |
| Mecca | 23 | 4.57 |
| Najran | 5 | 0.99 |
| Age | | |
| < 20 years | 1 | 0.20 |
| 20 - | 18 | 3.58 |
| 30 - | 142 | 28.23 |
| 40 - | 149 | 29.62 |
| 50 - | 134 | 26.64 |
| 60 years and more | 59 | 11.73 |
| Crop pattern | | |
| Date palm | 289 | 57.46 |
| Vegetables | 242 | 48.11 |
| Cattle | 139 | 27.63 |
| Fruits | 116 | 23.06 |
| Feeding | 110 | 21.87 |
| Organic farming | 79 | 15.71 |
| Field Crops | 57 | 11.33 |
| Honey & Bee Products | 37 | 7.36 |
| Fish | 10 | 1.99 |
| Coffee | 10 | 1.99 |
| Flowers | 7 | 1.39 |
| Other | 27 | 5.37 |

Source: the study's findings

The questionnaire includes questions on farmers' region, age, and crop pattern. It also contains questions to measure farmers' previous experiences on electronic commerce as well as their future intentions to adopt this innovation and in what products. Frequencies and percentages were used for data presentation.

Results and discussions

Farmers' previous experiences on the electronic trade

Findings in table 2 show that near one third only of respondents (35%) were experienced on electronic buying of products, while less than one fifth of them (19.3%) have the experience of the electronic selling of products. This result revealed the lack of experience of farmers on electronic trade generally as well as agricultural electronic trade.

Table 2 Distribution of respondents by their previous experiences on electronic trade (n = 503)

| Item | Buy | | Sell | |
|-------|-----------|------------|-----------|------------|
| | Frequency | Percentage | Frequency | Percentage |
| Yes | 176 | 35.0 | 97 | 19.3 |
| No | 327 | 65.0 | 406 | 80.7 |
| Total | 503 | 100 | 503 | 100 |

Source: the study's findings

Farmers' evaluation of the electronic marketing

Respondents were asked to determine their perception of characteristics of the electronic marketing, findings in table 3 revealed that "save time and effort" was mentioned by all of respondents, "low cost" was mentioned by 55.47%, "trialability" was mentioned by 28.43%, followed by "trustability" and "ease of use" as mentioned by 24.25% and 5.37% of respondents, respectively.

These findings are agreed with this mentioned by (Rogers, 2013), he mentioned that the perceived characteristics of innovations (relative advantage, compatibility, trialability, complexity, and observability) are critical to achieving rapid rates of adoption and overall success in the marketplace, findings revealed that eCommerce has the relative advantage upon the traditional marketing (which refers to the extent to which the innovation is more productive, save time, save effort, costs less, or improves in some other manner upon existing practices), trialability, and low complexity so, the eCommerce technology has the probability to be adopted. Another attribute was perceived by farmers, Trustability, that refer to the confidence of farmers in e-commerce in terms of access to funds immediately after the sale.

This perception of eCommerce attributes may be due to the large size of Saudi Arabia, as well as the distance to the markets for the sale of agricultural products, in cases the farmer himself transfer his products to the market.

About the overall evaluation of the technology, results in the same table show that most of respondents (89.4%) considered the electronic marketing as good to excellent technology.

Table 3 Respondents' evaluation of the electronic marketing technology (n= 503).

| Item | Frequency | Percentage |
|------------------------------|-----------|------------|
| Characteristics | | |
| Ease of use | 27 | 5.37 |
| Trialability | 143 | 28.43 |
| Low cost | 279 | 55.47 |
| Save time and effort | 503 | 100 |
| More benefit (trust-ability) | 122 | 24.25 |
| Overall Evaluation | | |
| Excellent | 249 | 49.5 |
| Very good | 110 | 21.9 |
| Good | 91 | 18.1 |
| Fair | 41 | 8.2 |
| Bad | 12 | 2.4 |

Source: the study's findings

Farmers' Future Intention to Trade their Agricultural Products Electronically

In order to determine however respondents were adopt or not to adopt the electronic marketing to trade their agricultural products, they were asked to determine their intentions, findings in table 4 show that the majority of respondents (63.2%) have the intention to adopt

the electronic marketing once the technology was broadcasted, near one third of them (30.4%) have the intention to adopt is in short or medium time, while only 2.6% did not have the intention to adopt the new technology.

It could be concluded that the majority of respondents want to switch to electronic marketing immediately or in a short time because of the challenges they face in marketing their products traditionally, including distance to markets, competition of foreign products & large size agricultural companies, in addition to unfavourable weather and temperature factors and high transportation costs.

On the other hand, this result confirms the result obtained in the previous item related to the perceived characteristics of the eCommerce. As the farmers' perception of the characteristics of the technology increases, they intend to adopt it immediately

Findings in table 5, show that Date Palm was the most candidate crop to be electronically marketed as mentioned by 83.7% of respondents, because of Date Palm is a strategic crop that produced in large quantities and good quality, there is a governmental intention to switch to electronic marketing through the launch of an electronic platform for the sale and marketing of dates.

Vegetables and Fruits are also candidate to be marketed electronically as mentioned by 53.9% and 52.1% of respondents, respectively. While the less frequented products were Fish as mentioned by (23.7%) of respondents followed by Flowers and Field crops as mentioned by 27% and 33.4% of respondents, respectively.

Table 4 Respondents' intention to adopt the electronic marketing to trade their agricultural products

| <i>Do you tend to adopt electronic marketing to trade your agricultural products?</i> | <i>Frequency</i> | <i>Percentage</i> |
|---|------------------|-------------------|
| Yes: immediately | 318 | 63.22 |
| Yes: in short time | 101 | 20.08 |
| Yes: in medium time | 52 | 10.34 |
| Yes: after long time | 19 | 3.78 |
| No | 13 | 2.58 |
| Total | 503 | 100.0 |

Source: the study's findings

Table 5 The appropriate products to electronic marketing from the view point of respondents

| <i>Do you tend to adopt electronic marketing to trade your agricultural products?</i> | <i>Frequency</i> | <i>Percentage</i> |
|---|------------------|-------------------|
| Yes: immediately | 318 | 63.22 |
| Yes: in short time | 101 | 20.08 |
| Yes: in medium time | 52 | 10.34 |
| Yes: after long time | 19 | 3.78 |
| No | 13 | 2.58 |
| Total | 503 | 100.0 |

Source: the study's findings

Conclusion and recommendations

Most respondents have the intention to adopt the electronic marketing once the technology was broadcasted. Based on the previous findings, the proposed platform could help in: 1) saving time, effort and money on sellers and buyers, 2) allows farmers to choose whether to sell in the wholesale market or through the platform, 3) buyers will have the choice of the source of the products they want, 4) prevent monopolistic practices by some traders, 5) the possibility and ease of control over prices, 6) easy communication with sellers and buyers to evaluate quality of service.

The proposed platform should focus at the beginning on the eCommerce of Date Palm in addition to Vegetables and other Fruits because these products are the most candidate to be marketed electronically as mentioned by farmers.

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The role of innovation support services in boosting innovation in female- owned Italian farms. Is being entrepreneurial enough?

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Keywords

female farms, innovation, agricultural extension services, entrepreneurial profile

Abstract

Purpose. The aim of this study is to analyse the patterns of innovation adoption among Italian female farmers. More precisely, our purpose is to examine whether the presence of innovation support services and women farmers' entrepreneurial orientation affect innovation adoption by female-owned farms.

Design/Methodology/approach. A questionnaire was administered to a sample of Italian female farmers. A cluster analysis was employed in order to identify homogeneous "worlds of innovation."

Findings. The analysis revealed five clusters. Farmers with a high entrepreneurial orientation who collaborate with innovation support services were found to adopt multiple innovations.

Practical/Theoretical/Political implications: Our findings confirm the idea that innovation adoption heavily depends on both the effectiveness of innovation support services and farmers' entrepreneurial behaviour. At a policy level, these results point out to the need for policy interventions tailored to the different worlds of innovation that exist in rural Italy.

Originality/Value. To date, research on the adoption of agricultural innovations has neglected the gender dimension of agricultural entrepreneurship. Moreover, the relevant literature has not explicitly focused on the possible links between innovation adoption, farmers' entrepreneurial profiles, and use of innovation support services. Therefore, this paper attempts to fill this gap.

Introduction

This work deals with innovation process in female-owned farm enterprises. The aim of the study is to explore how innovation support services facilitate innovation adoption among

female-owned farms of Italy, and to investigate the potential effects of women farmers' entrepreneurial profile to their innovation behavior. The following research questions guided the study:

- Which sources of innovation-related information (formal, informal, private, public, individually-collectively channeled) female farmers prefer?
- To what extent women farmers' entrepreneurial profile enhances the quality of interaction with innovation support systems and, consequently, facilitates innovation adoption?

The paper is structured as follows. The next section provides a theoretical background aiming at explaining the importance of integrating gender issues in agricultural innovation studies. The third section is devoted to the methodology we have adopted to analyze gender differences in the uptake of innovation. Then, we present our results. Finally, some concluding remarks end the paper.

Theoretical background

The paper is conceived within a theoretical framework looking at female entrepreneurship through the lens of gender mainstreaming in European agriculture (Shortall, 2010) with the general purpose of investigating women's contribution to the economic development. The beginning of the new century can be considered a starting point of a new research frontier, where studies on women in entrepreneurship are marked by the "transition from childhood towards the adolescence" (Hughes et al., 2012). Despite the fact that some scholars still deny the relevance of gender-based issues in family-farm business research (Litz et al., 2012), this perspective seems senseless, given that an overlapping between the family and the entrepreneurial sphere is evident in family farming (Bradley, 2007; Errington and Gasson, 1993; 1988). Against this background, another element of analysis concerns how to approach entrepreneurship in the family farm business (McElwee, 2006). Our hypothesis is in line with Collins and Swail's theoretical analysis. Actually, we reject the perspective of entrepreneurship as an open to all activity, which neglects the relevance of context under its multidimensionality (Collins and Swail, 2014). A critical examination of the literature on female entrepreneurship indicates that it can be divided into two main strands: one built upon institutional theories and a second, which draws upon feminist theories.

Institutional theories are based on the original institutional economics (Veblen, 1899; 1909) which emphasize the role of both formal (regulative) and informal (cultural-cognitive) institutions (North, 1990) in human behaviors, through the development of specific ways of action, that the original institutional economics label as habits or, more broadly, "culture" (Hamilton, 1932). By emphasizing the relevance of informal institutions, original institutional economics provide an interdisciplinary approach which concentrates on the analysis of institutions and human behavior. Such an approach considers institutions as key elements in economics and analyses the process of institutional conservation, innovation and change. Working on Veblen's evolutionary concept of human agency, Hodgson, (2002; 2003) too considers social behavior as "inherited," that is, the product of selection, but whereas Veblen sees institutional selection as unmediated, Hodgson argues that it is mediated by experience. As posited by Hodgson, "The economy is an open and evolving system, situated in a natural environment, affected by technological change and embedded in a broader set of social, cultural, political and power relationships" (Hodgson, 2000, p.318). Applied to our analysis, this perspective accepts the relevance of institutions in shaping female behavior in farming activity. In fact, when talking about institutional contextualization, Welter (2011) shares the idea of institutional environments (which include societal attitudes and norms) affecting entrepreneurial behavior. Therefore, jointly with spatial context, institutions may offer

key elements for conceptualizing the gendered dimension of female entrepreneurship.

Feminist theories, on the other hand, assume a subordinate position of women in society and trying to find solutions to avoid this. As a matter of fact, feminist perspectives provide sound bases for explaining the gender gap in agricultural activities in the '70s and '80s, where a subsidiary role was assigned to women (Sachs, 1983). Nonetheless, despite the fact that more recent literature, starting from the '90s, recognizes a more visible role of female entrepreneurship in building up more sustainable agricultural systems (Shortall, 2002; 2006), patriarchal and masculine perspectives are still prevalent. Feminist theories are divided into two main strands: in the liberal feminism, phenomena of work segregation limit women's upgrading of competencies. Moreover, in agricultural activity men dominate organizations and this may represent a barrier to female farmers (Welter, Brush, de Bruin, 2014). This usually happens in many female-owned family farm businesses, framed within the context of copreneurship, where male dominance is realized within the women's ownership (Dyer et al., 2016). On the other side, the second strand makes reference to social feminism, which investigates the impact of women socialization in accessing certain types of business. Set against the context of rural entrepreneurship, agriculture is a typical sector where socialization may engender different paths of women's involvement. Thus, gender differences in the capability of and access to networking may affect attitude towards entrepreneurship. Female networks are more homogeneous and based on kinship, thus boosting high probability of entrepreneurial processes (Renzulli et al. 2000; McManus, 2001). In the light of theories of collective action, and following Ostrom's theory (Ostrom, 2007, 2010), one can expect that highly homogeneous networks (based on kinship) facilitate the success of collective action and, consequently, of entrepreneurial networking. On the other side, sociological network theories, based on the seminal work of Granovetter (1975; 1985), cast some doubts on the effectiveness of kinship-based networking on the probability to innovate (Boschma, 2004). Therefore, a gender-based perspective of innovation must be taken into account.

Gendering innovation processes

Some scholars consider gender dimension of innovation as a minor issue (Crowden, 2003; Ranga and Etzkowitz, 2010). More precisely, if, on the one side, innovation is considered a backbone of a farm's growth, on the other side, women's role was assumed as negligible in the modernization era (Seuneke, Bock 2015). This paper contrasts this view, by adhering to more recent analyses emphasizing the role of women as drivers of innovation, especially in developing countries (Ighomereho et al., 2013; Kingiri, 2013). Gendering means classifying according to gender, gendering innovations means that trajectories of innovation are differentiated on the basis of gender. Recently, the rise of multifunctional agriculture has relaunched the visibility of women in the farms, by letting them to "develop a new professional identity as new rural entrepreneurs" (Seuneke and Bock, 42). Notwithstanding a growing interest in the role that women occupy in this transition, it seems too trivial to consider that women's contribution to innovation is only limited to multifunctionality. Consequently, we agree with Welter, Brush and de Bruin (2014):

Our view of the relationship between context and gender is dynamic and reciprocal: gender is affected by contexts as they exist today and as they have existed before, but gender also affects contexts and thus contributes to changing contexts overtime (p.5). Therefore, our framework is drawn on a constituent perspective of women's role in agriculture (Whatmore, 1994; Wright, Annes, 2016), where female entrepreneurship may be perceived as an emancipatory act of empowerment (Rindova et al.'s, 2009; Hughes et al., 2012), not necessarily limited to the introduction of multifunctionality but tied to a

farm's growth. This perspective brings about:

a) questioning the construction of female entrepreneurship either as a different process from the male one and among the women's world of production (Welter, Brush, de Bruin, 2014; Díaz García and Welter, 2011);

b) contextualizing female entrepreneurship, by taking into account rural entrepreneurship as different from entrepreneurship in the rural (Korsgaard, Muller, and Tunvig, 2015) and by integrating who/where/when context variables (Welter, 2011; Ahl, 2006). This implies a contextual learning arising from female participation to a social community (Rae, 2006).

Within this framework, women may affect the "technological landscape" through diverse routes of innovation with respect to men, by introducing different technological trajectories, leading to diversified paths of sociotechnical transition (Darnhofer, 2015). Differences may be grounded on different value propositions, in the account of farm's diversity to which a set of related innovation support services have to be attached and where different change models are at stake (Sutherland et al., 2012). This process may originate gender issues and differences between male and female farmers (Charatsari and Papadaki-Klavdianou, 2017), arising from different connection with the AKIS system. Recent evolution towards more articulated innovation support systems with a diversified set of service offerings (Labarthe et al., 2013) makes access to them more complex. This is particularly true when multiple motivational pathways might lead to the adoption of innovations, like in the empirical cases of green innovation provided by Lioutas and Charatsari (2017). Therefore, links between innovation support services and innovation become less straightforward (Ndah et al., 2018), since innovation support services directly connected with a specific value proposition where each actor involved exchanges knowledge, expertise and skills (Vargo and Lusch, 2014; Lioutas et al., 2018). In real settings, the value proposition of an innovation is linked to a "coherent" stock of knowledge and extension provision, which facilitates innovation adoption by farmers.

This involves the second element of analysis: value propositions of extension programs and, consequently, rate of participation in extension programs, which may be differentiated on the basis of gender (Charatsari, Černič Istenič, and Lioutas, 2013). From this point of view, little attention has been devoted to the ways agricultural extension services can enhance innovation capacity of female farmers. Actually, systemic analyses on the role of agricultural innovation systems are needed, in order to intercept women's propensity to innovate. Nonetheless, farmers' permeability to innovation support services may depend on their entrepreneurial orientations. The ways farmers' entrepreneurial profile facilitates or impedes the adoption of extension services is a relevant topic not well explored. Set against the background of this paper, both Schumpeterian (or innovation-based) and Kirznerian (or opportunity based) approaches to entrepreneurship have to be taken into account (Alsos et al., 2011). Consequently, entrepreneurial alertness (Kirzner, 1979), by strengthening Schumpeterian entrepreneurial behaviors, is a key element for boosting innovation adoption. To the best of our knowledge, only a few studies have analyzed the links between innovation adoption, entrepreneurial profile and innovation support systems. Therefore, this paper is trying to fill a gap in the literature.

The concept of entrepreneurial learning (Hamilton, 2011; Seuneke, Bock, 2015) is fundamental in this background and above all in rural areas marked by relatively high barriers to innovation. By synthesizing its individual cognitive (based on experiential learning) and socially situated (learning as a social phenomenon) perspectives, Rae (2006) sees entrepreneurial learning as a dynamic and complex process including knowledge, behavior, emotional and affective learning, depending on both the context and the individual and able to boost opportunity recognition, creativity and innovation.

These two perspectives (cognitive individual and socially situated entrepreneurial learning) are at the basis of this analysis, with the purpose of testing: a) which innovation support services women farmers use during innovation adoption; b) if women farmers' entrepreneurial profile affects the uptake of innovation support services and, consequently, women's propensity to innovate and innovation adoption.

Methodology

The research is grounded on primary sources. A questionnaire was administered to a sample of 300 female farmers in all regions of Italy. The purpose was to investigate complex dimensions behind the innovation adoption decision, with a special focus to the effects that farmers' and farms' characteristics (age of the manager, education, economic and physical dimensions of the farm, etc.), role of innovation support systems and women's entrepreneurial profile (individual and economic values) have on innovation behavior (Figure 1):

A stratified random sampling was performed to select our sample. Criteria used for the stratification process were farms' territorial localization (rural-urban), farm size, and sociodemographic variables (age, level of education, family composition)².

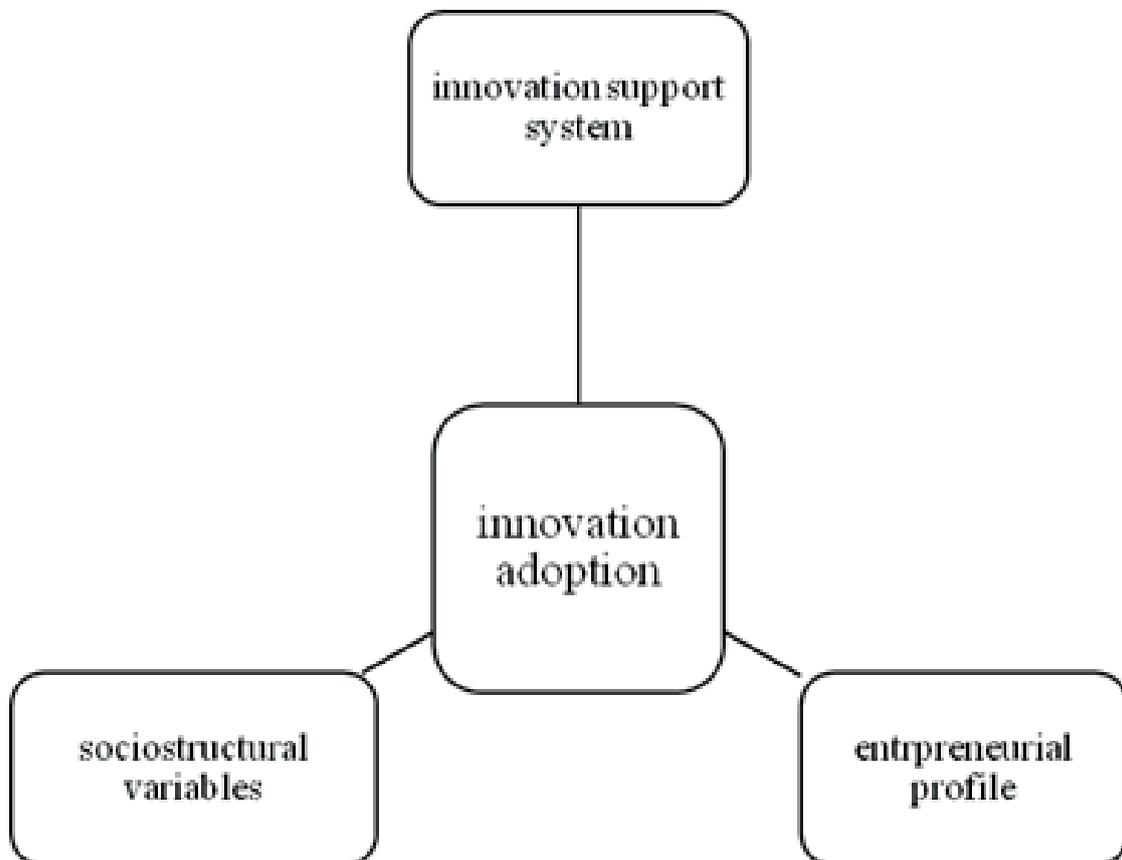


Figure 1 Framework of the analysis

The questionnaire used included four sets of questions. The first one referred to sociodemographic characteristics, such as farmers' level of education, age, family composition and stage in the life cycle. The second aimed at collecting data related to the main farming activities and strategies used for differentiation or diversification. Moreover, in this part of the questionnaire other questions, referring to farm size (both physical and economic), the distribution channels used, and other characteristics associated with the strategy of farm enterprise were added. The third set of questions was related to the entrepreneurial identity of participants, including items referring to

a broad range of entrepreneurial (proactiveness, risk-orientation, innovativeness) and personal (self-efficacy, optimism, personal control) attributes (Vesala, Peura, McElwee, 2007). Finally, the fourth set of questions aimed at gathering information on relational assets, like cooperative spirit, adhesion to producers' organization, trust, (Storper, 1997) and access to various sources of agricultural innovation support services (extension services, training courses, informal sources, etc.) which, according to Ndah et al. (2018) can increase farmers' propensity to innovate.

Both descriptive and multivariate statistics aimed at specifying the various 'worlds of innovation' (Storper, 1997) were used to analyze the collected data.

Descriptive statistics are presented in the results section with the support of the following index of specialization (Spi):

Where:

n_{ij} is the number of farms adopting innovation *i* with reference to the variable *j*.

n_{i.} is the total number of farms with the innovation *i*.

n_{.j} is the total number of farms with reference to the variable *j*.

$$\frac{n_{ij} / n_{i.}}{n_{.j} / n_{..}}$$

A multivariate analysis (cluster analysis), was performed to identify homogenous groups of female farmers on the basis of innovation adoption, where both the influence of innovation support services and entrepreneurship are investigated. Therefore, as clustering variables were used: a) the types of adopted innovations; b) the benefits after the uptake of innovation(s); c) farmer's entrepreneurial profile; d) access to innovation support services. To specify clusters, sociodemographic variables and territorial variables were taken into account as illustrative variables, by following McElwee and Smith's (2012) segmentation framework.

Results

Descriptive analysis

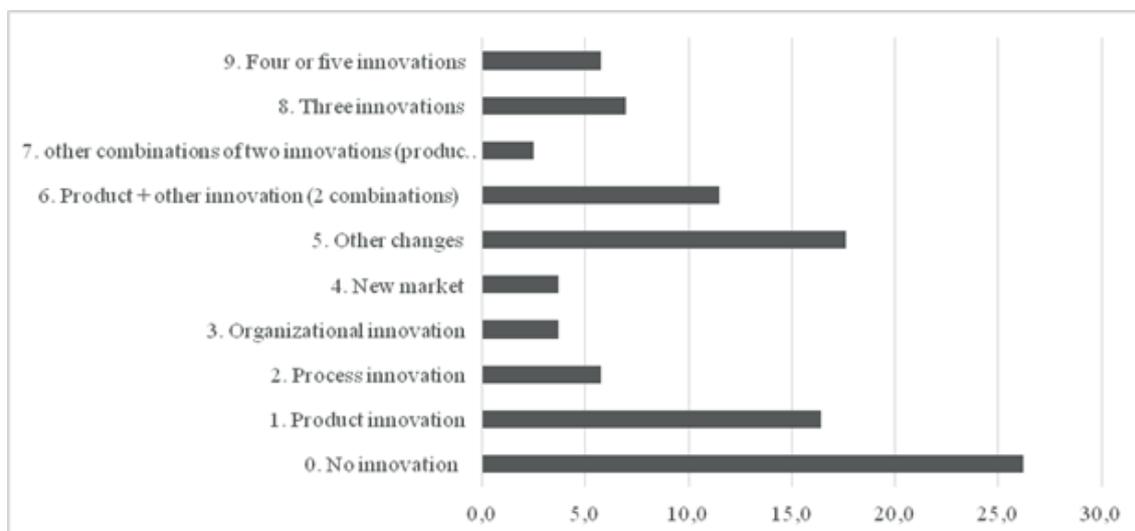
From the 300 questionnaires administered, 244 (81.3%) were considered as valid for the analysis. Based on the answers provided, the innovations adopted by surveyed farmers can be classified into eight categories (Table 1).

Table 1 Types of innovation introduced

| 0. No innovation |
|--|
| 1. Product innovation |
| 2. Process innovation |
| 3. Organizational innovation |
| 4. New market |
| 5. Other changes |
| 6. Product + other innovation (2 combinations) |
| 7. Other combinations of two innovations (product innovation excluded) |
| 8. Three innovations |
| 9. Four or five innovations |

Source: the study's findings

Figure 2 illustrates the rate of innovation and the types of innovation adopted in sampled female farmers. As the graph illustrates, more than one-fourth of Italian female farmers (26.2%) have not adopted any innovation, while 73.8% of them declare to have adopted one or more innovations. As the graph shows, the options “product innovation” and “other innovations” (which may be considered as “generic changes”) have the highest percentages, followed by process innovation, while the search of new markets and new organizational are less frequent. What emerges from the data is that a considerable share of farms (26.6%), introduces various types of innovations: for example, almost 8% of female-owned farms link product/process innovations to searching new markets and to new organizational arrangements.

**Figure 2 Patterns of innovation adoption in female farms**

An interesting finding is that the types of adopted innovations relate with the age of the farm manager. As Table 2 shows, the higher the number of innovations, the younger is the manager adopting innovations. A possible explanation here is that innovation adoption involves an investment that may be paid off in the long run. Consequently, it is more probable that the youngest generation presents higher propensity to invest compared to older farmers (Diederer et al., 2003; Schnitkey et al., 1992).

Table 2 Types of innovation introduced

| Type of innovation | age of the farm manager | | |
|--|-------------------------|--------|-----|
| | young | mature | old |
| 0. No innovation | 1.0 | 0.8 | 1.9 |
| 1. Product innovation | 0.9 | 1.1 | 0.0 |
| 2. Process innovation | 1.2 | 0.7 | 2.9 |
| 3. Organizational innovation | 1.4 | 0.5 | 4.5 |
| 4. New market | 0.7 | 1.4 | 0.0 |
| 5. Other changes | 0.8 | 1.2 | 0.9 |
| 6. Product + other innovation (2 combinations) | 0.8 | 1.3 | 0.0 |
| 7. Other combinations of two innovations (product innovation excluded) | 0.7 | 1.4 | 0.0 |
| 8. Three innovations | 1.4 | 0.6 | 0.0 |
| 9. Four or five innovations | 1.5 | 0.6 | 0.0 |

Source: the study's findings

In fact, high values of Spi can be found in cases of farms managed by older people (>65 years) and no innovation adopted. Moreover, innovative paths are realized along the “simplicity” line, where just one innovation is adopted. In cases of older farm managers, only process and organizational innovations have been introduced. Coming back to the younger generation one can observe a higher propensity to introduce innovation(s). In mature phases, a combination of two innovations has been found to be the common practice, while in farms managed by younger women multiple innovations have been introduced.

Another interesting variable we have linked to innovation adoption is owner's level of education. According to OECD (2016), farmers' educational level is an antecedent of their innovation behavior. The Table 3 presents the different values that the index of specialization obtains for innovation adoption patterns depending on the educational level of farm manager. Index's values indicate that zero or low education is highly associated with the possibility for a farmer to not adopt innovations (respectively 3.8 and 1.4).

Table 3 Innovation adoption according to educational level

| Type of innovation | no education | middle school diploma | professional school of agriculture | high school diploma | degree in agriculture | degree | post-graduation studies |
|--|--------------|-----------------------|------------------------------------|---------------------|-----------------------|--------|-------------------------|
| No innovation | 3.8 | 1.4 | 0.3 | 1.1 | 0.8 | 0.8 | 0.0 |
| Product innovation | 0.0 | 1.1 | 0.6 | 1.1 | 1.4 | 0.8 | 1.8 |
| Process innovation | 0.0 | 0.0 | 1.6 | 1.2 | 0.0 | 0.8 | 3.5 |
| Organizational innovation | 0.0 | 0.0 | 0.0 | 1.3 | 0.0 | 1.3 | 0.0 |
| New market | 0.0 | 1.0 | 0.0 | 1.6 | 0.0 | 0.4 | 0.0 |
| Other changes | 0.0 | 1.0 | 1.5 | 1.0 | 0.0 | 1.0 | 1.1 |
| Product + other innovation (2 combinations) | 0.0 | 1.9 | 2.4 | 0.6 | 1.0 | 1.1 | 0.9 |
| Other combinations of 2 innovations (product inn. excl.) | 0.0 | 0.0 | 3.7 | 1.0 | 0.0 | 1.3 | 0.0 |
| Three innovations | 0.0 | 0.5 | 1.3 | 0.1 | 6.4 | 2.1 | 1.4 |
| Four or five innovations | 0.0 | 0.0 | 0.0 | 1.3 | 0.0 | 1.1 | 1.7 |

Source: the study's findings

Good performance is registered in farms where the manager has a professional diploma in agricultural engineering, where various profiles of innovation emerge. Highly attraction is verified both with the product and other innovations (two combinations) and with the adoption of two innovations excluding product innovation (3.7). The positive relationship between level of education and innovation adoption is confirmed by the high value of the index for farmers with post-graduation studies and the category “four or five innovations.”

As far as structural variables are concerned, the Figure 3 presents the relationships between farm’s physical dimension and innovation adoption. What it is worth to note here is that, on the one side, the bigger the farm the higher is the number of innovation. On the other side, the highest level of innovation is found in smaller farms (2-5 hectares). Here, innovation takes on a different trajectory with respect to the largest farms, since novelty is the main source of niche innovation (van der Ploeg, Marsden, 2008; Roep, Wiskerke, 2004).

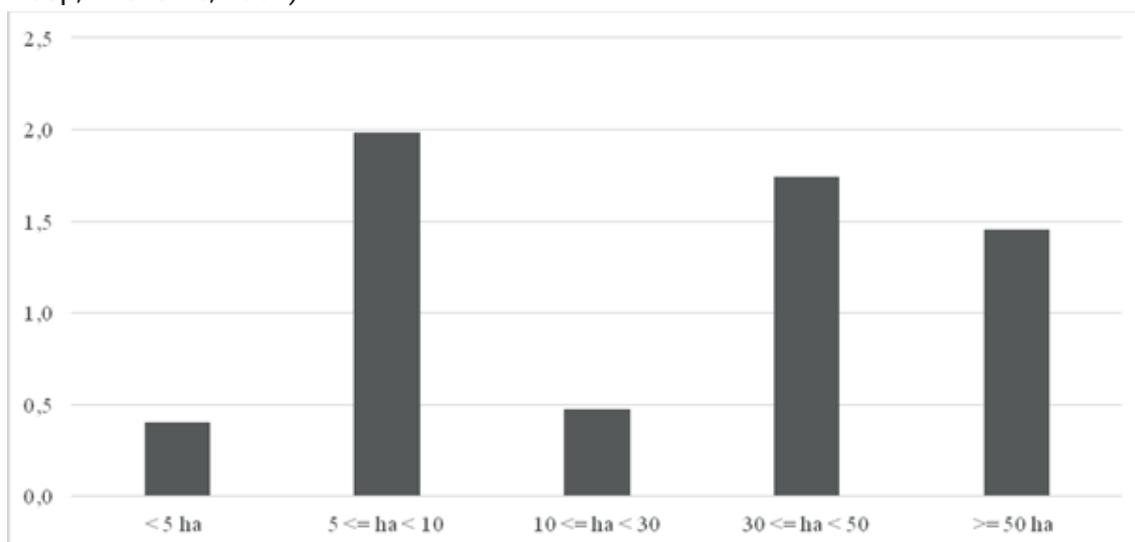


Figure 3 -Innovation adoption according farm's dimension (Spi)

Cluster analysis

The cluster analysis that follows aims at offering more information by uncovering homogeneous clusters of farms. More precisely, the analysis classifies farmers on the basis of our hypotheses that is innovation support services and the entrepreneurial profile of farm owners affect processes of innovation adoption.

In order to classify interviewed farmers based on homogeneous behavior regarding innovation adoption, a cluster analysis has been carried out, through the Wald test (ascendant hierarchical). The following active variables were selected to classify the farms, articulated according to three main domains (Table 4):

- a. The domain of innovation, which deals with the innovation adoption patterns and the benefits from introducing innovations.
- b. Entrepreneurial identity of farmers, which, according to Vesala et al. (2007) and Blun-del et al. (2018), refers to:
 - i. economic values, which are key determinants of entrepreneurial orientation, like pro-activeness, risk-taking and innovativeness (Rauch et al., 2009);
 - ii. individual values, concerning the psychological dimensions of entrepreneurship, like personal control (Furnham and Steele, 1993), optimism and self-efficacy (Cromie and O'Donaghue, 1992).
- c. Access to innovation support services, which includes the multiple service offerings,

such as information, training and advisory services (Faure et al., 2018). Illustrative variables aimed at obtaining further information about farm's socioeconomic characteristics are listed in Table 5.

Table 4 - Cluster analysis: active variables

| <i>Domains</i> | <i>Variables</i> | <i>Categories of variables</i> |
|---|--------------------------|--------------------------------|
| Innovation | Innovation adoption | 10 |
| | Benefits from innovation | 6 |
| Entrepreneurial identity: individual values | Decision making | 4 |
| | Personal control | 3 |
| | Self-efficacy | 4 |
| | Optimism | 3 |
| Entrepreneurial identity: economic values | Risk-taking | 4 |
| | Proactiveness | 4 |
| | Innovativeness | 4 |
| ISS | Information | 8 |
| | Training | 8 |
| | Advising | 8 |
| | Combination of sources | 7 |

Table 5 - Illustrative variables

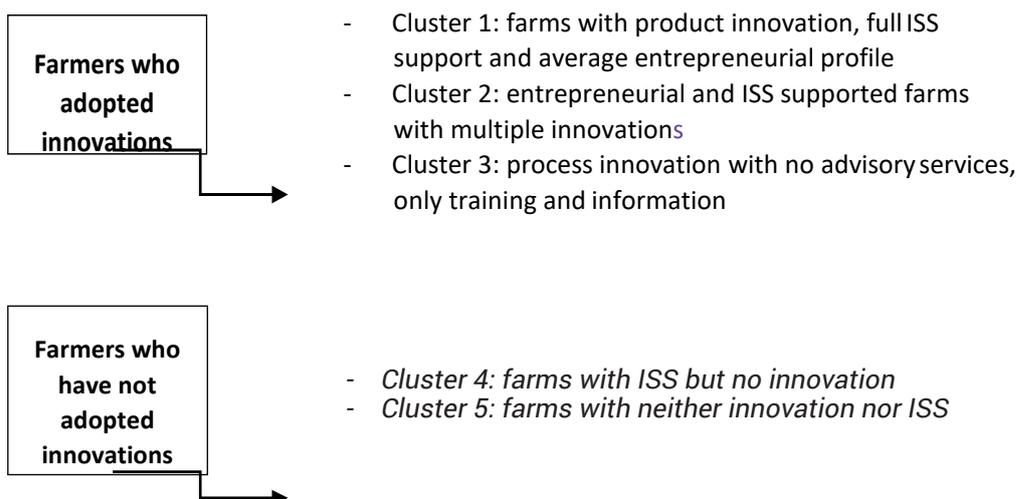
| <i>Domains</i> | <i>Variables</i> | <i>Categories of variables</i> |
|--|---|--------------------------------|
| Territorial | Administrative region | 19 |
| | Territorial location (mountain, hill, lowland) | 3 |
| Sociodemographic | Year of activity start-up | 5 |
| | Set up | 3 |
| | Family type | 6 |
| | Life cycle of the family | 4 |
| | Age | 4 |
| | Education | 7 |
| | Utilised agricultural area | 6 |
| Structural and market | Total agricultural area | 6 |
| | Labour//capital technology intensity | 4 |
| | Combination of L/C/T intensity | 7 |
| | Adhesion to associative organisms | 3 |
| | Benefits from adhesion to associative organisms | 4 |
| | Geographical destination of the product | 6 |
| | End market | 4 |
| | Combination of end markets | 10 |
| | Quality products | 6 |
| | Drivers of quality adoption | 4 |
| | Farm diversification | 4 |
| | Pull/push motivation for diversification | 3 |
| | Computer endowment | 3 |
| | On-line information acquisition | 4 |
| | European Size Unit | 6 |
| | Type of farming (livestock/crop) | 8 |
| Labour | 5 | |
| Adoption of rural development policies | 4 | |
| Farmers' informal network | 4 | |

Figure 4 shows the clusters extracted on the basis of our multivariate analysis. Each cluster holds the highest internal homogeneity and presents the highest heterogeneity with respect to the other groups of farmers.



Figure 4 Cluster analysis: five homogeneous groups of female farms

Two macro-groups of farmers may be drawn on the analysis (figure 4): the first one includes farmers who adopted innovations during the last years. Clusters 1, 2 and 3 were included in this group. The second one contains farmers who have not adopted innovations, included in clusters 4 and 5.



Cluster 1 – farms with deep access to services, product innovation and generic changes

The first cluster includes 86 farmers, typified by product innovation and other general changes, from whose farms economic benefits are drawn. With a value-test of 6.52, the high degree of access to a diversified set of knowledge provision emerges, ranging from information, to advising and training. Therefore, innovation services empower female farmers to the uptake of innovation. As far as sources of knowledge are

concerned, desk advising (value test 4.35), information from both magazines and internet (3.44), online advising (3.12) and participation to conferences and training days (2.96) are the main sources utilized by these female farmers. They are mainly oriented towards sustainable methods of agriculture and do not show specific entrepreneurial profiles. More precisely, more than 22% of their farms moved towards organic farming, while almost 24% to sustainable agriculture. Market destination of the products is prevailing on local and regional markets (42%), while a low propensity to export emerges.

Cluster 2 – Entrepreneurial and ISS supported farms with multiple innovations

The second group of female farmers emerges as the most successful innovators. This cluster contains 37 farmers, which represents 15.6% of the total sample. It is characterized by the presence of effective support services addressing introduction of a diversified set of innovations within the farms. More specifically, training is the most used service offering, with the highest value-test (8.35), followed by all types of advisory services (value-test: 7.17). Moreover, the construction of valuable informal networks seems fundamental for stimulating farmers' knowledge upgrade. This sort of virtuous atmosphere, made up of both formal and informal networks of knowledge boosts the strengthening of embedded informal relationships (Hess, 2004), with a multiple effect on the propensity to innovate. As a matter of fact, 27% of the farms in this cluster introduce four or five innovations, against an average percentage of 2% registered in the other clusters.

Moreover, coherently with our hypothesis, female entrepreneurs evidence high entrepreneurial orientation, supported by both individual and economic values. Among economic values, risk-taking is the most important variable of the cluster (value test: 3.31). However, self-efficacy seems to be the most important element of the entrepreneurial identity of farmers (value test: 4.90): female farmers do declare higher entrepreneurial competencies with respect to their counterparts. Furthermore, among individual values, is worth considering personal control, according to which female entrepreneurs declare to be able to affect farm's success (value-test: 2.66).

Another key element drawn on the empirical analysis is the specialization of farms in this cluster in a quality product, more precisely in origin-linked products, typified by specific territorial quality. The use of localized agrifood systems based on geographical indications seems to be a remarkable characteristic of this cluster, where farms are competitive in both local-regional (48.6%), national (10%) and international markets (16%). Furthermore, it is not surprising that the region with the majority of farms in this cluster is Emilia Romagna, characterized by the presence of social capital and high numbers of quality products, mostly geographical indications (like PDO and PGI).

To summarize, thanks to effective AKIS and a high entrepreneurial identity, these women introduce numerous innovations (4-5 innovations, with a value test of 4.64), bringing about a large set of benefits for the farms (value-test: 5.69).

Cluster 3 – Farms with process innovation and no advisory services (only training and information)

The third cluster includes 41 farmers (17.3%), prevalently localized in Southern Italy, with a higher concentration in the region of Sicily. The farmers in this cluster do not present specific entrepreneurial orientation and were not closely collaborate with advisory services (value-test: 8.30). Actually, these farmers prefer to access informal networks and training and information to acquire knowledge, by avoiding farm advisory services. They consider sufficient these services for them to introduce innovations and, more precisely, process innovation. This change brings about both economic and social be-

nefits for these farms.

Cluster 4: Farms with limited ISS and processes of deactivation

The 54 farmers of the fourth cluster have not adopted innovations (value-test: 12.93). It is notable that their farms are characterized by evident patterns of deactivation, according to which levels of agricultural production are actively contained or even reduced (van der Ploeg, 2008, 7). This is clearly confirmed by high value-test of the variable linked to growth orientation (no intention to promote the farm's growth), with a value-test of 2.70. Innovation support services are poorly consumed by these farmers. As the analysis indicates the use of service offerings is limited to training courses and some conferences attended (value-test: 2.42). Farms included in the fourth cluster present a relatively lower propensity to invest on in quality. Moreover, products are distributed through local circuits, i.e. local and regional markets, with the lowest propensity to export on international markets (7%). In this cluster it is observed the higher percentage of farms with no quality strategies.

Cluster 5: Farms with neither ISS nor innovation

A similar group of farmers is found in cluster 5 (19 farmers). Here, no innovation support services are consumed, whereas there is a limited access to and use of sources of knowledge and information (value-test: 8.36). These farms seem characterized by strong isolation, likely they are located in the decline phase of the farm's life cycle. Products are mainly marketed on national markets, with no particular quality attributes, out of the conformity specificity.

Discussion and conclusions.

With the purpose of filling a gap in literature, this paper has explored the eventual connection between provision of innovation support services, the presence of an entrepreneurial identity of farmers, and innovation adoption by female farmers. Results confirmed the presence of a variety of worlds of innovation (Storper, 1997), where both innovation support services (presence/absence) and entrepreneurial orientation (presence/absence) may affect the propensity to innovate. The links between the three interpretative variables here adopted (socio-structural attributes, entrepreneurial orientation, collaboration with innovation support services) are evident, bringing about differentiated paths of innovation in female farmers, thus confirming recent literature on the role of entrepreneurship in women managed farms (Pato, 2015). The two macro-groups of the cluster analysis (adopters / not adopters) indicate a different propensity to innovate. The first one consists of innovative farmers, who are novelty-inclined, and the second one includes farmers with no propensity to innovate. The first macro group is the sum of three and the second contains two clusters. The effectiveness of innovation support systems seems not always relevant regardless of entrepreneurial dimension. Interestingly, collaboration with innovation support services and farmers' level of entrepreneurial identity are higher in the second cluster, where numerous innovations adopted. Hence, it can be argued that innovation adoption is the outcome of a successful combination of farmers' entrepreneurial orientation supported by highly effective support services. Female entrepreneurs provide a strong contribution to on innovation adoption, alongside the paths of multifunctional agriculture, in account of quality products typifying the second cluster. On the other side, even when agricultural extension services and other sources of information are present, the lack of a defined entrepreneurial orientation was found to negatively affect innovation adoption.

Consequently, in order to make innovation support services more effective, policy action should also strengthen key elements of entrepreneurship, by focusing on female rural entrepreneurs. Although policy provisioning recognizes gender mainstreaming as a pil-

lar of the rural policy (Shortall, 2010), policy action seems not always coherent. Despite a specific supply of incentives for female farmers in the programming period 2007-2013, this attention seems less visible in the actual programming period 2014-2020. Nonetheless, it is commonly recognized that gender mainstreaming affects trajectories of farm development. Therefore, at the beginning of the new programming era for rural development 2021-2027, building up a toolkit for addressing women's upgrading of entrepreneurial profile and their capability of accessing innovation support services, should be privileged in account of women's role in stimulating sustainable agricultural models.

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Factors pertaining the gap between research and practice: The case of innovative spraying equipment

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Keywords

Innovative spraying equipment, adoption, farmers' groups, INNOSETA project, Multiple Correspondence Analysis

Abstract

Introduction: The Thematic Network on “Innovative Spraying Equipment, Training and Advising” (INNOSETA) aims at the effective exchange between researchers, industry, extension services and farming community. The network links directly applicable research and commercial solutions and grassroots level needs and innovative ideas thus contributing to close the research and innovation divide in this area. Among others, the INNOSETA project aims at assessing end-users’ needs and interests and at identifying the factors that influence farmers’ generation shift, adoption and diffusion of SETA.

Purpose

In this paper some of the results of the on-going data analysis, collected through farmers’ survey (see below) are presented particularly concerning the identification of farmers’ groups with similar characteristics that relate to farmers’ perceptions and adoption of innovatory spraying equipment.

Design/Methodology/approach

Data were drawn from farmers’ survey in seven EU hubs: France, Greece, Italy, The Netherlands and Belgium, Poland, Spain, and Sweden. Five cropping systems were selected throughout all regions, i.e. arable crops, open field vegetables, orchards, greenhouses and vineyards. The target was to interview 50 farmers (comprising 25 adopters and 25 non-adopters of innovative spraying equipment) per hub, based on the farm size classes for each of the cropping systems per country (EUROSTAT 2013). Overall,

348 valid questionnaires were collected. For data analysis the packages SPSS for Windows (ver 23.0) and SPAD (ver5.5) were used. Analysis was at both univariate (frequencies) and multivariate level. For the latter Multiple Correspondence Analysis (MCA) and Cluster Analysis were utilized.

Findings

Five groups of farmers have been identified showing differences in farms' and farmers' characteristics and general perceptions as well as with regard to their perceptions and adoption of innovative spraying equipment. Some indicative findings follow.

- All Groups: the majority waits for others to have positive experiences with technology before adopting it
- Group 5: also prefer to have some experience with technology before adopting it
- Group 5: farmers are the first ones to know of new technology among the social circles.
- Group 4: farmers depend on the opinion of their social circles in order to acquire new technology.
- Group 4: farmers rely on their own experience for the use and operation of spraying equipment; advisors follow (important source of information on spraying equipment)
- Advisors are important for Group 3
- Group 5: the most important source are manufactures and their dealers; the Internet follows
- Groups 3 and 4: the majority experiment on their farms by themselves
- Group 5: high percentage of farmers who experiment with other farmers as well as with researchers and advisors
- Groups 3 and 5: farmers keener to adopt innovatory spraying machinery; farming is their primary occupation while the first seem to rely more than other farmers on advisory services and the latter on joint-experimentation and contacts with manufactures/dealers.
- Group 5: farmers more sensitive vis-à-vis environmental protection, the reduction of PPP inputs and farm size when making decisions on buying new spraying machinery
- Groups 4 and 5: farmers put emphasis on compliance with EU Regulations, operator safety and economic considerations
- Groups 4 and 5: farmers believe that the reduction of environmental hazards and the compatibility of the equipment are more important characteristics of spraying equipment that would make them more relevant to farmers' needs than their colleagues do
- Group 5: farmers do not show much interest on whether the new equipment will show economic benefits right away (or not)

Conclusion:

Innovation adoption and diffusion is undoubtedly multifactorial (Rogers, 2003); the heterogeneity of both farms and farmers affects what is adopted, to what extent, and when. In this piece of on-going work, an attempt to construct farmers' groups with similar characteristics, as regards the adoption of innovatory spraying equipment, was undertaken. Despite the particular scope and sampling methodology followed in the IN-NOSETA project, the importance of exploring the differing features of target-groups has been shown. Further exploration, especially vis-à-vis national/regional AKIS is needed. Implications: Stakeholders need to gain deeper knowledge of farmers' characteristics and needs in order to bridge the gap between research developments and the actual use of the available equipment by farmers.

Looking for the missing link: The multiple meanings of sustainability in agricultural knowledge and information systems

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Keywords

Sustainability, AKIS, farmers, advisors, agronomy students, sustainability-related knowledge

Abstract

Purpose: The challenge of sustainability generates the need for multi-actor collaboration schemes, which set and pursue mutual goals. In this work, we aim at depicting the different meanings attributed to the concept of sustainability by Greek farmers, advisors, and agronomy students. We also attempt to explore the ways through which sustainability-related knowledge is constructed by these three groups and to identify the major obstacles in the knowledge construction process.

Design/Methodology/Approach: To answer our research questions we followed an iterative qualitative approach. Data collected through focus groups, semi-structured interviews, and observational research, were combined into a common thematic analysis.

Findings: The analysis uncovered that participants seem unable to fully understand the intercorrelations among the three dimensions of sustainability, thus losing the opportunity of drawing the big picture of sustainable agriculture. Farmers and advisors emphasize the economic dimension of agricultural sustainability, whereas students prioritize the need to embrace environmental strategies in farm practice. The low levels of trust between farmers and advisors, the different types of skills and knowledge they possess, and the lack of knowledge networks in which scientific and practical knowledge can be combined reduce their opportunities to reach a common understanding of sustainability. Moreover, the limited attention paid by the Greek system of agronomic education to the development of sustainability-related knowledge and skills restricts advisors' ability to develop key competencies needed to guide the transition towards sustainable agriculture.

Practical/Theoretical implications: Findings reveal that key actions are needed to rebuild trust between farmers and advisors, create webs for knowledge co-production, and provide students with opportunities to develop facilitation skills.

Originality/value: This work, aiming at understanding the multiple meanings of sustainability for farmers, advisors, and agronomy students, uncovers barriers to the transition towards sustainable agriculture.

Introduction

Worldwide, agricultural knowledge and information systems (AKIS) focus on the promotion of sustainable farm production models which can secure farmers' economic well-being while in parallel conserving natural resources and maintaining social balance (Adolwa et al., 2017; Gava et al., 2017; Zecca and Rastorgueva, 2017). Today, there is a general agreement that to achieve agricultural sustainability all the actors and the sub-systems of AKIS should develop a mutual understanding of sustainability, set and pursue common goals, and adopt a uniform vision of the future. Nevertheless, despite the fact that all the actors involved in the production and supply of agrifood products advocate sustainable development (Francis, 1990), the meaning attributed to the concept of sustainability heavily depends on the priorities set by each actor (Sydorovych and Wossink, 2008; Kamali et al., 2014).

In the case of AKIS, it is well known that participating organizations and individuals have multiple and often conflicting foci (Lioutas et al., 2019), as well as diverge perceptions of what should be designated as important (Agbontale and Issa, 2017; Ortolani et al., 2017). In this vein, it is not surprising that sustainability is differently conceived by the involved actors (Curry et al., 2012), leading to varying aims and objectives. So, a critical question is whether the key actors who participate in knowledge and information systems attribute the same meanings to the concept of sustainable agriculture.

Of course, the term "sustainability" – as Paehlke (2005) argues – is quite amorphous, thus generating conflicting or even competing views over it (Krueger and Agyeman, 2005). These different considerations, built upon distinct interests and varying experiences (Šūmane et al., 2018), lead to different knowledge stocks which, when combined, can create new knowledge bases (DeCarolis and Deeds, 1999; Tzabbar et al., 2008). However, despite the high volume of research on the relationships between farmers and other participants in the knowledge and innovation systems (e.g., Sutherland et al., 2013; Hilkens et al., 2018), only a small share of attention has been directed to the ways sustainability is approached by AKIS's actors.

This study aims at depicting the perspectives of farmers, advisors and agronomy students on agricultural sustainability in Greece. A second objective is to investigate the ways sustainability-related knowledge is built by these three groups. By focusing on two central nodes of AKIS (farmers and advisors) we can gain insights on what facilitates or impedes transition towards sustainable agriculture, whereas by adding the students' point of view we can outline the ways agronomic education can contribute to the development of a holistic understanding of sustainability.

From empty banks to multi-stakeholder learning loops

The theoretical framework in the article is based on a critical, constructivist approach to learning. Critical pedagogy builds upon the groundbreaking work of

Paolo Freire (1970). In "Pedagogy of the oppressed," Freire argues that successful learning must be built on empowerment, and not on an imitation of the language of the ruling class. Students and other learners should not be seen as empty vessels to be filled with knowledge, but as co-creators of knowledge. Freire further stressed the importance of dialogue between theory and practice.

Many years have passed since Freire worked with education for illiterate people in Latin America, but the basic features of the power dimensions of learning still remain. The relation between farmers and advisors is not equal. Advisors, in general, have more skills in theory, while farmers have practical skills (Ingram, 2008). Sustainability is sometimes perceived as an elite concept, with little relevance for people in the manual

labor sectors. The theory of critical pedagogy implies that if agriculture should become sustainable, it must be learnt by farmers on their own terms, and not as something imposed from above. The relation between advisors and farmers will thus be examined from a critical perspective. The farmers' definition and experiences of sustainability issues will be compared with the advisors' perspective and practices.

To escape the pitfalls of traditional pedagogy, alternative concepts have been launched, of which "action learning" is of specific relevance for this article. In order to meet the challenges of sustainability, a combination of practical and theoretical skills is needed (Heiskanen et al., 2016). This calls for an "action learning" approach, that links the world of learning with the world of action through a reflective process within learning groups (McGill and Beaty, 1992). There is a growing recognition that an effective understanding of how learning happens must encompass a variety of pedagogical approaches to support the learning process (Freeman et al., 2014). Action learning happens in the complex real world – on farms, and in the entire agrifood system, where many actors and stakeholders are involved. Successful learning is thus often based on learning loops where skills and knowledge are transferred, developed and re-transferred between actors (Lieblein et al., 2012, Francis et al., 2013). With an action learning approach, we aim to discuss if there are potentials for learning loops, with farmers and advisors as key actors, which can lead the way towards more sustainable agrifood practices.

Methods

To answer our research questions we followed a qualitative approach. Focus groups, semi-structured interviews, and observational research were used to ensure triangulation. This combination of different data collection methods permits the complementarity of conclusions and enhances the trustworthiness of the results (Morgan and Spanish, 1984; Morse, 2003). At the first stage, a series of three focus groups was conducted during fall 2018. Participants in the first focus group were four table-grape producers, the second focus group consisted of 18 agronomists who offer advisory work to farmers, and in the last focus group participated five agronomy students. A focus group guide was used as an agenda for data collection. Since one of our aims was to compare the groups, we used some common questions in all three cases (Morrison-Beedy et al., 2001). The collected data were analyzed thematically (Braun and Clarke, 2006). Data extracted from focus groups' discussions were collated into codes, and then these codes were combined to produce meaningful themes.

Moreover, the methodology of action learning was employed to create groups of heterogeneous actors (learning sets) who engage in collective, discovery-based learning activities, so as to collaboratively construct new knowledge. In total, two different learning sets were formed: one focused on livestock farming, and a second centered on viticulture. Each one of these groups consisted of a farmer, a student of agronomy, an academic, an agronomist/advisor with work experience in the field, and an observer with expertise in knowledge co-production processes.

Through a process of discovering problems, proposing and implementing solutions, and reflecting on the procedure of identifying-solving problems, each learning set intended to develop a common understanding of the ways farming is practiced as well as to discover different meanings of farming and agricultural sustainability. This way, within the framework of the learning set, each participant helps others to make sense of their experience (Revans, 1982; Mumford, 1996) while the dialogue and the reflection process leads to a redefinition of the concept of farming. In parallel, the identification of a problem can lead to the questioning of some old perceptions, to the redefinition of aims, and, finally to the reconstruction of agricultural knowledge (Revans, 2017).

After the formation of the learning sets, a series of meetings were organized. During these meetings the members of each team discussed on problems associated with farm practice, attempted to contextualize these problems, proposed and applied solutions in real settings, observed the outcomes of these solutions, and, finally, reflected on the process so as to clarify what the set has done and how members contributed to the knowledge co-production process. The observer collected data on the process, ensuring in parallel the democratic functioning of the set. After each meeting, all the participants completed a semi-structured questionnaire.

Both, observational data and qualitative data collected through these questionnaires were analyzed using the principles of thematic analysis. An iterative process was used during data analysis, to ensure that themes and explanations are valid. Hence, after each meeting, a preliminary analysis of the data was performed, and the results were used to inform the data collection process in the subsequent meetings of the learning set. Such a procedure of reflexive iteration (Srivastava and Hopwood, 2009), which is also common in other methods like interpretative phenomenological analysis (Smith et al., 1999) or autobiographical memories analysis (Charatsari, 2014), leads to the generation of new questions aimed at the clarification of some concepts and the search for identical themes (Lasch et al., 2010), thus permitting the comprehensive description of the issues under study (Polkinghorne, 2005). This way, the data analysis process followed a spiral path (Fig. 1), since each step of the analysis was used to inform subsequent steps.

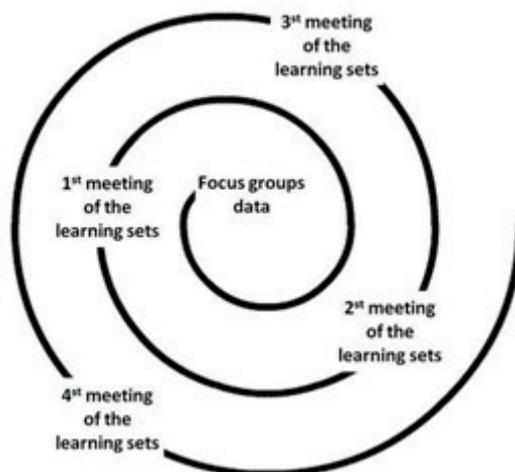


Figure 1 *The spiral path of data analysis process*

Farmers

Pursuing sustainability

Participants in the focus group noted that they face considerable problems due to climate change. The frequency of extreme weather events, along with the altered weather patterns which heavily affect yield potential and grapes quality, increased farmers' awareness of the issue of environmental sustainability. However, all the participants seem to emphasize the economic dimension of sustainability. This finding was also evident in the data collected the learning sets. The analysis indicated that the lack of appropriate knowledge supply schemes limits farmers' opportunities to better understand the complex relation between ecological and economic systems.

To cope with climate change, farmers are trying to adapt their strategies, without however having a clear orientation. Most of the times, they rely on their own intuition and

experimentation, while they learn and infer from successful or unsuccessful decisions. Both, the high cost and the limited efficacy of agrochemicals used, along with the fact that Greek legislation forbids the use of some pesticides, have led farmers to reconsider agrochemicals use. One of the table-grape producers noted that some years ago he began to apply biological treatment systems to control grape insects and fungi. As he explained, after four years of application, the control system was proven to be quite effective. Nevertheless, he continues to use standard phytosanitary treatments in combination with biocontrol strategies.

Other participants expressed mixed opinions about the potential of biological control of vineyards. For some of them, a major barrier in the implementation of such alternative strategies is the extremely high cost of biological control, whereas for others lack of know-how is the major constraint. In general, table-grape producers use a wide range of agrochemicals. Our data revealed that farmers' reliance on pesticides has a binary nature. On the one hand, it is an outcome of the vulnerability of vineyards to climate variability. On the other hand, this over-reliance on chemicals has some psychological precursors: using pesticides seems to be a "safer" decision, reducing the level of farmers' perceived production risk. The overall picture is that farmers feel trapped when it comes to coping with sustainability. They are well aware of the need to reduce pesticides, for both economic and environmental reasons, but most of them feel that they do not have much choice, due to the impact of the changing weather conditions. Climate change generates the need for more intensive use of agrochemicals, thus leading to climate-unfriendly behaviors.

In addition, an interesting finding – emerged from both the focus group data and the learning sets – was that farmers' willingness to reduce pesticide use is mainly guided by economic motives. Hence, although they understand that pesticides have serious effects on biodiversity and increase resistance in target pests, they believe that agrochemicals can secure the production levels of their farms. Environmental sustainability is placed on an equal footing only when it is associated with the economic performance of farms.

Knowledge networks and sustainability

An interesting finding is that farmers have a rather negative attitude towards education and training. Some of them mentioned that farming is learned in the field and not in the classroom. However, all the farmers stated that they participate in several informal networks through which they can access information and share knowledge with other farmers and agronomists. Social media communities – in which farmers and agronomists exchange experiences and information about product prices, plant diseases, subsidies, new policies, technologies, and other issues – serve as informal knowledge networks. Focus group participants stressed that the production of table grapes is a dynamic business, which generates the need for quick and flexible access to knowledge when new situations occur. Indeed, all farmers emphasized the importance of collaboration networks for both innovation and market access. Some of the participants have installed humidity and temperature sensors or systems predicting insect attacks, hence they see these networks as spaces facilitating innovation adoption. In addition, networking offers farmers opportunities for gaining market information and developing new marketing channels, so as to reduce their dependence on wholesalers who dominate the distribution chain, thus reducing profit margins for table grape producers.

Apart from their participation in digital networks, farmers noted that they collaborate with agronomists, with whom they have also developed social relationships. Neverthe-

less, they express a mixed attitude towards agronomic knowledge. The analysis revealed that farmers distinguish between empirical and scientific knowledge. The first type of knowledge refers to the levels of their practical understanding of farming. According to focus groups' participants, through their daily work as farmers, they have developed skills and competencies that have transformed them into experts on farming systems. As one of the participants commented: "We don't really need continuous assistance from agronomists. After all, nobody knows my farm as I do."

The second category of knowledge is related to the theoretical understanding scientists' have on the complex interrelations among farming systems components. Although some farmers noted that empirical knowledge is more important because it is by default adapted to the special context of each farm when a new problem emerges the need for scientific knowledge inputs is evident. Nonetheless, farmers are concerned about how difficult it is for them to get access to research results. To their opinion, scientific knowledge stays within the boundaries of academia, since there is a lack of knowledge bridges between academia and farmers.

Agronomists are used as advisors on issues related to new pests, fungi, and technological equipment. Nevertheless, the lack of public organizations in the Greek AKIS urges farmers to collaborate exclusively with private agronomists, who also sell agrochemicals or agricultural machinery. This dependence on private sector advisors often leads farmers to question the neutrality and the reliability of scientific knowledge. Some of the participants noted that during summer 2018 when the climate conditions led to an increase in pest attacks, agronomists consulted them to spray higher quantities of pesticides. The limited efficacy of this practice, along with the unwillingness of advisors to propose alternative pest control solutions, was interpreted by farmers as an attempt on the part of agronomists to sell more agrochemicals. The first learning sets also uncovered a feeling of mistrust between farmers and agronomists, which poses obstacles to the development of mutual and agreed goals and objectives. It seems a paradox, but the analysis suggested that although farmers prioritize their economic goals over environmental concerns, they believe that agronomists' overemphasis on economic gains is what impedes the transition towards sustainability

Advisors/agronomists

Sustainability: Is it really important?

For most of the advisors who participated in the focus group, the issue of sustainability was found to be associated with the overuse of agrochemicals. The new legislation, which forbids the use of certain pesticides, urged Greek agronomists to reconsider the feasibility of some well-established farm management practices. Nevertheless, their focus is on the economic aspect of agricultural sustainability, whereas the environmental and social dimensions of sustainable farming systems attract limited attention. According to the analysis, the main concern of agronomists is the economic viability of farm enterprises. Consequently, they care more about the maintenance of agricultural production at a high level than on the conservation of natural resources.

However, advisors seem to attribute a different meaning to the concept of sustainability. Observational data further supported this argument, indicating that each agronomist emphasizes on different aspects of sustainable farm production. Terms like animal welfare, water conservation, soil fertility or gas emissions were mentioned during the learning sets by agronomists, but without being combined into a common concept. As the analysis indicated, this is an outcome of their different educational backgrounds. Even

agronomists who graduated from the same university have different specializations, depending on the discipline they chose to study. Agricultural universities in Greece offer two years of introductory education in which students take general courses (such as mathematics, physics, and chemistry) and three years of specialized education, in which students are offered courses in only one of the following disciplines: horticulture and viticulture, plant protection, arable crops, hydraulics and soil science, animal production, food science and technology, and agricultural economics. Hence, graduates have the opportunity to reach a high specialization level in their discipline, but they lack general knowledge about farming systems. This can explain why agronomists look at the issue of sustainability through different lenses, as well as why they lack a holistic understanding of the issue.

Moreover, it is remarkable that some advisors seem to perceive sustainable agriculture as a collection of “alternative” farm production practices, which, oftentimes, are viewed as opposed to scientific developments and as outdated in a world where technology progresses rapidly. In general, most of the agronomists believe that new, smart farming technologies can lead to a more sustainable agriculture, although – again – the prominence is given to the maintenance of production and not to the potential environmental benefits of smart farming.

Sustainability and agronomic knowledge

Although all the surveyed agronomists noted that advisory work is one of their everyday tasks, information and knowledge supply is an extra service offered to farmers free of charge. Since there is a lack of public extension services and the Greek state does not financially support private advisors, consultants also sell chemical pesticides and/or technology in order to make a living. Farmers do not pay for the advisory work offered by agronomists, but only for the products that they buy. This has led to a situation where farmers think that advisors have a hidden agenda, to sell products.

Under such circumstances, the development of trust between farmers and advisors seems to be a high priority. One advisor highlighted the importance of building strong relations with farmers and making them understand that agronomists are trying to help and support them. This issue should also be addressed when an advisor collaborates with a farmer. As data from the learning sets indicated, mutual understanding is crucial for the development of trust between farmers and advisors. However, what impedes the development of such a mutual understanding is the different “knowledges” farmers and advisors possess. Both groups seem to perceive their “own” knowledge as superior. This feature is illustrated in the following comment, made by a focus group participant: “Farmers don’t ever admit that they can be wrong. In order to challenge this, we should develop a higher degree of trust.”

However, to effectively supply farmers with sustainability-related knowledge, agronomists should also develop some new, interpersonal skills. Nevertheless, as some advisors explained, the only way to build these new skills is through their experience. As they noted, agronomic education in Greece focuses almost exclusively on natural science issues, whereas the economic and social aspects of farming systems receive a limited share of attention. A participant noted that the course of “agricultural extension and education” is provided only to the students of the branch “Agricultural economy” of Aristotle University of Thessaloniki and Agricultural University of Athens, whereas other universities in the country do not include such courses into their curricula. In this course, students have the opportunity to learn the basic principles of effective communication, whereas they are also exposed to a way of thinking that endorses the need to develop strong bonds with the agricultural population. Nevertheless, even in

institutions offering extension/education courses, the focus continues to be on linear models of knowledge and innovation diffusion, thus revealing a dominance of a traditional, largely outdated way of thinking.

Students

Sustainability: An idealized concept or a necessity?

Contrary to the other two groups, agronomy students are more aware of the sustainability issue. The analysis of focus groups data revealed that participants had a more uniform view of sustainability than professional agronomists. According to their responses, the main goal of sustainability is the optimization of production, the reduction of resource depletion, and the cyclical management of the production process. Moreover, an important finding is that they attribute higher importance to the environmental dimension of sustainability. During the learning sets, sometimes it was observed that students proposed solutions having in mind the environmental impacts of agriculture. However, these solutions were not always judged as economically viable by the other members of the learning set. This observation indicates that students often perceive the economic dimensions of sustainability as contradictory to the aim of environmental conservation.

Our results also indicated that students believe that, while – as future agronomists – they have to play a crucial role in a shift from conventional to sustainable agriculture, the achievement of sustainability is a difficult task for the farmers, mainly because of their mindset and their low educational level. A key prerequisite for the implementation of sustainability in agriculture is the change in farmers' mindset concerning the reduction of inputs in their farm enterprises. To their opinion, a critical skill for any agronomist is to cultivate her/his ability to help farmers adopt a more holistic view of their enterprise, so as to change their mindsets.

Moreover, the transition to sustainable agriculture is viewed by students as a collective process. Some participants suggested the need to develop new, multi-actor collaboration schemes that operate beyond the agronomist-farmer dyad, so as to effectively promote sustainable agriculture. To their view, agricultural cooperatives, independent agronomists, farmers and the Greek Ministry of Rural Development and Food should collaborate closely to facilitate the transition to sustainable agriculture.

Building sustainability knowledge: Are books enough?

All the students were found to agree that they need to build knowledge on how to guide the transition process. The shift from conventional to sustainable agriculture is viewed as quite demanding and – as some focus groups participants noted – the support from more experienced actors (organizations and individuals as well) from other countries can help Greek farmers and agronomists overcome some of the major barriers they face during transition.

As, gradually, the higher education in Greece began to integrate active learning with traditional teaching techniques; students have the ability to participate in research projects conducted by their institute. Three out of five students that participated in the focus group were working in research projects: Argyris participated in a project concerning a new pest (insect) that attacks the crops of kiwi in the area of Katerini, Orestis worked in the laboratory investigating the population of a specific pest, and Thodoris was studying the development of resistance of *Tetranychus urticae* to pesticides. According to their responses, their active engagement in research projects helped them to improve their comprehensive skills, although no mention of the issue of sustainability

was made.

Argyris, working in the project, found a new enemy of kiwi that destroys the crops and his main concern was to inform farmers and farm communities in the region of Katerini and all over Greece about this insect. Nevertheless, universities are poorly connected with farming communities, thus reducing students' opportunities to interact with farmers and, consequently, to know their real needs. A major question for students was: "how can anyone convince a farmer to adopt sustainable farm management practices without knowing her/his real needs?" Data from the semi-structured interviews also revealed that learning through interacting with farmers is considered as more important when compared to traditional teaching methods. One of the students who participated in a learning set stated that this interaction offers the opportunity not only to test the veracity of scientific knowledge but also to develop interpersonal skills, necessary for facilitating the transition towards sustainability.

Students argue that the contribution of the Greek educational system to the development of sustainability-related skills is limited. The curricula offered by the higher education institutes – although knowledge-intensive – are not aimed at providing students with the skills necessary to effectively carry out the duties of an agronomist-advisor. So, they express the need for more specialized courses which will give them the knowledge and the skills to identify and solve farmers' real problems, as well as to effectively communicate with farmers. One of the students who spent a semester in The Netherlands within the framework of a European students' exchange project (Erasmus+) noted that action-based learning could help future agronomists cultivate a different mindset and develop a new variety of skills.

Discussion and conclusions

In this study, we pursued to understand the different meanings attributed to sustainability by Greek farmers, agronomists/advisors, and agronomy students. By combining different data, we also aimed at uncovering the processes through which these three groups construct sustainability-related knowledge. Our work indicated that, for Greek farmers and agronomists/advisors, the interest on sustainability emerged as a result of the observation that conventional farm practices cannot ensure the viability of farm enterprises. The analysis revealed that farmers express serious concerns about the future of farm production in Greece. The climate change has serious implications for the productive capacity of farms and generates the need to effectively manage new plant diseases. Although the findings showed that there is a consensus among farmers on the need to reduce agrochemicals use, conventional styles of plant protection continue to be the common practice. The lack of effective alternatives, the high vulnerability of some crops, and producers' psychological reliance on chemical pesticides contribute to the maintenance of a conventional logic of farm management.

Interestingly, most farmers agree that transition to sustainability is heavily dependent on agronomic science, but there is a considerable speculation about both the competencies and the intentions of agronomists and advisors. Such a lack of trust was also evident in the results from the advisors focus group. This shortage of confidence is the outcome of the different "knowledges" farmers and advisors possess and the different viewpoints they adopt. Ingram et al. (2010) argue that the work contexts of farmers and scientists shape their understandings on and meanings they attribute to different components of farming systems. However, as observational data from the learning sets revealed, when these knowledges are combined new meanings can emerge. This integration of different types of knowledge can facilitate the understanding of both the complex issues that characterize sustainability (Folke et al., 2005; Kelman et al., 2012)

and the roles occupied by different actors in sustainability transition (Pahl-Wostl et al., 2008).

According to critical theories of learning, different “languages” and lack of trust between actors are a major threat to the development of new knowledge and skills. It is interesting to note that while farmers have a critical attitude towards formal education, they are very active in exchanging knowledge with other actors by using digital media. In these online social communities, the interaction between farmers and advisors is more open, providing opportunities for knowledge cross-fertilization. Therefore, online communities serve as mechanisms for single- and double-loop learning (Argyris, 1976), helping farmers to question whether they can improve their practices or whether they should change practices and ways of thinking, respectively (Hayes and Allinson, 1988). Nevertheless, differences in “languages” and “knowledges” still remain, as could be seen in actors’ understanding of sustainability. As the findings revealed, agronomists and farmers associate sustainable agriculture mainly with the issue of economic viability, underemphasizing the environmental dimension of sustainability and paying limited attention to the social aspects of sustainable agrifood systems. On the contrary, students underline the link between sustainability and the environment, without however paying special attention to the overlap between the three dimensions of sustainability. Data derived from both students and advisors suggest that a possible source of this stance is the prominence given by agronomic education to technical issues and the lack of focus on interpersonal, communication, and guidance skills. Indeed, some recent studies suggest that agronomic education in Greece is not oriented towards supplying students with such skills, whereas it puts limited emphasis on sustainability issues (Charatsari et al., 2018; Charatsari and Lioutas, 2019).

In sum, our findings indicate that in the Greek AKIS sustainability has diverged meanings for different actors. To come out of this Babel-like situation, more efforts are needed in the direction of cultivating trust among stakeholders, by creating effective learning loops between scientists, farmers, and students, and by supplying current and future agronomists with soft skills to facilitate the transition towards sustainable agriculture.

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Awakening senses and sensitivity to make sense in learning approaches of agricultural sustainability

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Sensorial perceptions, experience, agro-ecology, eco-education, outdoor education, poetry

Abstract

In this paper, we explore the awakening potentialities of original open-ended creative approaches built on sensitive experiences for teaching and learning agro-ecology. A two years experiment (2016-2018) on an INRA's experimental farm station was conducted in France with students and farmers. During visits, we designed and tested original multi-modal inquiry tools: mime, landscape drawing, land art and poetry. We found that it encouraged curiosity, and enabled to overcome and transform some operative and epistemic predicates that support conventional agricultural practices. Sensorial perceptions expression supported by aesthetic tools favoured genuine experience and emotion sharing. This study opens new perspectives for the design for agricultural field trips and more generally for the (re)-design of sustainable agricultural systems, through the development of a "linked" pedagogy, outdoor, sensitive, and creative with a greater consideration of intuitive and emotional reasoning.

Introduction

For many scholars, the agro-ecological transition (AET) had become critical to face current and future multilevel challenges in the agri-food systems (Gliessman 2014; Wezel et al. 2009) in order to achieve a sustainable co-evolution of socio-ecosystems. The AET requires to transform not only farmers' agricultural practices but also the types of knowledge, reasoning, norms, and values within the AKIS (Agricultural Knowledge and Innovation System) (Coquil et al., 2018a). One major obstacle to change lies in a long time trend to separate and reduce life medium to an inanimate exteriority, rational, controllable. The Western scientific tradition, rooted in Cartesianism, has repressed all kind of sensible relationships with nature, whether sensorial and corporeal, or affective and emotional, to reach objectivity. Sensitive knowledge has been disqualified and made invisible in agricultural curricula and trainings. Farmers had become largely dispossessed from their decision-making autonomy, with externalised technico-economic diagnosis and ready-made solutions produced by the AKIS.

But in agro-ecology, management must be as adapted as possible to the local environment and thus impose deep-learnings to restore relationships to the living and its dynamics. Agroecological knowledge and know-how are situated, experiential and sensitive. They are incorporated, built over time, and relied on perceptual skills developed on contact with nature, paying attention to the seasons, flows, sounds, colours... Such

singular, often tacit and informal knowledge challenge both knowledge production and transmission processes.

In the broad field of environmental education (EE), ecopedagogies form a recent educational shift towards greater connection with nature. They call to take a post-humanist perspective on education, inspired by the ecocentric philosophy (Molina-Motos, 2019) that expressed the need to move away from an human-centred worldview and establish a Earth-centered relationship with the planet. Recent applications of EE could be found in the pedagogy for connection promoting place-based education in real life settings (Barrable 2019). However, such approaches had been hardly investigated theoretically and empirically and in adult education in particular regarding agriculture apart from Moneyron (2018) through the concept of “ecoformation”.

In this paper, we explore how a sensitive education could be initiate in agricultural initial and vocational trainings to sustain the agroecological transition. We report findings from a 2.5 years social experiment on an INRA organic experimental farm station (Est France) with farmers and students. We first expose the practical design of learning modalities to awake and share sensorial perceptions and foster reflexivity to question frames of references rooted in conventional farming systems. Then we describe the course of the experiment, and discuss what were the learnings and resistances, both for learners and teachers/facilitators.

Material and methods

Context and objectives of the experiment

Our study took place within the experimental farm station of Mirecourt, in the Vosges region in eastern France. Since 2006 and for twelve years, the practitioners of the station experienced a the step-by-step design of autonomous mixed crops dairy systems on 240 ha certified in organic farming (Coquil et al., 2014). Since 2016, the experiment has evolved into a living lab in order to contribute to a sustainable local agro-food system and to increase the added value for the creation of lasting employment (Coquil et al., 2018b). A diversification process has been tried for both animal (sheep, pigs) and vegetal productions (vegetables, oil and legume crops).

Between 2016 and 2019, we conducted a social experiment to sustain the agroecological transition of the region by sharing knowledge, know-how and experiences and transform it into actionable knowledge (Anglade et al.2018). The 15 practitioners of the experimental station were involved, and more than 1200 participants from the agricultural sector (27% farmers, 57% students in technical and higher education in agriculture, 16% from technical and research institutes) over 60 days (Anglade et al., 2018). We designed and facilitated a participative learner-centered framework that stands in three phases, immersion, transmission, appropriation, repeated iteratively in different situations rooted in the farm reality. It supports a complex meaning making process, all day long (generally from 9 a.m. to 5 p.m.). The main objectives were: (i) to induce disruptive learning and question frames of references and values; (ii) to favour autonomous thinking and promote self-actualization; (iii) to facilitate the circulation of tacit agroecological experiential knowledge, (iv) to give inspiration for the (re)-design of sustainable agricultural systems.

Training program

We focus here on a 4-days field trip designed in September 2018 for students of an engineering agronomy schools “ISARA” in their 5th year (fig.1). 5 farmers joined the 25 students and 2 teachers to follow the program. The first ½ day on the INRA station was

Quiet immersion as a critical starting point

The first step of quiet immersion emerged in response to a frequent observation that students didn't really pay attention to their surroundings during farm visits. Despite their substantial bookish knowledge, they were enabled to name the life medium apart from wheat and rape crops. We attribute this attitude to a poor experience of diversity in farms and a lack of outdoors and practical activities that nearly disappeared from agricultural curricula, especially in higher levels. We think that is also the consequence of a "ready-to-think" culture of knowledge transfer.

Facing silence was challenging and troublesome. It's take stock of what everyone knows or ignores. It compelled to become aware of its own observation habits (or lack of habits). The students were initially dispelled and confused. The main difficulty for us as facilitators was to face a dominant wait-and-see attitude, urging us to tell them what was there and what should be known about it. To encourage and support the process, we had to learn to distance from explanations and tried to keep quiet. We showed an attentive attitude, striding the field to explore every corner, scratching and kneading the earth, kneeling to pick a plant and extract the roots ... And timidly, by imitation, nearly everyone got involved into this approach despite many hesitations. We observed that from sites to sites, the participants were more and more actively and finely noticing. Their curiosity and eager for learning increased.

Sharing sensorial perceptions through collaborative art-based activities

The art activities proposed to extend and give meaning to the immersion phase had significantly helped the participants to pay more attention to their surroundings by triggering hyper-aesthetic outlooks. The different sessions brought into play several exchanges with the environment that constantly stimulates the students' curiosity and their desire to learn and to express themselves. In Table 1 we reported the main observations of student's attitude and skills for each modality.

Compositions: discovering nature diversity

The composition activity has greatly improved the students' perception of biodiversity. The collection of a considerable variety of materials (straw, roots, flowers, grains, fruits etc.) boosted the desire to explore the site by sight and touch. It considerably enriched the visions by breaking out of the first print of a homogeneous field of cash

| TOOLS | Student's attitudes | Lessons and learnings |
|--------------|---|---|
| IMMERSION | <ul style="list-style-type: none"> - Wait and see - Uncomfortable - Teacher imitation | <ul style="list-style-type: none"> - Active and passive senses engage in inquiry |
| COMPOSITIONS | <ul style="list-style-type: none"> - Exploration and curiosity - Excitation - Collaboration | <ul style="list-style-type: none"> - Discover (bio)diversity - Overcome the fear of the unknown - Rejuvenate sense of wonder |
| MIMES | <ul style="list-style-type: none"> - Interactivity - Fun - Watchful attention | <ul style="list-style-type: none"> - Enter into the living dynamics - Post-humanist perspective (decentration) |
| DRAWING | <ul style="list-style-type: none"> - Zoom in and out - Dialogue and debates - Imagination | <ul style="list-style-type: none"> - Perceive the global picture - Share different visions |
| POEMS | <ul style="list-style-type: none"> - Emotions - Creativity - Calm, silence - Well-being | <ul style="list-style-type: none"> - Value intuitive reasoning - Share values and emotions |

Figure 2 Students' attitudes and learnings using multi-modal tools to share perceptions

crops.

“ It’s funny, because it looks hyper abundant gathering everything like that. Whereas when you look at the landscape, just like that ..., you don’t realize at all.”

Composing with material also allowed to not focus on mental pictures and categories, and to get acquainted with unfamiliar elements. One could pick and add everything to the composition even without being able to name it.

The student engaged with excitement in a treasure hunt to find nature. It was both a moment of astonishment and enchantment with place. Nature was not only offered to the gaze but also more discretely to the hearts of lovers, with bouquets of flowers carefully chosen amidst dandelions, poppies, cardamine, crimson clover ... The world “beauty” was very often pronounced. There was a search for coherence and harmony in the compositions. This session contributed to rejuvenate a sense of wonder, which has been identified as determinant by ecocentric education scholars (Barrable, 2019; Washington, 2018) to develop care and respect for natural world and find a sustainable future.

Mime: Entering into the living dynamics

The activity of performing mime also eased careful observation, curiosity and engagement. Participants couldn’t stay passive; they were called to step out from a watcher exteriority and to get on stage within the theatre of living beings. Being mute unlocked movements whereas language and drawing tended to freeze the observations. The bodies interplayed, came and went through the grasslands, and made use of the natural setting. They were showcasing dynamics and interactions between animals and their environment including relationships with humans.

In this way, mime was also a way to take a post-humanist perspective, by decentring from the only human point of view and recovering empathy with all the living. Within an “eco-anthropology” line, mime operated a radical inversion to capture symmetrically the “native” perspective, that of non-humans. We observed that the students’ first action was to squat down, at ground level. They found themselves in the midst of rather than on top of. They performed gestures and postures which were those of animals, snorting, smelling the perfume of fresh grass, grazing, bouncing, sleeping etc. they expressed some emotions and feelings they guessed, like docility, well-being, curiosity. They didn’t only slip into animal’s intentions, but they also tried to animate any tangible form that met their gaze, as potentially other experiencing subject, sensitive and responsive to their surroundings. They were a maternal nurse or a hungry calve. They were a rock, a bush, a leaf in the wind, a wet moss carpet, a graminaceous or a legume. They were the river, or a water container. They were a fence, a door, a path ... They were both human and non-human at the same time within a hybrid society. For a few minutes, on this living theatre, borders were evaporating between objects and subjects.

Drawing: Varying focal lengths and perspectives taking

Drawing was a powerful tool to acquire a greater comprehensive view of the farming system, literally put into perspectives. Making a picture entailed selecting a setting, choosing a focal, zooming in and out, making clear a point of view.

The panoramic sight was useful to widen the views beyond the parcel boundaries and increase contextualisation at the landscape scale. Each picture was singular, mixing fine details about farming conditions and practices (i.e. soil types, sowing, mowing, refusal areas ...) observed at parcel scale, with structural scenery features (i.e., parcels’ dispersion, vicinity of urban and natural lands). Variations and contrasts were caught

through an infinity of symbols, shapes and colours. For example, different shades of green were used to represent either natural or synthetically fertilized grasslands.

Drawing a collective picture operated as an efficient preparation to dialogue and perspective taking. It created an environment in which stories can be told, the past relived and the future imagined. Through their pencils marks, students shared views and tried to build collectively a coherent picture. They composed narratives and engaged in lively discussions about agricultural models. Salient features, like the size of a huge methanation plant in the neighbour's field, crystallize debates.

The different drawings revealed a plurality of representations of the same scene, which motivated the participants to listen actively and to question other choices and make a case of their own. Confronting the visions favoured decentring, and allowed to found similarities, point out contradictions, and discover overlooked things. The drawings served as useful medium to share experiential knowledge, successes and difficulties and to collectively look ahead for sources of improvement, in coherence with each own situations, systems and values.

Poetry: animating the world and connecting emotional resonances

The final restitution showed that poetry was another relevant way to animate nature subjects. All the poems told the story of an encounter with water, air, soil, flora and fauna. Beyond the poetic license, animist turns of phrase sounded like if poetry activated a connected way of thinking. It offered of a more open, intimate, intuitive, non-logical style of encounter with the world, which has already been identified as valuable in EE (Bonnett, 2007). Unlike with the schematic restitutions, the students were not speaking of nature, but as nature. Verbs were conjugated in present time to depict a living world. "Verdant, worked land, vibrant. The ground breathes, she replenishes. Faba, aot, lens are dancing in farandole. Daisy looks at the seasons go by ...".

Writing and reading poems times were greatly appreciated by the participants for whom it was "a pleasant and needed moment of breathing". Like Proust's madeleine, sensuous grips triggered memories supporting an incarnate and intimate meaning making process. Those strong emotional resonances, inside echoes, brought forth the wonder of our natural world. It reenchanting the farm by opening a world of allegories and associations of ideas, drawing new links, condensing, displacing. Poems relying on intuitive and affective reasoning's added a cognitive value to the schematic portraits focused on functional traits. By leaving room to subjectivities, the poems revealed a great diversity of inner understandings of the agricultural systems. Poetic restitutions led to an overall move of participant's questionings, from techno-economical to social change concerns and environmental caring. "How to move from money to happy?" said one group as his last big question

Discussion: (Re)-educating the gaze for agroecological learnings

In this social experiment, we proposed a promising way to teach and learn agro-ecology relying on the development of sensitivity skills. We assume that to re-educate the gaze within ecological farming systems, we shouldn't place the emphasis on external diagnosis, explanations and demonstrations, but we should rather focus on learning how to become an attentive observer. That means a turn from "ex-powerment" to "empowerment" in order to adjust and adapt continually action within a living landscape. How to remain fully alert in a state of mindfulness? How to listen the "spell of the sensuous"? to quote the ecologist and philosopher D. Abram. We agree with the statement of Masschelein (2010), that education of attention does not require a rich method but a « poor pedagogy ». But we would rather speak of a "slow pedagogy", in echoes to the

slow food campaign for alternative consumption choices. We learnt to teach less to accompanied a more open-ended experience. Silent immersive sessions were conducive to it.

The outdoor setting, the “significance of being in place” (Bonnett 2013) was an essential component of the learning framework. We showed that going back to the primate of perception in the Merleau-Ponty phenomenologists’ sense, to ante-predicative feelings, was a driving force to engage the visitors in a full inquiry process, in order to question themselves, others and the world. Our main role was to facilitate an intersubjective and hyper-dialectic process that never clot into one interpretation, to transform frames of references.

This deep learning process took time, more time than a simple knowledge transfer. From a classical 2 hours’ farm tour, we extended the field trip to a 4-days training program. According to us, slowing down the teaching process to increase autonomous thinking and learn mindfully also lay in the desaturation of the transmission process. We chose to introduce much less technical information than before, and only when it was motivated by a question. It greatly favoured curiosity to learn more about agroecological farming systems. Despite it was uncommon and quite uncomfortable, this approach was finally very much appreciated.

“It feels good to take the time to waste the time! That reminds me why I love this work.” said one farmer lying in the meadow.

Keen attention to colours, shapes, sounds, odours, textures, allowed to reconnect with emotions and feelings. It was assisted by the artistic tools that support diverse forms of thoughts and ways of understanding and interacting with the world. It facilitated the participation and expression of all (including women) leading to genuine experience sharing and perspective taking in new dialogic spaces. The artworks revealed a variety of signs and criteria regarding animals, crops, material and natural resources, etc., that attracted attention of the participant depending on their preferences, experiences and sensitivity. It played on a process of decentring/centring which is known as a key process of complex learnings in cooperative pedagogies, notably through the notion of socio-cognitive conflicts (Doise et al., 1975).

Conclusion

This experiment brought new ideas for the design of farm visits and field trips considering further the place in itself and bodies as fundamental actor for agroecological learning. It might be applied in commercial farms, but also in high school and vocational agricultural farms.

For experimental station, it could be an opportunity to reinvent themselves as “wonder hubs” for inspiring future agricultural practices, mixing distal and proximal thoughts, critical thinking and feelings, science and arts. But it would require to take a step away from mechanical, impersonal, objective views, to re-enchanted places with living narratives. It would imply to make great strides toward the reintroduction of the knowing subject in the object of knowledge and efforts to re-establish legitimacy of experiential knowledge.

In the end, we call for the development of a “linked” pedagogy, outdoor, sensorial, and creative with a greater consideration of intuitive reasoning, for the (re)-design of sustainable agricultural systems.

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Varieties of advice provision in mutable practices: biological pest control and direct selling in Latvia

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Retro-innovation, peer-to-peer learning, advisory services, marketing, pest control, AGRILINK

Abstract

The purpose of this paper is to understand the different demands that biological pest control and direct selling place on advisory services, and the conditions that ensure the resilience of these practices in Latvia. The analysis is based on semi-structured interviews with farmers and experts carried out as part of the Horizon 2020 project Agrilink. The analysis indicates that formal instruction and informal learning co-exist side by side in the case of biological pest control. The example of direct selling, on the other hand, shows that, while formal advisory organisations are engaged, the skills necessary for distribution and sales are primarily acquired through practice and consultation with peers. Crucially, while the case studies inhabit different advisory landscapes, both illustrate the importance of peer-to-peer and informal learning that supplements, and occasionally compensates for the lack of, assistance from formal advisory organisations. Furthermore, despite the fact that they each have their own knowledge and advisory needs, both direct selling and biological pest control broadly correspond to the notion of retro-innovation and exist in a perpetual state of development. Overall, this paper makes the case that a deeper appreciation of the conditions in which particular practices operate would provide a more solid basis for interventions that aim to encourage their widespread adoption and contribute to the sustainability of agriculture in Europe.

The first section of this paper introduces the concept of retro-innovation and the attendant advisory challenges. The second section describes the methodology employed for collecting the data, while the third section provides an overview of the empirical material. The fourth section provides an analysis of the main findings.

The processual dynamics of retro-innovation

Literature on innovation in agriculture suggests that various forms of knowledge are involved in the development of novel practices that can contribute to the sustainability of agriculture (Leeuwis, 2004; Clavel, 2014). That is to say, in addition to scientific knowledge provided by traditional knowledge institutions and organisations within the Agricultural knowledge and innovation system and Farm advisory system (AKIS/FAS), farmers may draw upon alternative sources to develop new approaches to growing food and practising agriculture more generally, and applying these on their farm. Of particular interest to this paper is the increasing trend towards the use, and contemporary reinterpretation of, practices and forms of knowledge that were previously discarded or

forgotten. This shift is often perceived as a result of growing discontent with current production and growing practices, and their environmental impact. In order to better conceptualise this phenomenon, the notion of retro-innovations has been put forward to refer to practices that recombine old and new knowledge.

Retro-innovation is about developing knowledge and expertise that combines elements and practices from the past (read; from before the dominance of the modern regime) and the present and configures these elements for new and future purposes.

(Stuiver, 2006: 150)

While retro-innovations are often discussed in relation to the potential for regime changes vis-a-vis food production, the article by Stuiver (2006) also notes the attendant epistemological nuances of experimenting with new/old practices in a real-life farming environment. Specifically, Stuiver argues that the knowledge involved in experimental practices is often contextual and, therefore, local. An awareness of these local nuances is essential to gaining a complete understanding of the innovation in question (see also Carayannis et al., 2012). The reason for this is that much of the knowledge necessary to implement and adopt an innovation may not be readily available elsewhere and may need to be developed and/or adapted 'on the spot' with close co-operation between farmers, agricultural advisers and other actors.

This claim is consistent with the overall need for contextual sensitivity noted in the literature on innovation and technology transfer. According to Clavel (2014), research has produced considerable knowledge regarding the restoration and improvement of the integrity of ecosystems. However, converting the results into practice has often been hampered by human and social factors, which were inadequately appreciated. In general, these failures have been the result of a limited understanding of local abilities to accommodate sustainable innovations, a difference in the way different stakeholders see the issues to be dealt with, and a lack of policies conducive to sustainable innovation. Consequently, it could be argued that sustainable agricultural innovations typically require complex solutions that are carefully adapted to, and supportive of, local agro-ecological and social conditions. Transporting such contextually specific innovations to different contexts will almost invariably have to be complemented by their redesign, requiring new relationships to be established that facilitate learning, negotiation and implementation (Bocher and Krott, 2016; Carayannis et al., 2012).

This brings us to the claim put forward in the introduction – innovations are often best seen as continuous developments. Indeed, while previously the conception of innovation was based on a linear model (i.e. transfer from scientists to users [Guerin, 1999]), more recently it has evolved towards a notion of process (Clavel, 2014). As a process, it encompasses different factors, which affect the application of knowledge in novel and unexpected ways. Approaching the innovation process in this way helps us to understand that, in addition to novel technological artefacts and procedures, innovation depends upon and requires that human practices and social relationships be altered to create conditions conducive for such practices to happen and evolve.

Building networks for wider uptake

Farmers choose to adopt and reinterpret an innovation based on a variety of different factors. In general, it seems plausible that farmers adopt a particular practice or technology if it is well-suited to their socioeconomic circumstances, the location of the farm and the particular crop variety that they grow, or animal they work with. However,

in addition to these objective characteristics, a successful innovation is often the result of networking and interactive learning between heterogeneous agents (Nutley et al., 2002), and the involvement of AKIS/FAS organisations.

The role of scientists and researchers is important, especially in relation to retro-innovation. Stuiver (2006) has suggested that scientists can support different types of old and forgotten knowledge and expertise, and clarify their relevance for the retro-innovation in question. An additional responsibility is the identification of particular farmers who could affect change and cooperation with them, though this could be done in collaboration with FAS/extension organisations. Indeed, Leeuwis (2004) has argued that extension organisations should aspire to manage communication in processes that are somehow aimed to bring about new patterns of coordination with the aim of network building, learning and negotiation. This final point underlines the importance of actively engaging farmers in the innovation process. In other words, if the innovation is only perceived as technical in nature and external to the stakeholders, a self-sustaining process of innovation is difficult to trigger.

On the whole, it appears that analyses of retro-innovation call for a contextually sensitive approach to existing practices. AKIS/FAS organisations should be involved in different capacities as providers of knowledge, as facilitators and network builders, though the engagement of local farmers is also critical.

In what follows we wish to look at how this plays out in the Latvian context, especially in relation to biological pest control (BPC) and direct selling (DS), which both involve elements of retro-innovation, though each manifests a slightly different ecosystem as regards the flow of knowledge.

Empirical materials: methodology and sampling

The empirical material for this paper consists of 70 semi-structured interviews with Latvian farmers in the Vidzeme and Pierīga NUTS 3 regions conducted between August 2018 and February 2019. 40 interviews were with farmers who practise BPC, and 30 with farmers who practise DS. In addition, 10 interviews with experts were conducted to supplement the interviews with farmers.

The reason for our selecting Vidzeme for a closer study of BPC is related to the prominence of organic farming in this region. Vidzeme is a predominantly agrarian region of Latvia with a high number of organic holdings. Furthermore, organic farming has also recently become more prominent in Vidzeme, judging by the steady growth of the number of organic farms (an increase of 18.9% between 2013 and 2016 [Central Statistical Bureau 2019a]). In addition, while the total number of organic holdings is higher in another statistical region (Latgale), Vidzeme has the highest share of organic farms (7.47%, national average – 5.25%) (Central Statistical Bureau 2019a; 2019b).

The Pierīga region was chosen for DS as it is a predominantly urban region located near the capital city of Latvia (Riga), which gives farmers access to customers with higher purchasing power. It has a good infrastructure and, consequently, access to both the capital and many regional market towns (e.g. Tukums). This has enabled many farmers to continue and start practising DS.

When selecting farmers to interview, we combined various sampling strategies. In the case of BPC, some contacts were provided by local advisors, while others were suggested by the respondents themselves. Care was taken to avoid interviewing a single group of friends or colleagues who obtain advice from one another or the same sources. This is evidenced by the geographical spread of our interviewees – clusters in different parts of Vidzeme. Nonetheless, the sample is not random, which limits the extent to which findings can and should be generalised.

In the case of DS, we also combined several strategies, though snowball sampling

was more prominent. We approached several farmers who sell their produce at several markets in the Riga and Pierīga regions and hail from the Pierīga region. We obtained contact information from the people responsible for the markets. Additional contacts were suggested by the farmers we interviewed.

Overall, this means that our sample is not random and, therefore, has limitations. Our findings cannot claim to be representative of the complexities attendant to implementing BPC methods and DS techniques. Nonetheless, cross-comparison between interviews in the case of both innovations suggests that we have managed to identify several issues that are of common relevance to many farmers. Consequently, while not exhaustive, our findings are indicative of common issues, experiences and obstacles that affect farmers who are engaged with the innovation in question.

Advice provision, learning and implementation of BPC and DS in Latvia

The two innovation areas we have chosen illustrate different forms of interaction with FAS/AKIS, though both are prominent examples of retro-innovation in the sense that old knowledge that has been accumulated over generations is combined with contemporary solutions.

The case of biological pest control

Latvian agriculture has witnessed a notable expansion of integrated and organic farming over the last two decades. These developments, largely induced by growing consumer demand of organic food and increasing EU and state support for organic farming, have gradually reinvigorated farmers' interest in, and use of, BPC methods on their farms. While there are several agents and organisations that provide advice regarding innovations in this domain, there is a growing need for relevant expertise among researchers and advisors that could assist farms in adapting their farming practices based on the principles of BPC. Both the farmers and the experts we interviewed referenced the fact that people in Latvia with small allotments have used BPC methods for a long time, and regularly seek advice from different institutions (e.g. State Plant Protection Centre). Consequently, BPC is becoming a more prominent topic for AKIS organisations in Latvia. It was further indicated that the significance of BPC is steadily growing as a result of more interest and the greater restrictions placed on the use of pesticides. However, there are different forms of BPC that indicate considerable internal heterogeneity.

Prevalence and awareness

On the whole, our research shows that there are both philosophical and commercial interests involved in the recent choices to return to organic farming and use BPC. Some farmers continue to use or introduce BPC methods due to the belief that these are better for the environment and provide products that are better for people's health, as they are perceived to be more natural. Nonetheless, there are also farmers who are either partially or fully persuaded to transition to organic farming out of commercial considerations (e.g. subsidies). It should be noted that all farms in our sample benefited from agricultural subsidies to some extent, though only a minority were heavily reliant upon them.

The variety of BPC methods we encountered in our interviews was considerable, and most adopters used several methods in conjunction. Most of these methods involve a specific use of plant products or strategic use of insects who were natural enemies of specific pests, while others simply rely on the willingness of the farmer to tend to her plants and trees. Crucially, the majority of the methods employed by the adopters in our

sample did not require financial investment, but they were labour- and knowledge-intensive. Some, however, involved the acquisition of commercial products (e.g. trichodermin) from specific input suppliers.

Unsurprisingly, therefore, not all respondents had the same understanding of BPC. Specifically, there were farmers who indicated that they do not use any biological methods or techniques because they assumed that these involved using products purchased from input suppliers. Others had a broader understanding of biological plant protection methods and also included an intentional use of insects, attraction of birds to reduce the impact of particular pests, and other soil management techniques. In short, there is a possibility that some farmers fail to recognise some of their practices as forms of BPC. Moreover, several of our respondents who claimed that they were organic farmers indicated that they do not use BPC methods. This was one of the more surprising findings, corroborated by our interviews with the experts - many farmers do not use specific pest control methods, relying on the ability of ecosystems to take care of themselves. This diversity of opinion regarding what counted as BPC was also reflected in different assessments of the impact of these methods. While it was generally noted that BPC methods had a beneficial or very beneficial impact on the quality of products, the environment and the well-being of workers, enthusiasm for their impact on competitiveness was muted. However, this includes two somewhat contradictory sentiments that were expressed by our respondents. On the one hand, it was indicated that biological methods lead to lower yields and are more expensive. On the other hand, some respondents indicated that they chose biological methods because they were cheaper. This can, potentially, be the result of a different understanding of what constitutes a biological method. For some, it was a creative (and often traditional) use of natural resources to combat pests, while others saw biological methods as the use of commercial products that were suitable for use on organic farms.

Many of the farmers in our sample had become aware of BPC methods when they were children or when they attended educational courses, though the channels were incredibly varied. Some farmers referred to general courses on organic farming, while others indicated that these were courses organised by specific institutions (e.g. Latvian Rural Advisory and Training Centre [LRATC], Latvia University of Life Sciences and Technologies, and Rural Support Service). Nonetheless, many of our respondents mentioned different ways of finding out about BPC – trips abroad, cooperatives, visits by farmers from Germany (in the 1990s), organic farming associations, farmers' organisations and input suppliers. A significant observation in the case of older farmers was that their awareness about the specifics of BPC came from peers, informal interest groups or semi-formal institutional arrangements, rather than a specific advisory institution.

Overall, BPC was seldom perceived as an innovation. In the case of farmers whose parents or grandparents had farming experience, knowledge of, and appreciation for, BPC had been passed on informally and experientially. These were often practices that had been in use for several generations, and hardly innovative. Even among farmers who had discovered BPC more recently, these methods were associated with folk wisdom, rather than modernity. However, despite the long-term familiarity observed in our interviews, we noted that farmers routinely expanded their horizons and endeavoured to learn new things.

Learning about biological pest control

Various agents consult and advise farmers as regards BPC methods. The range of actors identified by our respondents includes traditional advisory organisations, universities, informal groups or thematic associations, neighbours, relatives, public institutions, NGOs, cooperatives and input suppliers. Crucially, however, the majority of the

agents are advice providers without a specific advisory function. Thus, there is a robust network of semi-formalised knowledge exchange that is crucial for the continued resilience of BPC.

Nonetheless, traditional advisory organisations still play a role. The implementation stage in particular shows a pronounced preference for formal advisory organisations, though less than half of all respondents had received assistance from an advisor. The most prominent organisation was LRATC, which was mentioned by 28% of respondents. A few independent advisors were also mentioned. Furthermore, despite the diversity of advisors engaged in relation to BPC, the majority of the farmers we interviewed indicated that they had approached LRATC regarding general farm management issues, and advice was provided during face-to-face meetings or conversations on the phone, though several respondents noted that they had attended courses on organic farming or the management of organic farms.

Somewhat surprisingly, the Association of Latvian Organic Agriculture was only mentioned by two interviewees, though several references to other farmers indicate that other members of the organisation are being consulted on a regular basis.

We also observed that farmers did not always identify a particular institution but a specific adviser at the institution or one of its regional branches. This often complicated the distinction between individuals and the institution for which the person worked. In some cases, this may be due to the personal relationships that exist between farmers and advisors, though this may be because many of the advisors identified by name were simply regional representatives of LRATC and, most likely, chosen due to their proximity and availability.

An important observation is that family members and peers play a key role in the assessment and implementation of BPC, and form a crucial part of the advisory landscape. As was noted above, many farmers engaged the services of regional advisors to address issues both related and unrelated to BPC. However, this is often supplemented by informal advice provided by relatives and peers. Furthermore, as was noted above, family members and neighbouring farmers had played a hugely significant role in making our respondents aware of BSC.

Another prominent source of advice is various interest groups or societies. Our interviews indicate the significance of learning through various formal and informal networks that bring together people with common practical or commercial interests, and it was indicated that members assist one another on various technical issues (including pest control). Several farmers indicated that they have formed their own informal network of farmers with mutual interests.

In addition to advisors and informal interest groups or societies, an increasingly prominent source of information was the Internet. Many respondents noted that they searched for information that was relevant in the assessment and implementation stages online. The use of online sources includes both general browsing to find information about topics of interest, and using official sources (e.g. the homepage/database of the Rural Support Service) to clarify uncertainties regarding regulations.

Advice and uptake

Somewhat surprisingly, the prevailing opinion among experts on BPC in Latvia is that formal advisors have not had a significant impact on the uptake of this innovation. Experts indicated that advisors have certainly played a role in helping farmers assess and implement these methods (as confirmed by our interviews), but their role in spreading awareness about BPC methods is debatable.

This seems consistent with the observation that there is a lack of specialised experts on BPC, even though many organisations provide advice. Experts noted that neutral

advice on the merits and shortcomings of BPC methods is required as not all farmers have the necessary knowledge to competently and critically assess the (biological) method in question. The growing significance of input suppliers as providers of advice makes this more acute, as they are primarily interested in selling more of their products, though it should be noted that these companies employ experienced experts in the field.

Furthermore, experts noted an unwillingness on the part of the farmers to acknowledge that BPC methods appropriate for successful organic farming require a systematic approach. Experts from the Latvian Plant Protection Research Centre and State Plant Protection Service indicated that many farmers believe that “natural” methods should be non-invasive and demand little in terms of input and effort from the farmer. This may partially account for the unexpected finding that many organic farmers do not use BPC methods. However, the experts also noted that such an approach to pest control and soil management leads to unpredictable yields and a poor appreciation of the fragility of the situation on the farm in question.

The case of direct selling

DS and local markets are a major distribution channel for small farmers and small food processors in Latvia. Better market access for these groups of farmers and producers is relevant in order to face such sustainability challenges as local food provisioning and security by contributing to a more stable food supply at the local level and reducing dependence on imported food. It can also improve social cohesion within local communities and between urban and rural areas by stimulating recognition of the contribution of small farmers and producers to food security and rural development.

DS involves a broad spectrum of innovations: market innovations, organisational innovations, technological innovations and use of e-commerce, logistics and other services. The actors involved in this innovation area include farmers, small processors, artisanal producers, consumer groups, local governments, environmental groups and food movements.

Prevalence and awareness

According to the interviewed experts from LRATC and the assessments of several farmers, DS is practised by approximately 50% of small farms in Vidzeme and Latvia more generally. This seems like a plausible estimate, as DS is a widespread practice in Latvia, and 50% of the farmers we interviewed sold more than half of what they produced directly to consumers. Due to the fact that these farmers were selected for interviews regarding DS, the high volume of direct sales is not surprising.

By far the most common method in Latvia is the distribution of goods through social networks of various scales. These networks may include relatives, friends, acquaintances, neighbours, colleagues and their respective social circles. The distribution of food through such social networks is seldom understood as DS, but it is an important channel for distributing one’s products without the involvement of commercial intermediaries. Other important channels are local and farmers’ markets, on-farm sales, farm shops, permanent clients, sales in town markets, delivery to residential areas and places of work, and online sales. Somewhat surprisingly, direct purchasing groups were mentioned only in three cases, which indicates a limitation of our sample, as this is an increasingly important distribution channel in Latvia.

Most of the farmers we interviewed practice several forms of DS. We note that our respondents were opportunistic as regards the methods they employ to distribute their goods. As the circumstances change, a particular channel may become more prominent. For example, a farmer admitted that by limiting sales on the farmers’ market due

to a lack of buyers, she has strengthened and even expanded the range of regular customers shopping directly on the farm; another farmer had expanded sales through an online channel.

From the perspective of farmers, DS was often perceived as a traditional and “old” form of commercial activity. The responses indicate that many farmers’ parents, grandparents or other close relatives were engaged in DS to a greater or lesser extent, and relatives were often key sources of information about DS in the awareness stage. Consequently, the activity is considered by many of our respondents to be something inherited from their family. For many, the knowledge and skills necessary for DS are part of their experience and family history. Even those farmers who did not become aware of DS via their relatives, did so from friends or neighbours, further strengthening the impression that DS is a common practice.

Those who had practised it since the late 1980s and early 1990s could seldom identify a particular person or organisation that had told them about DS. What was clear, however, was that advisors and advisory organisations in the narrow sense had played a peripheral role in this process. Those who had started to practise DS more recently found it easier to identify a particular person or organisation that had informed them about DS. Farmers who had sold their products for several decades began to do so largely because this was a convenient way to sell their produce and other products during the transition period to a capitalist economy (in the 1990s). This was not always the case, however, and people who had started to practise DS in the last decade indicated that theirs was a conscious choice, though the triggers varied. Some farmers responded to demand, while others simply said that they had to do something to earn a living.

Learning about direct selling

Interviewees cited several prominent ways of learning the skills necessary to practise DS. The main sources of information and learning mentioned were observations made at markets, exchanges with other farmers, feedback from clients and professional literature.

Testing particular practices on one’s farm and making observations on other people’s farms were also prominent ways of acquiring the skills necessary to practise DS. Attendance of courses was also mentioned, but these events were seldom specifically about DS, though they did involve bookkeeping and rural tourism, which have a connection with DS.

Overall, the advice of fellow practitioners and relatives is crucial, and social learning and informal peer-to-peer learning is widespread, though it has the undesirable side effect of narrowing down the range of channels and forms for selling one’s products. Access to knowledge possessed by other groups is, therefore, very important and could be facilitated by institutional learning.

Even though much of the required knowledge is passed down and exchanged informally, DS requires bringing this practice into line with today’s market conditions and societal demands. The continuation and adaptation of old practices to new market and societal conditions requires innovative solutions. Unsurprisingly, we note that several of our interviewees were aware that “old” knowledge exchanged among peers requires the influx of new insights. Therefore, it is crucial to acknowledge that farmers involved in DS are aware of other sources of information that allow new practices to enter into the mix.

DS appears to be a highly mutable and somewhat unpredictable practice. This often means that farmers have to experiment with different sales techniques and distribution channels whose continued relevance is routinely re-evaluated as a result of communication with regular clients and the available technological and infrastructural means.

A prominent approach is building social circles with regular customers. This can eventually become an important source of information and feedback for the farmers about their products. There have been several cases where farmers have started growing new types of vegetables because of consumer demand.

All forms of DS require professional advice, and the education of farmers, consumers and traders would greatly contribute to the stability of DS, but such assistance is only sporadically available and is not sufficiently tailored to different forms of DS, relying on the ingenuity and initiative of individual farms. Situational and episodic knowledge transfer predominates, and takes place in the usual places of rural communication – market, shop, post office, village centre.

Farmers in the Pierīga region appear to be well-situated to have access to various advisory organisations and providers of advice in general. An important regional player is LRATC, and the presence of several markets (e.g. Central market in Riga, Tukums market) provides additional support, while state institutions (e.g. Food and Veterinary Service, State Revenue Service) are easily accessible both in person (in Riga) and via information and communication technologies. However, informal advice is more prominent. Neighbours, relatives, fellow practitioners and the organisers of specific markets are key providers of knowledge and information. The nature of the advice varies, but often relates to the distribution and marketing of goods. The most prominent exchange of knowledge and practical tips is with reliable and well-known peers and relatives. Almost every farmer has several colleagues that had earned his/her trust. Formal advisory organisations, on the other hand, assist in matters pertaining to taxes and bookkeeping.

Many of our interviewees noted the need for skills associated with planning a business and marketing. While some argued that this cannot be taught in courses, it was evident that a limited ability to market one's goods was a serious challenge for many farmers. This was confirmed in the interviews with experts who noted that DS requires a unique combination of skills that few farmers have. Specifically, they may be quite proficient at growing vegetables or fruit, but they lack the skills to present their products and attract customers. This point was made repeatedly by market representatives who noted that they often have to encourage farmers to think about their product more thoroughly.

It was also suggested that exchange of knowledge and experience could be facilitated by advisors. For example, advisors could organise training events on DS with the involvement of experienced farmers as consultants and mentors. In addition, meetings could be organised with consumers and direct purchasing groups to discuss demand and supply issues, consumer preferences, dietary requirements, etc. Specific seminars with farmers, LRATC advisors, municipalities and other organisations could be useful to discuss rules, regulations and the organisation of trade.

Advice and uptake

There are no particular institutionally-based knowledge brokers or intermediaries that could, or aim to, facilitate the spread of DS or short food chains. While there are agents and organisations that provide advice, providing advice specifically regarding DS is not their main function. For example, in some farmers' markets (Kalnciema market, Straupe market) the organisers partially perform the advisory function. A prominent non-governmental organisation (Latvijas Lauku forums) also provides advice on DS, but this is part of a general attempt to stimulate rural development, rather than a specific focus on short food chains.

Consequently, the available advice is often fragmented, conveyed in a non-systematic manner and concerns specific elements of DS, so the advice is partial and requires that the farmer in question seek additional help elsewhere. The advice provided by

LRATC is an excellent instance of this. We interviewed a representative of one of their regional branches who indicated that employees provide advice regarding bookkeeping and assist in navigating the plethora of official requirements. They also provide advice regarding technical solutions for home and artisanal producers. However, sales techniques and practical skills are imparted by way of peer-to-peer learning.

In view of the above, different forms of trading and distribution channels are developing at different rates. For example, direct purchasing groups have gradually become more prominent, and distribution via online tools is also increasing in importance. Many of these dynamics are not captured by official statistical data. The growth and decline of various distribution channels, however, are due to different drivers. The decline of local markets is largely determined by the depopulation of rural areas and lack of professional management and long-term planning for the future of these markets. Internet marketing, on the other hand, is facilitated by the improved skills of farmers (both young and old) in the use of mobile applications (often facilitated by younger relatives), easy access to courier services and the growing interest of consumers in niche products. Direct purchasing groups are consumer-driven innovations facilitated by motivated and educated urban consumers and entrepreneurs.

Some forms of DS are comparatively worse off in terms of advice. For example, online sales and direct purchasing groups have no formalised and structured advice procurement procedures. It is also difficult to get advice from other farmers about these new forms and channels of distribution, so producers are learning by experimenting and from the experience (both positive and negative) of their colleagues, using information about e-commerce in other sectors, or relying upon the input of their children.

Overall, the effectiveness and resilience of the DS business model in Latvia may, in large part, be due to the social embeddedness of farms. DS is economically advantageous for small farms specialising in, for example, growing vegetables, herbs, salads and garlic. Its economic benefits are also manifested in small part-time farms, which produce small-scale niche products and also deal with small-scale processing and handle all sales without intermediaries, thus generating higher income. This is often done through established sales channels via social ties (relatives and customers in the workplace through relatives). Reliance on social networks also saves the time needed for marketing, as significantly more time would be needed to sell products in the market.

Analysis

Both BPC and DS are established practices in Latvia. On the whole, the farmers we interviewed indicated that they had few knowledge needs that were not met, or could not be met with some effort on their part (e.g. looking for information online). Nonetheless, some of our respondents noted that they had experienced a lack of technical/agricultural knowledge, uncertainties regarding legal questions (e.g. taxes, requirements) and marketing skills. What is more, advice regarding the innovations in particular was fragmented.

Biological pest control

EU policy is widely credited for popularising organic farming. However, it is unclear whether it has yet had significant impact on the prevalence of BPC in Latvia, though official requirements appear to be effective means of stimulating the uptake of this innovation. Limiting the range of chemicals that are available for use in agriculture may steer farmers towards BPC. This, however, is also a potential weakness of the current situation regarding BPC – it is often not clear to farmers which methods are permitted on organic farms. Furthermore, there is a need to navigate the advice provided through various channels to ensure that BPC methods are employed responsibly and lead to

adequate yields.

The knowledge-intensive methods of protecting plants from various pests require insights into biology and chemistry. While some of this knowledge is practice-based and is first acquired from relatives and other farmers, the input of the wider AKIS/FAS is crucial for encouraging ecologically responsible and systematic applications of pest control methods. Consequently, the gaps in knowledge provision and the growing role of input suppliers lays bare the needs for easily accessible impartial expertise.

While there are, indeed, different organisations and state institutions that can assist farmers using BPC, the role of informal learning still remains crucial, and it allows for contemporary applications and modifications of established practices. Furthermore, the ecological and, arguably, philosophical motivation of many practitioners is also crucial for understanding the uptake dynamics of BPC, as is the continued importance of peer-to-peer and intergenerational learning. If supplemented with technical advice from advisory and scientific organisations, these could be widely applied and contribute to environmental sustainability.

Direct selling

From a general perspective, DS has been left on its own in terms of institutionally-based and formally organised advice provision. There is little in the way of formal advice or it is insufficiently specific to be of practical use to people engaged in DS.

On the other hand, the Latvian case of DS illustrates the significance of peer-to-peer, intergenerational and other informal learning practices that allow new skills and insights to reinvigorate established approaches. The resilience of DS suggests that an innovative practice can survive with limited institutional support. With some caveats, informal learning in general has managed to compensate for this seeming deficiency of the regional FAS. This is contingent upon a high number of practitioners willing to share their knowledge and skills with others and adapt to changing circumstances. It should be noted, however, that many farmers have begun to re-evaluate the costs and benefits of DS, and the suitability of this business model to their situation.

On the whole, the knowledge needs of DS practitioners are more practical and mostly rely on a robust exchange of insights and experiences among peers, with AKIS/FAS organisations being involved in relation to production techniques and the acquisition of different permits, rather than the distribution of products as such.

Conclusions

This paper has looked at two practices that are seldom seen as innovations by the practitioners themselves. They illustrate different, and internally heterogeneous, forms of interaction with the advisory system. Despite the fact that they each have their own knowledge and advisory needs, they broadly correspond to the notion of retro-innovation introduced at the beginning of this paper. This is primarily due to the fact that they involve combinations of particular techniques, insights and experiences that have a long presence in Latvia, but these are re-discovered by a younger generation of adopters that bring with them a host of new approaches (e.g. trichodermin in the case of BPC, online sales in the case of DS). What is more, the application and implementation of BPC and DS is not static but exists in a state of perpetual development. This leads to gradual changes in the perception of what BPC and DS can be, as the variety of methods employed by practitioners keeps growing.

Crucially, both case studies illustrate the contextual specificity of advisory landscapes and the importance of peer-to-peer and informal learning that supplements, and occasionally compensates for the lack of, assistance from formal advisory organisations. In the case of BPC, there appears to be a co-existence of sorts between formal instruction

(e.g. courses) and informal learning. In the case of DS, there appears to be a kind of division of labour where advisory organisations are engaged regarding technical requirements and permits, whereas the skills necessary for distribution and sales are acquired through practice, user feedback, and consultation with peers. In summary, these seemingly routine practices are highly dependent on different sources of knowledge that allow them to retain their dynamism and evolve with the demands of the time. A better understanding of the different forms of advice provision that are characteristic of, and suited to, these practices can provide a more solid basis for interventions that aim to encourage their widespread adoption.

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The challenges of disseminating agro-ecological innovations build on knowledge co-creation: the case of Douro vineyards

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Keywords

Knowledge co-creation, Agro-ecological infrastructures, Innovation, Sustainable farming transitions

Abstract

The Douro wine-county is defined by a mountainous landscape, where vineyards are supported by stone and land terraces, facing a tricky combination of sustainable challenges. Climate change is aggravating these vineyards vulnerability to drought risk, extreme temperatures, soil erosion and pest attack. High production costs in these mountainous vineyards led in nineties, to strong investment in modernisation and mechanisation along with the decline of typical ecological infrastructure, such as schist walls, olive and fruit trees and other live hedgerows or patches of Mediterranean bush groves. However, around 2008 a dynamic towards a biodiversity-based farming has been initiated with implementation of the idea of improving and expanding ecological infrastructure associated to the vineyards, both the traditional and new ones: the soil coverage with spontaneous and preferential seeded vegetation. This idea was developed and implemented together by a farmer advisory organisation of vine and wine sector, researchers from UTAD and two winegrowers. Together, they have initiated in this region a transition towards sustainable farming. Currently a large number of farmers have adopted these innovative agro-ecological approaches, while with a diversity in configurations and intensity, and many other are looking forward to adopt it. The greatest limitation appears to lie on the access to knowledge. This specific agro-ecological knowledge is being created by a growing but still small number of large and medium commercial winegrowers in interaction with scientists and advisors. So there is a major advisory challenge to make this knowledge accessible to farmers, in particular the medium and small-scale vine producers.

Purpose:

The paper goals are two-folded: a) understanding the processes and the social networks mobilised by the producers that have adopted the innovation in order to identify who are the key actors in knowledge brokering processes; b) identify the actors, advisory business models and approaches that could facilitate the innovation implementation by other farmers.

Approach:

The paper builds on empirical research produced under the AgriLink conceptual and empirical framework. A case study approach was adopted, delimited along two dimensions: a) geographical area defined at the NUTS 3 providing socioeconomic context and the regional farming advisory system (R-FAS) frame; b) group of farmers with similar technical-economic orientation, although comprising the farm structure diversity representative of the group in the particular region.

Data collection and analysis:

Data were collected through personal semi-structured interviews designed in the AgriLink project context. A sample of 42 commercial driven vine-growers were interviewed between April and October of 2018, along with the advisory organisation and the scientists that were responsible for the launching and support the development of this innovation in the region. Vine-growers were sampled through a snowball procedure to include both adopters and no-adopters. The data analysis focused on the information related with the farmer's description of their own path from the innovation awareness towards the decision (or not) adopting it, and the knowledge and skills they acknowledge as key for the successful implementation of the innovation and from / with whom and how they got it

Results and implications:

The paper evidences the need for advisors to involve in the knowledge co-creation processes together with farmers and scientists, and that can be done through multi-actor research approaches and with innovation co-creation strategies, for instances in context of operational groups. Public funding for these knowledge co-creation processes and innovation co-creation strategies is fundamental to support these partnerships. However paradigms to assign public funding to innovation in agricultural sector need to encompass long term experimentation processes and to acknowledge agro-ecological innovation as key for economic competitiveness and sustainability of agriculture in Portugal and in Europe.

Rethinking the development of extension materials: A participatory approach to the development of a succession and inheritance decision support tool

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Keywords

Co-design, extension materials, succession and inheritance, decision support tools

Abstract

Purpose: This paper examines the use of a participatory approach in the development of extension material in the form of a paper-based decision support tool to help farmers and advisors through the complex processes of farm succession and inheritance. This paper uses the development of the “Farm Succession and Transfer Guide” as an example of the multi-actor co-design approach used in developing the guide.

Design/Methodology/approach: This study implements participatory action research using a multi actor co-design approach. A co-design framework was developed which was used to guide the design process and provided the outline for elite interviews and facilitated participatory design workshops with end users (farmers), stakeholders, industry experts and policy makers in the design and overall development of the guide.

Findings: The result was the effective design and implementation of a decision support tool in the form of a paper-based tool which was distributed to farm families and used to support their decision making on succession and inheritance. The participatory process provided an effective and innovative framework for developing a decision-making support tool for advisors and farm families in the form of the “Farm Succession and Transfer Guide”.

Practical/Theoretical/Political Implications: This approach used is one which could be replicated in the development of further extension materials or decision support tools in agriculture.

Originality/Value: This paper outlines an original example of how a participatory design can be used in the development of extension materials for complex farm issues.

The Virtual Farm as an alternative or an addition to 'live on-farm demonstration' : Challenges and opportunities

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Keywords

Virtual Farm; ICT tool; virtual demonstration; social learning; increase access

Abstract

This paper will look at the development of the Virtual Farm as a proof of concept, ICT (Information communication Technology) tool, to show the potential of demonstrating farm innovations virtually, to complement live on-farm demonstrations. The Virtual Farm was showcased at several Agriculture events across Europe to assess its acceptance by the Agriculture community. The response of the agricultural stakeholders that were engaged were recorded as an indication of its acceptance and as a guide to its future development. Farmers and stakeholders were enthusiastic to engage with the Virtual Farm and consultation resulted in interesting discussions on the future development. Topics discussed focused on how the tool could developed in the future to engage multi-actor groups both in agriculture and in the wider rural community. The consultations with external stakeholders were important to ensure future developments addressed stakeholders needs and therefore the end users' requirements to develop a usable ICT tool that enabled farmers to increase access to demonstrations, by using virtual demonstration to enhance on-farm demonstration. The potential funding necessary to take this forward in several directions was also explored

Introduction

Farmers learn new practices by experience but also by observing practices on someone else's farm (Prager & Creaney, 2017). This informal exchange of experience, or knowledge, was the main source of improving farming practices until the 1970s with the emergence of 'Agricultural societies' which emphasised and encouraged the formal improving of agriculture (Burton & Sutherland, 2019). On-farm demonstration has been used in various guises over the centuries: an early reference described demonstration as 'place a practical....lesson before the farm masses' (True, 1928). On-farm demonstrations allow farmers to visually evaluate innovations in-situ generally on commercial farms, although sometimes on research farms. Farmers then evaluation the information and discuss the problem and solution in their social groups during peer-to-peer interactions. A farmer's social network and information gathering allows them to be informed that a problem exists and may be influencing practices on their own farms (Prager & Creaney, 2017). Farmers learn and innovate through social learning, following exchanges both peer-to-peer and peer to other actors in the community. This helps to contextualise the innovation and to adapt to the relevant situation on the farmers own farm. Opportunities for this social interaction often arise during the social part of

an on-farm demonstration or during other social gatherings either informal or formal. It is however increasingly a problem that access to demonstration is biased towards large scale centrally located farmers who have time and resources available to enable them to attend on-farm demonstration (Labarthe & Laurent, 2013). Additional methods are therefore required to help increase the accessibility of demonstration to be more inclusive of minority groups. Participant profiles of on-farm demonstration, in certain Countries and regions also indicate a gender and demographic imbalance. By making demonstration more widely available, for example through virtual demonstration accessibility of farm demonstrations will be increased.

Farm-demonstration

Traditionally on-farm demonstration is used to engage the farming community in demonstration activities that showcase innovations, new technologies or practices. Farmers, often involved in a network, respond to an invitation to attend a day or ½ day of organised activities hosted by a facilitator. The innovation is visually demonstrated by experts whilst an auditory description is given by a demonstrator. Additional information is offered by experts through direct conversation and/or presentations, the community is given an opportunity to discuss the proceedings during a social interaction with their peers to exchange experiences. A mix of mediation techniques is thus involved, to accommodate different learning styles of participants. The strength of demonstration activity is that it enables experiential learning and direct communication between peers (Roderick, et al., 2000), also the information is presented both visually and auditory therefore allowing for different cognitive skills to be utilized. The weakness is that it is expensive in terms of organisational time, and logistically challenging for participants who need to find the time to travel and attend when the demonstration activity occurs.

The Virtual Farm proof of concept was developed to enhance on-farm demonstration by increasing access to on-farm demonstration using virtual demonstration. Virtual demonstration describes the use of video and digital technology to allow viewers to view an innovation without having to attend an on-farm demonstration that constricts the participant to a location and a time that may not be convenient. Assessing the participant attendance for live on-farm demonstrations indicates that the audiences show both a gender imbalance, and a demographic slant towards middle to older farmers (which is more frequently observed in Northern Europe). Access is also often limited due to geographical location, remote geographical areas e.g. Islands and highland areas are less well served for demonstration farms. Virtual demonstration negates both aspects.

Gaming environment

Computer games are associated with leisure and having fun, however they play an important role in agricultural education and therefore knowledge gathering (Stewart, et al., 2000).

The 'Virtual Farm' is a simulated farm environment hosting 360o videos, filmed in real live situations therefore by combining a gaming platform and immersive videos. The platform can be navigated either on a laptop using a mouse or by using a virtual reality headset. To minimise the cost of additional hardware that may not be readily available, especially in remote regions, it was decided to develop the virtually reality access using cardboard headsets, that are available at a minimal cost (they can also be made, instructions are available on-line) and an android phone. The viewer moves about the simulated environment using head movements and accesses the hosted videos with

a one click button. Once the videos have been accessed the video runs and the viewer can move their head to get an omnidirectional view of the innovation whilst the video plays, allowing the viewer to rotate fully to investigate the 'real' environment. College students that used head-mounted display units (similar to cardboard VR sets) to learn about botany gave higher ratings than when the information was received using a standard desktop display (Moreno & Mayer, 2002). The use of VR headsets enhances the experience of learning and retention is not affected by the method of delivery. The visual learning experience is paramount in this tool, but social interaction can be included with a social hub in terms of the 'virtual farmhouse and table'.

Traditionally farmers have liked to own their own copies of videos (E.g. DVDs) to learn about innovations but more recently farmers have started to search the web to find innovation videos to access on-line (Bentley, et al., 2019). An on-line survey to assess the views of farmers using Access Agriculture (digital on-line platform) suggest farmers surf the web to find videos on innovations but that digital platforms hosting the videos help farmers to access relevant information (Bentley, et al., 2019). Random searching by surfing the web can come up with a wealth of information on agriculture innovations, however people become disillusioned with poor quality videos and irrelevant information whereas a digital hosting platform can select to host good quality videos that depict relevant informative innovations. Viewers will select to return to these platforms that can provide relevant information, thereby saving time and decreasing the frustration of uploading, accessing and viewing pointless clips. Social interactions help to further disseminate the most relevant videos and therefore views per video are a good indication of the most worthwhile videos to view on a digital platform.

The rapid spread of ICTs, especially the uptake of mobile phones by farmers in rural areas of China (Zhang, et al., 2016) offers a unique opportunity to utilize new methods of disseminating information and increasing the impact and uptake adoption of agriculture innovations. Of 27 students surveyed on an Agricultural Machinery course at the Sot Training Institute (Bomet County, Kenya) 63% had a personal mobile phone capable of accessing course information, implying their ability to access available information at any time (Langat, et al., 2018). The use of low cost per unit dissemination methods to target information exchange specifically of agriculture innovations is increasing. A review of Dissemination models for agricultural information in China identified 7 novel methods (Zhang, et al., 2016). The review concluded the provision of information plays a vital role in developing agriculture and therefore farmers livelihoods. The National Bureau of Statistics in China concluded in 2014 where information and knowledge is poorly disseminated agriculture development becomes impeded (Zhang, et al., 2016). In developing countries where IT literacy may be low (Bello-Bravo, et al., 2017) or globally where languages barriers may be a problem visual information rather than written have obvious advantages in knowledge transfer or exchange. The use of ICT tools to deliver information on agriculture innovations using videos and mobile phones may be an approach that can potentially broker exchanges between research and farmers increasing impact of information in terms of uptake of agriculture information (Maredia, et al., 2018). The increased functionality of mobile technology has created a potential for learning that breaks down barriers that may otherwise prevent the access and interpretation of information (Shuler, 2009). Traditionally research and extension organisations view farmers as end-users who must be persuaded into adopting research outputs rather than partners in a process (Shanthy & Thiagarajan, 2011). This very top-down approach has been superseded in recent years to realise that farmers are part of the process and a bottom up approach allows farmers to be part of the process leading to an increase in adoption of innovations on farm. The use of multi-media methods to share the information and knowledge widens the accessibility of the information and

allows access for all, helping to remove or start to break down the barriers that have in the past prevented an equal access to the available resources. Farmers surveyed in India using a questionnaire sent to participating farmers indicated accessing information via mobile phones, was easy and convenient. The perceived benefits included quality of information, timeliness and reliability of the information were of paramount importance. Correlation analysis indicated irrespective of socio-economic characteristics farmers were utilizing the mobile multimedia (Ganesan, et al., 2013). This study indicates that the use of the mobile phone to access available information increases access to information for all.

Virtual Environments

Virtual communities supported by computers and communications tools have existed for several decades enabling virtual meetings to take place using inexpensive technical tools (Cakir, 2002). Taking the use of virtual communities one step further has been the use of virtual worlds. These have been used in education over several years, advances in technology however has led to the use of 3D virtual worlds in leisure entertainment. This has again inspired educationalists to find new ways to turn a multi-user virtual environment used in gaming into a 3D virtual learning environment that can be used in formal education and informal learning (Livingstone, et al., 2008).

Increase Adoption of innovation

The Virtual Farm uses the gaming environment, where users are comfortable with the technology, to introduce farming innovations to trigger informal learning. Social interactions enable generations where the technology is not generally accessed to be introduced by younger innovations. Families access the innovations on multiple platforms and the innovations can be discussed in a social setting allowing peer-to-peer learning. Different generations within a family can access the platforms depending on the technology they are most comfortable, but the resulting discussions focus on the innovations rather than the method that the information was received resulting in a common discussion point and thereby increasing access to the innovation. This can lead to an increased uptake and adoption of the innovation. In addition, it has been shown that videos help to enhance awareness, knowledge and increase the uptake of innovations (Karubanga, et al., 2017).

In some country's cultural barriers and power structures in rural communities can preclude some members of the community from accessing conventional training in agricultural practices. For example, in Benin, Africa, conventional training in methods of rice processing was only accessed by 27% of women where as farmer to farmer videos were accessed by 74% of women. Videos showing the use of farming practices enabled women to access training where conventional training had not been so easy to access. The videos have since been translated into 30 African languages to further increase the accessibility (Zossou, et al., 2009).

Multi-media engagement

Multi-media has various definitions which all involve the utilization of various channels of communication. The three common classifications are interactive, hyperactive and linear multimedia. Interactive allows the user to control the media accessed, hyper media provides the links required to access e-content material and linear requires the views to watch from beginning to end to receive the material (Langat, et al., 2018). The Virtual Farm is an interactive multi-media which allows the user to access selectively the material viewed.

Multi-media production involves the use of a combination of various forms of media to produce a single output (Langat, et al., 2018). The Virtual Farm uses both digital media to produce the simulated environment and 360-degree videos which are visual media. Multi-media learning occurs if a learner builds a mental representation from the words and pictures that have been shown (Mayer, 2002).

To help develop sustainable agriculture not only does the adoption of innovation need to occur but the farmers need to maintain the adoption of new technologies and practices. To encourage the sustained adoption of an innovation farmers, need to be aware of why the innovation is important, not only the technology or practice. This is traditionally achieved by providing training programmes using conventional training techniques, these reach a limited number of participants. As computers and ICT tools become widely available the effectiveness of using these new tools needs to be evaluated (Shanthy & Thiagarajan, 2011). Computer-based modules can be made readably available and are able to reach a larger number of farmers. In rural India a comparative study of conventional training compared to the use of multimedia delivery found 92% found the multimedia interesting. Farmers observations in this study indicated multimedia translated into action, reflected in higher adoption rates of technology (Shanthy & Thiagarajan, 2011).

Social Learning

Social learning is a process whereby individuals interact, jointly reflect and learn from each other (Bandura, 1971). This social learning is observed during on-farm demonstration, often termed peer-to-peer learning, where farmers access information and exchange and discuss with their peers to determine the relevant innovations for adoption and how they can be adapted for individual specific situations. Although observed in European farms, in developing Countries (although the world bank has is no longer distinguishing between developed and developing countries in its data presentation it is still a term universally used to determine the status of countries in economic terms) it is even more critical as populations depend on farming with limited access to expert knowledge due to dysfunctional extension services. Farmers learn and improve their practices by adopting innovations through social learning processes (MacGregor, 2007).

Marcel and Bart (2012) reported that the main source of information for agricultural prices, weather forecast and advice on agricultural practice is the farmer's own observation and experimentation followed by a conversation with other farmers. (Marcel & Bart, 2012). The adoption of innovations has been described as a process of socially negotiated learning (Prager & Creaney, 2017), through interaction, often peer-to-peer, the innovation is evolved and adapted to fit practical situations occurring on-individual farms.

In situations where traditional peer-to-peer social interactions are more difficult, e.g. rural areas, social media can be used to facilitate the social interaction effectively. The internet and new technologies allow farmers to share innovations, that would have been traditionally shared during face to face exchanges. YouTube and video hosting platforms allow farmers to share videos of innovations and twitter feeds, webinars and discussion forums allow farmers to socially interact, asking questions and sharing further experiences (Baru & Hartless, 2016). Social learning: videos can be shared from farmer to farmer by Bluetooth technology increasing the scalability of the knowledge transfer (Maredia, et al., 2018), equally if the videos are held on a digital platform links can be exchanged to have a similar increase in outreach.

The Virtual Farm

The Virtual Farm has been created to allow instant access to innovations and as such is seen as an addition or enhancement to on-farm demonstration. The use of the Virtual Farm to disseminate innovations is seen as a means to increase the access of demonstration. The Virtual Farm can also be seen as an addition to an on-farm demonstration, priming the visitor as to what to expect and ensuring time and effort are not wasted. Prager and Creaney (2017) identified that 'missing information' 'leads to gaps in the learning cycle and reduces overall learning' during a study of monitor farm demonstration in Scotland. Using careful videoing techniques, the hosted videos can capture aspects of an innovation (for example internal aspect of working machinery) not readily available during the conventional demonstration, so adding to the on-farm experience.

The 'Virtual Farm' a simulated farm environment hosting 360o videos, filmed in real live situations, can be navigated either on a laptop using a mouse or by using a virtual reality headset. There are 2 types of VR headsets mobile VR and console VR. A mobile VR uses an android or iPhone and a cardboard headset and app, it is wireless and does not require additional hardware making it readily accessible and relatively inexpensive. A VR console is tethered to a computer or gaming console so requires additional hardware and the associated costs and is less portable. The mobile VR does not allow a fully immersive experience as the viewer can only look around 360o. A console VR uses sensors to track the players position in a room and their hand and finger movements, giving a fully immersive experience. Part of the reason for choosing the Virtual Farm method was increasing the access to virtual demonstration. Google VR describe cardboard app as 'readily available for all', making the VR experience accessible to a wide majority of users. This app can be downloaded from the google play store for free onto an android phone and allows the user/viewer to experience immersive environments on their phone. Google VR have created the cardboard viewer specification as open source for anyone to download from individuals to manufacturers (<https://vr.google.com/cardboard/manufacturers/>). When the app is used with a cardboard headset, the user can experience an immersive environment. Both videos and simulation games can be downloaded for use with the cardboard to access simulated environments. The videos are useful for both education from toddlers to agriculture colleges and for farmers to engage with innovations and gather useful information. The simulated games can be used in education (e.g. <https://farmvr.com/> to engage with pupils, schools and teachers to teach about agriculture through VR games) whilst VR simulators can be used to train agriculture students and farmers to operate machinery, without accessing the actual machinery, in dedicated simulators.

Simulated games in Agriculture education are often used as one of several approaches to engage a wide range of students with varying abilities. Simulation games allow experiential learning and provide participants the opportunity to control or manipulate the environment in response to a set of variables. The teacher can manipulate the environment to simulate a situation creating a learning environment where the student is responsible for the decision made. Students use critical thinking to identify problems and solutions and play out these scenarios to manipulate the situation to achieve a favourable outcome (Park, et al., 1995). One of the advantages of simulation games is the ability to use them to stimulate learning through actively involving people in decision making. Students in a simulated environment are able to visualise and experience concepts that are otherwise just descriptions. Farmers both as an audience and as students tend to be action-orientated active learners (Nelson & Harris, 1978) and therefore suited to simulation games as opposed to passive learners associated with traditional lecture techniques and linear knowledge transfer seen in presentation techniques.

A weakness of simulation games are students may not have the hardware to access on-line games on a laptop or PC and the confidence to use the hardware and software associated with them. The advantage of the Virtual Farm is it uses simple hardware regularly in use for both farmers and students alike and a simple app to access innovations within the simulated farm environment. The user moves from the simulated environment to the video where they can then rotate fully to investigate the 'real' environment. The visual learning experience is paramount in this tool, but social interaction can be included with a social hub in terms of the 'virtual farmhouse and table' or subsequent social interactions both via social media and face-to-face.

In this paper we assess the potential of 'virtual demonstration' using the Virtual Farm: as a mechanism for farmer engagement and learning. Research was undertaken as part of the H2020 PLAID project (Peer to peer Learning: Accessing Innovation through Demonstration).

Methodology

The Virtual Farm proof of concept was developed by students from the Postgraduate course in Professional Masters Gaming Technology at Abertay University. The students selected Unity as the platform to build the simulated farm environment due to its extensive support of android operating systems making it the most versatile software to work with the cardboard app. Using previous basic understanding of game engines, knowledge of coding and Unity software the students built a simulated environment in which to host the 360o videos of farming innovations. The farm architecture included several buildings styles to showcase the possibilities, different buildings were depicted including a grain store, evident due to the associated grain tower, a tractor/machinery shed with associated tractor and an animal husbandry shed. Audio was used extensively to aid the visuals, e.g. water sounds close to the water course, animal noises when travelling around the animal husbandry shed, this also made the need to animate animals difficult to make realistic unnecessary and engine noises that decreased and increased depending on the closeness to the tractor engine. A water tower was included and a farm house which will be developed in subsequent builds to depict the social hub of the environment to allow social interactions by gathering virtually around the farm house table.

Viewers navigate the simulated environment by using head movements on the mobile VR but by using a mouse on the laptop and subsequent web-based builds.

The Virtual farm was show cased at numerous events throughout Europe to gauge firstly participants reaction to the technology and secondly to gather possible uses for the future of the Virtual Farm. Events are listed in Table 1.

Table 1 Events attended to showcase the Virtual Farm

| <i>Event Name</i> | <i>Location</i> | <i>Participants</i> | <i>Comments</i> |
|----------------------------------|---------------------|---|--|
| EIP-Agri Workshop | Jurmala, Latvia | Advisors, farmers | Interest from Advisors and providers of education |
| Southern Supra-regional Workshop | Venice, Italy | Research, advisors | General interest in how farmers can access innovations |
| Northern Supra-regional Workshop | Leuven, Belgium | Research, advisors | Interest in giving access to participants that do not regularly attend on- |
| Royal Highland Show | Edinburgh, Scotland | General public, farmers, research, policy | Interest in accessing relevant innovations |
| PLAID Pan-European workshop | Zagreb, Croatia | Research, farmers, advisors | Use of the virtual farm by stakeholders |
| Potatoes in Practice | Dundee, Scotland | Farmers, research | Interest in giving a unique view of demonstration |
| DatAgri | Cordoba, Spain | Farmers, academics, advisors | How to break down language barriers and improving outreach |
| Barley Away Day | Birnam, Scotland | Farmers, research | Engaging other H2020 projects |
| Macaulay Development Trust | Aberdeen, Scotland | Academics, funders | Develop the virtual platform to depict other environments |
| SSCR Potato winter meeting | Dundee, Scotland | Farmers and research | Dissemination of research results for farmers |
| AHDB | Dundee, Scotland | Policy makers and directors of farmers levy board | A virtual farm for levy boards to reach farmers |

Findings

The Virtual Farm was well received at each event and provided a focus for discussions about developing the technology further to enhance on-farm demonstration as a means to widen access for farm demonstration. The ability to access the virtual Farm on several different platforms made it appealing to a wide audience.

The most diverse audience was encountered at the Royal Highland Show (RHS) Edinburgh, an annual event that draws people (189,851 people attended the event for 2018) from many areas not just the agriculture community. The large mix of people provided valuable feedback. Several families engaged with the virtual Farm on the different platforms. Little explanation was needed, especially for the younger members of families, who instinctively knew how to access the simulated environment and were eager to encourage other members of the family to equally engage. We were also able to demonstrate the Virtual Farm to policy makers who have since responded with letters of introduction to cabinet ministers to influence policy recommendations and further funding opportunities. Also, at the RHS was the charity Royal Highland Education Trust

(RHET) which work with partners to provide and deliver world-leading learning opportunities for all Scotland's young people aged 3 to 18, in and through the Scottish agricultural environment and the countryside. RHET aims to provide the opportunity for every child in Scotland to learn about food, farming and the countryside and to create a wider understanding of the environmental, economic and social realities of rural Scotland. To further this experience the RHET would like to develop a Virtual Farm that is specifically for children to learn about the rural and farming environment. Several groups of children visited us to experience the virtual farm and it was deemed a great success and we hope to further this collaboration.

A diverse audience was also encountered at the EIP-Agri Workshop where the Virtual Farm was welcomed as an innovation to bridge the gap between researchers, advisors and farmers. An Eastern European advisor commented that 'this will enable us to demonstrate the finer details of some innovations and engage farmers to actively discuss barriers to the adoption of innovations'. An education provider from England was interested in the Virtual Farm as a platform to host a virtual environment for students in a postgraduate course, where the students were not continuously on campus but accessed tools remotely. Following a discussion with a representative from a group of Spanish advisors the Virtual Farm was showcased at the DatAgri event in Cordoba, Spain that engaged farmers and researchers.

The DatAgri event was extremely interesting as it attracted a diverse group of Spanish speaking farmers from a wide but remotely rural area in Spain and a limited number of researchers. The language barrier was overcome as the technology is intuitive and the innovations are visually displayed. A translator (partner involved in the PLAID project) introduced the project and translated the description of the Virtual Farm and an interactive session allowed participants to actively engage with the Virtual Farm.

The three European Stakeholders meetings that were attended, where we showcased the VF, brought to light an interest for the VF as a means to connect farmers and advisors and other actors from the agriculture community. Farmers were interested in the virtual Farm as a means for accessing innovations, advisors however could visualise the potential to showcase innovations to farmers. This is a potential tool to introduce the farming community to results from researchers and to show farmers the results in a way that could impact the farmers and be useful on a commercial farm not just as a set of research results. One advisor commented 'this is a great way to engage farmers in a new concept so they see the results in practice rather than just hear me describe the potential impact the use of an innovation could have, I don't need to get them to give their time to witness this but can show them here and now'.

Attendance at the Potato in Practice event allowed us to display the versatility of the technology. A live demonstration of potato harvesting was scheduled, so 360o cameras were mounted on the machinery and footage was taken during the demonstration and then hosted onto the Virtual Farm so participants of the live on-farm demonstration could see potatoes progressing through the machinery, a view that was not possible during the demonstration due to moving machinery and the large number of participants at the event. A potato grower that had travelled from England commented, 'that's a view only a potato would normally have had, it's reassuring to know the process will not damage my harvest'. This illustrated the added value the Virtual Farm can give to on-farm demonstration, accessing areas not normally available due to health and safety restrictions. It does prove a challenge to get suitable footage that can provide good experience for the viewer. The 360o cameras are specialised equipment that require patience to set up although with practice the experience becomes less frustrating and easier to produce good quality experiences. As new technology is advancing so fast hopefully the newer models will be more intuitive and less temperamental allowing everyone to capture 360o footage and upload to the platform.

Conclusion

This paper looked at the acceptance of the Virtual Farm proof of concept by the stakeholders in the agricultural community as an alternative or an addition to on-farm demonstration.

Several new opportunities have been identified during the show casing of the proof of concept to stakeholders throughout Europe, those that would be expected to make use of a professionally developed app.

Specific opportunities that have been identified are:

- Virtual Farm hosting innovations: the videos can be categorised to allow a search to be performed. ~With the correct search options being built in farmers would be able to select specific videos according to specified categories.
- Training opportunities – a platform to host videos offering training on specific topics
- A virtual platform for educators
- A virtual rural experience platform
- Research tool to disseminate research results

We conclude that the Virtual Farm will help to increase the access of on-farm demonstration for the wider agriculture community. It is hoped as minority groups engage with virtual demonstration they will be encouraged to access on-farm demonstration. Virtual demonstration also has a unique draw, in addition to on-farm demonstration, due to its ability to inform and engage the farming community to the immerse possibilities of adopting innovations on their own farms. The widespread access to this information may help improve agriculture globally and help the agriculture community to produce food sustainability to feed the global population.

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The Virtual Farm as an alternative or an addition to 'live on-farm demonstration' : Challenges and opportunities

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Keywords

Virtual Farm; ICT tool; virtual demonstration; social learning; increase access

Introduction

This paper will look at the development of the Virtual Farm as a proof of concept, ICT (Information communication Technology) tool, to show the potential of demonstrating farm innovations virtually, to complement live on-farm demonstrations. The Virtual Farm was showcased at several Agriculture events across Europe to assess its acceptance by the Agriculture community. The response of the agricultural stakeholders that were engaged were recorded as an indication of its acceptance and as a guide to its future development. Farmers and stakeholders were enthusiastic to engage with the Virtual Farm and consultation resulted in interesting discussions on the future development. Topics discussed focused on how the tool could be developed in the future to engage multi-actor groups both in agriculture and in the wider rural community.

The consultations with external stakeholders were important to ensure future developments addressed stakeholders' needs and therefore the end users' requirements to develop a usable ICT tool that enabled farmers to increase access to demonstrations, by using virtual demonstration to enhance on-farm demonstration. The potential funding necessary to take this forward in several directions was also explored.

Farmers learn new practices by experience but also by observing practices on someone else's farm (Prager & Creaney, 2017). This informal exchange of experience, or knowledge, was the main source of improving farming practices until the 1970s with the emergence of 'Agricultural societies' which emphasised and encouraged the formal improving of agriculture (Burton & Sutherland, 2019). On-farm demonstration has been used in various guises over the centuries: an early reference described demonstration as 'place a practical...lesson before the farm masses' (True, 1928). On-farm demonstrations allow farmers to visually evaluate innovations in-situ generally on commercial farms, although sometimes on research farms. Farmers then evaluate the information and discuss the problem and solution in their social groups during peer-to-peer interactions. A farmer's social network and information gathering allows them to be informed that a problem exists and may be influencing practices on their own farms (Prager & Creaney, 2017). Farmers learn and innovate through social learning, following exchanges both peer-to-peer and peer to other actors in the community. This helps to contextualise the innovation and to adapt to the relevant situation on the farmer's own farm. Opportunities for this social interaction often arise during the social part of an on-farm demonstration or during other social gatherings either informal or formal. It is however increasingly a problem that access to demonstration is biased towards

large scale centrally located farmers who have time and resources available to enable them to attend on-farm demonstration (Labarthe & Laurent, 2013). Additional methods are therefore required to help increase the accessibility of demonstration to be more inclusive of minority groups. Participant profiles of on-farm demonstration, in certain Countries and regions also indicate a gender and demographic imbalance. By making demonstration more widely available, for example through virtual demonstration accessibility of farm demonstrations will be increased.

Farm-demonstration

Traditionally on-farm demonstration is used to engage the farming community in demonstration activities that showcase innovations, new technologies or practices. Farmers, often involved in a network, respond to an invitation to attend a day or ½ day of organised activities hosted by a facilitator. The innovation is visually demonstrated by experts whilst an auditory description is given by a demonstrator. Additional information is offered by experts through direct conversation and/or presentations, the community is given an opportunity to discuss the proceedings during a social interaction with their peers to exchange experiences. A mix of mediation techniques is thus involved, to accommodate different learning styles of participants. The strength of demonstration activity is that it enables experiential learning and direct communication between peers (Roderick, et al., 2000), also the information is presented both visually and auditory therefore allowing for different cognitive skills to be utilized. The weakness is that it is expensive in terms of organisational time, and logistically challenging for participants who need to find the time to travel and attend when the demonstration activity occurs.

The Virtual Farm proof of concept was developed to enhance on-farm demonstration by increasing access to on-farm demonstration using virtual demonstration. Virtual demonstration describes the use of video and digital technology to allow viewers to view an innovation without having to attend an on-farm demonstration that constricts the participant to a location and a time that may not be convenient. Assessing the participant attendance for live on-farm demonstrations indicates that the audiences show both a gender imbalance, and a demographic slant towards middle to older farmers (which is more frequently observed in Northern Europe). Access is also often limited due to geographical location, remote geographical areas e.g. Islands and highland areas are less well served for demonstration farms. Virtual demonstration negates both aspects.

Gaming environment

Computer games are associated with leisure and having fun, however they play an important role in agricultural education and therefore knowledge gathering (Stewart, et al., 2000).

The 'Virtual Farm' is a simulated farm environment hosting 360o videos, filmed in real live situations therefore by combining a gaming platform and immersive videos. The platform can be navigated either on a laptop using a mouse or by using a virtual reality headset. To minimise the cost of additional hardware that may not be readily available, especially in remote regions, it was decided to develop the virtually reality access using cardboard headsets, that are available at a minimal cost (they can also be made, instructions are available on-line) and an android phone. The viewer moves about the simulated environment using head movements and accesses the hosted videos with a one click button. Once the videos have been accessed the video runs and the viewer can move their head to get an omnidirectional view of the innovation whilst the video

plays, allowing the viewer to rotate fully to investigate the 'real' environment. College students that used head-mounted display units (similar to cardboard VR sets) to learn about botany gave higher ratings than when the information was received using a standard desktop display (Moreno & Mayer, 2002). The use of VR headsets enhances the experience of learning and retention is not affected by the method of delivery. The visual learning experience is paramount in this tool, but social interaction can be included with a social hub in terms of the 'virtual farmhouse and table'.

Traditionally farmers have liked to own their own copies of videos (E.g. DVDs) to learn about innovations but more recently farmers have started to search the web to find innovation videos to access on-line (Bentley, et al., 2019). An on-line survey to assess the views of farmers using Access Agriculture (digital on-line platform) suggest farmers surf the web to find videos on innovations but that digital platforms hosting the videos help farmers to access relevant information (Bentley, et al., 2019). Random searching by surfing the web can come up with a wealth of information on agriculture innovations, however people become disillusioned with poor quality videos and irrelevant information whereas a digital hosting platform can select to host good quality videos that depict relevant informative innovations. Viewers will select to return to these platforms that can provide relevant information, thereby saving time and decreasing the frustration of uploading, accessing and viewing pointless clips. Social interactions help to further disseminate the most relevant videos and therefore views per video are a good indication of the most worthwhile videos to view on a digital platform.

The rapid spread of ICTs, especially the uptake of mobile phones by farmers in rural areas of China (Zhang, et al., 2016) offers a unique opportunity to utilize new methods of disseminating information and increasing the impact and uptake adoption of agriculture innovations. Of 27 students surveyed on an Agricultural Machinery course at the Sot Training Institute (Bomet County, Kenya) 63% had a personal mobile phone capable of accessing course information, implying their ability to access available information at any time (Langat, et al., 2018). The use of low cost per unit dissemination methods to target information exchange specifically of agriculture innovations is increasing. A review of Dissemination models for agricultural information in China identified 7 novel methods (Zhang, et al., 2016). The review concluded the provision of information plays a vital role in developing agriculture and therefore farmers livelihoods. The National Bureau of Statistics in China concluded in 2014 where information and knowledge is poorly disseminated agriculture development becomes impeded (Zhang, et al., 2016). In developing countries where IT literacy may be low (Bello-Bravo, et al., 2017) or globally where languages barriers may be a problem visual information rather than written have obvious advantages in knowledge transfer or exchange. The use of ICT tools to deliver information on agriculture innovations using videos and mobile phones may be an approach that can potentially broker exchanges between research and farmers increasing impact of information in terms of uptake of agriculture information (Maredia, et al., 2018). The increased functionality of mobile technology has created a potential for learning that breaks down barriers that may otherwise prevent the access and interpretation of information (Shuler, 2009). Traditionally research and extension organisations view farmers as end-users who must be persuaded into adopting research outputs rather than partners in a process (Shanthy & Thiagarajan, 2011). This very top-down approach has been superseded in recent years to realise that farmers are part of the process and a bottom up approach allows farmers to be part of the process leading to an increase in adoption of innovations on farm. The use of multi-media methods to share the information and knowledge widens the accessibility of the information and allows access for all, helping to remove or start to break down the barriers that have in the past prevented an equal access to the available resources. Farmers surveyed

in India using a questionnaire sent to participating farmers indicated accessing information via mobile phones, was easy and convenient. The perceived benefits included quality of information, timeliness and reliability of the information were of paramount importance. Correlation analysis indicated irrespective of socio-economic characteristics farmers were utilizing the mobile multimedia (Ganesan, et al., 2013). This study indicates that the use of the mobile phone to access available information increases access to information for all.

Virtual Environments

Virtual communities supported by computers and communications tools have existed for several decades enabling virtual meetings to take place using inexpensive technical tools (Cakir, 2002). Taking the use of virtual communities one step further has been the use of virtual worlds. These have been used in education over several years, advances in technology however has led to the use of 3D virtual worlds in leisure entertainment. This has again inspired educationalists to find new ways to turn a multi-user virtual environment used in gaming into a 3D virtual learning environment that can be used in formal education and informal learning (Livingstone, et al., 2008).

Increase Adoption of innovation

The Virtual Farm uses the gaming environment, where users are comfortable with the technology, to introduce farming innovations to trigger informal learning. Social interactions enable generations where the technology is not generally accessed to be introduced by younger innovations. Families access the innovations on multiple platforms and the innovations can be discussed in a social setting allowing peer-to-peer learning. Different generations within a family can access the platforms depending on the technology they are most comfortable, but the resulting discussions focus on the innovations rather than the method that the information was received resulting in a common discussion point and thereby increasing access to the innovation. This can lead to an increased uptake and adoption of the innovation. In addition, it has been shown that videos help to enhance awareness, knowledge and increase the uptake of innovations (Karubanga, et al., 2017).

In some country's cultural barriers and power structures in rural communities can preclude some members of the community from accessing conventional training in agricultural practices. For example, in Benin, Africa, conventional training in methods of rice processing was only accessed by 27% of women where as farmer to farmer videos were accessed by 74% of women. Videos showing the use of farming practices enabled women to access training where conventional training had not been so easy to access. The videos have since been translated into 30 African languages to further increase the accessibility (Zossou, et al., 2009).

Multi-media engagement

Multi-media has various definitions which all involve the utilization of various channels of communication. The three common classifications are interactive, hyperactive and linear multimedia. Interactive allows the user to control the media accessed, hyper media provides the links required to access e-content material and linear requires the views to watch from beginning to end to receive the material (Langat, et al., 2018). The Virtual Farm is an interactive multi-media which allows the user to access selectively the material viewed.

Multi-media production involves the use of a combination of various forms of media to produce a single output (Langat, et al., 2018). The Virtual Farm uses both digital media to produce the simulated environment and 360-degree videos which are visual media.

Multi-media learning occurs if a learner builds a mental representation from the words and pictures that have been shown (Mayer, 2002).

To help develop sustainable agriculture not only does the adoption of innovation need to occur but the farmers need to maintain the adoption of new technologies and practices. To encourage the sustained adoption of an innovation farmers, need to be aware of why the innovation is important, not only the technology or practice. This is traditionally achieved by providing training programmes using conventional training techniques, these reach a limited number of participants. As computers and ICT tools become widely available the effectiveness of using these new tools needs to be evaluated (Shanthy & Thiagarajan, 2011). Computer-based modules can be made readably available and are able to reach a larger number of farmers. In rural India a comparative study of conventional training compared to the use of multimedia delivery found 92% found the multimedia interesting. Farmers observations in this study indicated multimedia translated into action, reflected in higher adoption rates of technology (Shanthy & Thiagarajan, 2011).

Social Learning

Social learning is a process whereby individuals interact, jointly reflect and learn from each other (Bandura, 1971). This social learning is observed during on-farm demonstration, often termed peer-to-peer learning, where farmers access information and exchange and discuss with their peers to determine the relevant innovations for adoption and how they can be adapted for individual specific situations. Although observed in European farms, in developing Countries (although the world bank has is no longer distinguishing between developed and developing countries in its data presentation it is still a term universally used to determine the status of countries in economic terms) it is even more critical as populations depend on farming with limited access to expert knowledge due to dysfunctional extension services. Farmers learn and improve their practices by adopting innovations through social learning processes (MacGregor, 2007).

Marcel and Bart (2012) reported that the main source of information for agricultural prices, weather forecast and advice on agricultural practice is the farmer's own observation and experimentation followed by a conversation with other farmers. (Marcel & Bart, 2012). The adoption of innovations has been described as a process of socially negotiated learning (Prager & Creaney, 2017), through interaction, often peer-to-peer, the innovation is evolved and adapted to fit practical situations occurring on-individual farms.

In situations where traditional peer-to-peer social interactions are more difficult, e.g. rural areas, social media can be used to facilitate the social interaction effectively. The internet and new technologies allow farmers to share innovations, that would have been traditionally shared during face to face exchanges. YouTube and video hosting platforms allow farmers to share videos of innovations and twitter feeds, webinars and discussion forums allow farmers to socially interact, asking questions and sharing further experiences (Baru & Hartless, 2016). Social learning: videos can be shared from farmer to farmer by Bluetooth technology increasing the scalability of the knowledge transfer (Maredia, et al., 2018), equally if the videos are held on a digital platform links can be exchanged to have a similar increase in outreach.

The Virtual Farm

The Virtual Farm has been created to allow instant access to innovations and as such is seen as an addition or enhancement to on-farm demonstration. The use of the Virtual Farm to disseminate innovations is seen as a means to increase the access of demonstration. The Virtual Farm can also be seen as an addition to an on-farm demonstration, priming the visitor as to what to expect and ensuring time and effort are not wasted. Prager and Creaney (2017) identified that 'missing information' 'leads to gaps in the learning cycle and reduces overall learning' during a study of monitor farm demonstration in Scotland. Using careful videoing techniques, the hosted videos can capture aspects of an innovation (for example internal aspect of working machinery) not readily available during the conventional demonstration, so adding to the on-farm experience.

The 'Virtual Farm' a simulated farm environment hosting 360o videos, filmed in real live situations, can be navigated either on a laptop using a mouse or by using a virtual reality headset. There are 2 types of VR headsets mobile VR and console VR. A mobile VR uses an android or iPhone and a cardboard headset and app, it is wireless and does not require additional hardware making it readily accessible and relatively inexpensive. A VR console is tethered to a computer or gaming console so requires additional hardware and the associated costs and is less portable. The mobile VR does not allow a fully immersive experience as the viewer can only look around 360o. A console VR uses sensors to track the players position in a room and their hand and finger movements, giving a fully immersive experience. Part of the reason for choosing the Virtual Farm method was increasing the access to virtual demonstration. Google VR describe cardboard app as 'readily available for all', making the VR experience accessible to a wide majority of users. This app can be downloaded from the google play store for free onto an android phone and allows the user/viewer to experience immersive environments on their phone. Google VR have created the cardboard viewer specification as open source for anyone to download from individuals to manufacturers (<https://vr.google.com/cardboard/manufacturers/>). When the app is used with a cardboard headset, the user can experience an immersive environment. Both videos and simulation games can be downloaded for use with the cardboard to access simulated environments. The videos are useful for both education from toddlers to agriculture colleges and for farmers to engage with innovations and gather useful information. The simulated games can be used in education (e.g. <https://farmvr.com/> to engage with pupils, schools and teachers to teach about agriculture through VR games) whilst VR simulators can be used to train agriculture students and farmers to operate machinery, without accessing the actual machinery, in dedicated simulators.

Simulated games in Agriculture education are often used as one of several approaches to engage a wide range of students with varying abilities. Simulation games allow experiential learning and provide participants the opportunity to control or manipulate the environment in response to a set of variables. The teacher can manipulate the environment to simulate a situation creating a learning environment where the student is responsible for the decision made. Students use critical thinking to identify problems and solutions and play out these scenarios to manipulate the situation to achieve a favourable outcome (Park, et al., 1995). One of the advantages of simulation games is the ability to use them to stimulate learning through actively involving people in decision making. Students in a simulated environment are able to visualise and experience concepts that are otherwise just descriptions. Farmers both as an audience and as students tend to be action-orientated active learners (Nelson & Harris, 1978) and therefore suited to simulation games as opposed to passive learners associated with traditional lecture techniques and linear knowledge transfer seen in presentation

techniques. A weakness of simulation games are students may not have the hardware to access on-line games on a laptop or PC and the confidence to use the hardware and software associated with them. The advantage of the Virtual Farm is it uses simple hardware regularly in use for both farmers and students alike and a simple app to access innovations within the simulated farm environment. The user moves from the simulated environment to the video where they can then rotate fully to investigate the 'real' environment. The visual learning experience is paramount in this tool, but social interaction can be included with a social hub in terms of the 'virtual farmhouse and table' or subsequent social interactions both via social media and face-to-face.

In this paper we assess the potential of 'virtual demonstration' using the Virtual Farm: as a mechanism for farmer engagement and learning. Research was undertaken as part of the H2020 PLAID project (Peer to peer Learning: Accessing Innovation through Demonstration).

Methodology

The Virtual Farm proof of concept was developed by students from the Postgraduate course in Professional Masters Gaming Technology at Abertay University. The students selected Unity as the platform to build the simulated farm environment due to its extensive support of android operating systems making it the most versatile software to work with the cardboard app. Using previous basic understanding of game engines, knowledge of coding and Unity software the students built a simulated environment in which to host the 360o videos of farming innovations. The farm architecture included several buildings styles to showcase the possibilities, different buildings were depicted including a grain store, evident due to the associated grain tower, a tractor/machinery shed with associated tractor and an animal husbandry shed. Audio was used extensively to aid the visuals, e.g. water sounds close to the water course, animal noises when travelling around the animal husbandry shed, this also made the need to animate animals difficult to make realistic unnecessary and engine noises that decreased and increased depending on the closeness to the tractor engine. A water tower was included and a farm house which will be developed in subsequent builds to depict the social hub of the environment to allow social interactions by gathering virtually around the farm house table.

Viewers navigate the simulated environment by using head movements on the mobile VR but by using a mouse on the laptop and subsequent web-based builds.

The Virtual farm was show cased at numerous events throughout Europe to gauge firstly participants reaction to the technology and secondly to gather possible uses for the future of the Virtual Farm. Events are listed in Table 1.

Table 1 Events attended to showcase the Virtual Farm

| <i>Event Name</i> | <i>Location</i> | <i>Participants</i> | <i>Comments</i> |
|----------------------------------|---------------------|---|--|
| EIP-Agri Workshop | Jurmala, Latvia | Advisors, farmers | Interest from Advisors and providers of education |
| Southern Supra-regional Workshop | Venice, Italy | Research, advisors | General interest in how farmers can access innovations |
| Northern Supra-regional Workshop | Leuven, Belgium | Research, advisors | Interest in giving access to participants that do not regularly attend on-farm demonstration |
| Royal Highland Show | Edinburgh, Scotland | General public, farmers, research, policy | Interest in accessing relevant innovations |
| PLAID Pan-European workshop | Zagreb, Croatia | Research, farmers, advisors | Use of the virtual farm by stakeholders |
| Potatoes in Practice | Dundee, Scotland | Farmers, research | Interest in giving a unique view of demonstration |
| DatAgri | Cordoba, Spain | Farmers, academics, advisors | How to break down language barriers and improving outreach |
| Barley Away Day | Birnam, Scotland | Farmers, research | Engaging other H2020 projects |
| Macaulay Development Trust | Aberdeen, Scotland | Academics, funders | Develop the virtual platform to depict other environments |
| SSCR Potato winter meeting | Dundee, Scotland | Farmers and research | Dissemination of research results for farmers |
| AHDB | Dundee, Scotland | Policy makers and directors of farmers levy board | A virtual farm for levy boards to reach farmers |

Findings

The Virtual Farm was well received at each event and provided a focus for discussions about developing the technology further to enhance on-farm demonstration as a means to widen access for farm demonstration. The ability to access the virtual Farm on several different platforms made it appealing to a wide audience.

The most diverse audience was encountered at the Royal Highland Show (RHS) Edinburgh, an annual event that draws people (189,851 people attended the event for 2018) from many areas not just the agriculture community. The large mix of people provided valuable feedback. Several families engaged with the virtual Farm on the different platforms. Little explanation was needed, especially for the younger members of families, who instinctively knew how to access the simulated environment and were eager to encourage other members of the family to equally engage. We were also able to demonstrate the Virtual Farm to policy makers who have since responded with letters of introduction to cabinet ministers to influence policy recommendations and further funding opportunities. Also, at the RHS was the charity Royal Highland Education Trust (RHET) which work with partners to provide and deliver world-leading learning opportunities for all Scotland's young people aged 3 to 18, in and through the Scottish agricultural environment and the countryside. RHET aims to provide the opportunity for every child in Scotland to learn about food, farming and the countryside and to create a wider

understanding of the environmental, economic and social realities of rural Scotland. To further this experience the RHET would like to develop a Virtual Farm that is specifically for children to learn about the rural and farming environment. Several groups of children visited us to experience the virtual farm and it was deemed a great success and we hope to further this collaboration.

A diverse audience was also encountered at the EIP-Agri Workshop where the Virtual Farm was welcomed as an innovation to bridge the gap between researchers, advisors and farmers. An Eastern European advisor commented that 'this will enable us to demonstrate the finer details of some innovations and engage farmers to actively discuss barriers to the adoption of innovations'. An education provider from England was interested in the Virtual Farm as a platform to host a virtual environment for students in a postgraduate course, where the students were not continuously on campus but accessed tools remotely. Following a discussion with a representative from a group of Spanish advisors the Virtual Farm was showcased at the DatAgri event in Cordoba, Spain that engaged farmers and researchers.

The DatAgri event was extremely interesting as it attracted a diverse group of Spanish speaking farmers from a wide but remotely rural area in Spain and a limited number of researchers. The language barrier was overcome as the technology is intuitive and the innovations are visually displayed. A translator (partner involved in the PLAID project) introduced the project and translated the description of the Virtual Farm and an interactive session allowed participants to actively engage with the Virtual Farm.

The three European Stakeholders meetings that were attended, where we showcased the VF, brought to light an interest for the VF as a means to connect farmers and advisors and other actors from the agriculture community. Farmers were interested in the virtual Farm as a means for accessing innovations, advisors however could visualise the potential to showcase innovations to farmers. This is a potential tool to introduce the farming community to results from researchers and to show farmers the results in a way that could impact the farmers and be useful on a commercial farm not just as a set of research results. One advisor commented 'this is a great way to engage farmers in a new concept so they see the results in practice rather than just hear me describe the potential impact the use of an innovation could have, I don't need to get them to give their time to witness this but can show them here and now'.

Attendance at the Potato in Practice event allowed us to display the versatility of the technology. A live demonstration of potato harvesting was scheduled, so 360o cameras were mounted on the machinery and footage was taken during the demonstration and then hosted onto the Virtual Farm so participants of the live on-farm demonstration could see potatoes progressing through the machinery, a view that was not possible during the demonstration due to moving machinery and the large number of participants at the event. A potato grower that had travelled from England commented, 'that's a view only a potato would normally have had, it's reassuring to know the process will not damage my harvest'. This illustrated the added value the Virtual Farm can give to on-farm demonstration, accessing areas not normally available due to health and safety restrictions. It does prove a challenge to get suitable footage that can provide good experience for the viewer. The 360o cameras are specialised equipment that require patience to set up although with practice the experience becomes less frustrating and easier to produce good quality experiences. As new technology is advancing so fast hopefully the newer models will be more intuitive and less temperamental allowing everyone to capture 360o footage and upload to the platform.

Conclusion

This paper looked at the acceptance of the Virtual Farm proof of concept by the stakeholders in the agricultural community as an alternative or an addition to on-farm demonstration.

Several new opportunities have been identified during the show casing of the proof of concept to stakeholders throughout Europe, those that would be expected to make use of a professionally developed app.

Specific opportunities that have been identified are:

- Virtual Farm hosting innovations: the videos can be categorised to allow a search to be performed. ~With the correct search options being built in farmers would be able to select specific videos according to specified categories.
- Training opportunities – a platform to host videos offering training on specific topics
- A virtual platform for educators
- A virtual rural experience platform
- Research tool to disseminate research results

We conclude that the Virtual Farm will help to increase the access of on-farm demonstration for the wider agriculture community. It is hoped as minority groups engage with virtual demonstration they will be encouraged to access on-farm demonstration. Virtual demonstration also has a unique draw, in addition to on-farm demonstration, due to its ability to inform and engage the farming community to the immerse possibilities of adopting innovations on their own farms. The widespread access to this information may help improve agriculture globally and help the agriculture community to produce food sustainability to feed the global population.

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Exploring structural factors which contribute to effective on-farm demonstrations

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On farm demonstrations, structural characteristics, on farm demonstrations effectiveness, factor analysis

Abstract

Purpose: The objective of this paper is to explore how/what structural characteristics of on-farm demonstration events impact on the views of participants on the success/ effectiveness of the demonstration they attended.

Design/Methodology: Primary data were collected in the framework of the AgriDemo-F2F project. The AgriDemo-F2F research team, given the current piece's of work particular focus on structural characteristics, based their analysis on the responses of participants collected through the 345 post- demonstration questionnaires filled out by the attendees of 31 demo events held in 12 EU countries, in 2018. Factor analysis was employed, and the identified factors formed new variables which consequently were used to run a multiple linear regression to predict general effectiveness.

Findings: Results indicate that decisions on structural dimensions of on-farm demonstrations on either the programme/overall level and/or the event level are crucial in both setting up the scene for effective peer exchange as well as in facilitating learning components, methods and approaches used to trigger participants' actions in their farming activities.

Introduction

Research on the adoption and diffusion of innovations has consistently confirmed that one of farmers' most commonly cited sources of information and ideas is other farmers (Rogers, 2003). Farmers and small scale foresters tend to be most influenced by proof of successful farming methods by their peers (Kilpatrick and Johns, 2003; Warner 2007; Schneider et al., 2009; Hamunen et al., 2015). Such farmer to farmer learning, or peer learning in general terms, involves participants learning from and with each other and is possible anywhere on the scale between informal and formal learning.

In this regard, on-farm demonstrations allow farmers to see a new/innovative technology, practice or system in operation on a working farm not too dissimilar to their

own and talk to someone actively engaged in the practice and to whom they can relate – i.e. peers (Miller and Cox, 2006, Bailey et al., 2006). On-farm demonstrations facilitate an effective learning situation for farmers to “see the crops themselves”, “interact with the scientists and extension workers on the field”, and “get doubts clarified themselves”; “seeing is believing” is the basic philosophy of field demonstrations. Demonstration farms thus allow for the creation of practical knowledge that can be used directly on farms. This way, the possibility of farmers to observe the results of on-farm trials at demonstration farms, allows them to make a decision to introduce the innovations much faster; this is especially true for those technologies that are costly, complex, or require a major shift in the operation (Miller and Cox, 2006).

The farms on which on-farm demonstrations are held are a meeting place where on-the-farm trials are conducted, solutions and tools are designed and implemented, advice is provided as well as the dissemination of knowledge and information is taking place. In the experimental part of the demonstration farm’s functions, if there is any, technologies, tools and methods are tried, compared or validated. In the educational part, the results or methods applied are demonstrated, training opportunities are provided to farmers and experience exchange is taking place throughout open events and other dissemination actions throughout an area (Kiełbasa and Kania, 2015; Gros and Oldeweme, 2013; Syngenta 2016; Madureira et al. 2015).

If appropriately planned and structured, on-farm demonstrations can be a very powerful and efficient mechanism for innovation showing, providing an environment where active learning can take place through visualisation and discussion (Bailey et al., 2006; Smallshire et al., 2004; Angell et al., 2004). Indeed, on-farm demonstrations serve as one of the most effective extension education tools ever developed in order to speed up the technology transfer process (Leeuwis, 2004; Hancock, 1997; Rogers, 2003; Kittrell, 1974; Vanclay, 2004; Coutts, 2005).

The objective of this paper is to explore how/what structural characteristics of on-farm demonstration events impact on the views of participants on the success/ effectiveness of the demonstration. The remaining of the paper is structured as follows. Section 2 provides the theoretical overview of the structural characteristics of on-farm demonstrations. Section 3 focuses on methodological issues. Section 4 presents the results of the analysis and Section 5 offers some concluding remarks.

Theoretical background

Previous review papers (Pappa et al., 2018; Ingram et al., 2018; Cooreman et al., 2018) have examined characteristics and processes that enable learning in demonstrations. The aforementioned papers, taken from work in the EU H2020 project Agri-Demo-F2F project (see: Methodology), address the structural, functional and cognitive aspects of on-farm demonstrations and peer-to-peer learning, respectively.

In the paragraphs below, an overview of the structural characteristics of on farm demonstrations is presented, taken from Pappa et al. (2018) - with emphasis on the aspects which relate most closely to the findings.

Actors and roles

The literature describes the following parties involved in on-farm demonstrations: 1) the initiator(s), the organizer(s), the funder(s), specialist(s), advisors, extension agents and facilitators, 2) the demonstrator(s), and 3) the participants and target audience. Some of these actors may perform multiple roles. Initiators, organisers, funders, faci-

litators and specialists Initiators, funders and organizers often overlap. The entities that may initiate, fund or organize an on-farm demonstration can be very diverse and include: a) farmers or farmers' organisations wishing to undertake their own peer-to-peer research and learning, working either independently or in collaboration with other entities (USDA/NRCS, 2013.); b) private/commercial companies (Syngenta, 2016; Gros and Oldeweme, 2013); c) NGOs and/or other agricultural/ developmental organisations (Qamar, 2013; Okiror, 2016); d) extension services or other advisory services (Penn State Extension, 2017); e) research institutes/ universities (Nuthall et al., 2011); and f) ministries or other related national agencies (Smallshire et al., 2004; BMEL, 2016; Kuipers et al., 2005). Usually, it is partnerships between the above-mentioned entities who are involved in initiating on-farm demonstrations and networks (Fisk et al., 1989; Stammen, 2016; USDA/NRCS, 2016; Mitchell, 2016).

In most cases demonstration farms operate within a funded project/programme. In many cases the funder is of national (Kemp and Michalk, 2011; BMEL, 2016), regional, or EU origin or operates within a co-financing scheme. Therefore, demonstration programs make use of public funds, deploy private funds or a public-private co-financing scheme.

Finally, advisors/extension agents/experts are actors who have a role both in relation to the local organisation and programme delivery level and as facilitators at demonstration events. They generally facilitate multiple source information sharing and discussion. However, they often also take the role of demonstrator (see below). Agents' characteristics have been found to contribute to effective collaboration and thus to the success of on-farm demonstrations (see Pappa et al., 2018).

Demonstrators

The demonstrator can be a farmer, researcher, specialist/extension agent, private sector employee, advisor, or student. Demonstrations and explanations that are farmer-led (and possibly researcher/advisor supported and facilitated) provide a sense of ownership for both the demonstrator and participants; farmer participants will have more confidence and will be more receptive to innovations, if a new practice is shown by a fellow farmer (Miller and Cox, 2006; Kuipers et al., 2005; Oakley and Garforth, 1985; Kumar, 2014). The decision process for selecting the demonstration farmer varies (see Pappa et al., 2018).

Furthermore, the demonstrator farmers' characteristics are identified in the literature as an important factor for effective demonstrations. Farmer demonstrators should be experienced and continuously involved in commercial farming, with good farming skills in their local context and conditions. They are preferably full-time residents in the community, can communicate in the local language and are sensitive to local cultures, mannerisms, farming practices and needs. They should have good leadership and communication abilities, a good reputation and status in their community (Franzel et al., 2015; Kumar, 2014; Kiptot et al., 2006; Cunningham and Simeral, 1977), and conform to the image of a 'typical' farmer, representing 'typical' conditions, i.e. 'typical' in the biophysical, farming system and socio-economic sense (Gibbons and Schroeder, 1983). A tendency has been observed for participants to seek a demonstrator with a slightly higher social status than their own (Rogers and Leuthold, 1962; Gibbons and Schroeder, 1983).

Additionally, demonstration farmers should be hospitable, willing to show their farm to visiting groups and easily approachable by other farmers and extension workers (Kumar, 2014; Syngenta, 2016; Warren et al., 2017). Training received by demonstrators increases the demonstration effectiveness; the value of 'train the trainer' schemes has

been described by several authors (Smallshire et al., 2004; Franz, 2009; Fischer and Vasseur, 2002).

Participants and target audience

Target audiences are determined at the organisation/programme level and/or at the demonstration farm/event level. An on-farm demonstration provides learning opportunities to many different actors (Stammen, 2016). Participants are defined as the on-farm demonstration attendees and any other stakeholder/interested party and/or individual. The target audience and the participants can be distinguished based on various criteria such as age group, gender, innovativeness (adoption category) and awareness (aware, already interested, already adopted the practice), farm type/production system and sector, socio-economic background, etc.

It is very important during the planning of demonstration activities to define the type of farmer for whom the intervention is intended and ensure it is appropriate and relevant (Krah, 1992). Furthermore, the number of people involved and reached by the activities is important and an indicator of their effectiveness. When planning a demonstration event, targeting both men and women can have a positive influence by possibly adding different gender-related viewpoints to the discussion (PACC, 2015). There is also value in organizing demonstrations for clusters of peer farmers (Janvry et al., 2016; Franzel et al., 2015; Rogers and Leuthold, 1962). Furthermore, the presence and participation during a demonstration event of multiple stakeholders can contribute to the overall events' effectiveness through discussions, which are often held in the frame of on-farm demonstrations (Bailey et al., 2006; Kielbasa and Kania, 2015; Franzel et al., 2015; Nuthall et al., 2011).

Networks

Demonstration farm networks are formed from either bottom up approaches (initiated by farmers themselves in an informal way), or top down approaches (created by organisations as formal and coordinated programmes and projects; (Franzel et al., 2015; Kiptot et al., 2006; Bailey et al., 2006). Working with pre-existing locally based initiatives, groups and networks in the farming community adds to the effectiveness of demonstration activities (Franzel et al., 2015; Kiptot et al., 2006; Bailey et al., 2006; Helin and Dixon, 2008). Networks containing informal social networks were also found to be more effective in delivering demonstrations (Creaney et al., 2015; Kiptot et al., 2006). A network of farmer-owned demonstrations allows for greater geographic distribution of demonstration activities (Warren et al., 2017).

In a demonstration network trials are usually conducted, solutions and tools are designed and implemented; discussions and educational meetings are organized, along with training courses, workshops and advice provision (Kielbasa and Kania, 2015).

Moreover, as aforementioned, demonstration farms are the "meeting place" for all network participants; (thus farmers benefit from the availability of multiple sources of information (Bailey et al., 2006; Kielbasa and Kania, 2015; Franzel et al., 2015; Kuipers et al., 2005; CCCA, 2013; Okiror, 2016; Nuthall et al., 2011). However, the need for involvement of multiple stakeholder groups may also give rise to coordination difficulties.

There are several parameters to be taken into account when developing a demonstration network such as the overall size of the network (i.e. the number of farmers and demonstration sites), the homogeneity of the network (i.e. whether it will be sector-specific or multi-sectoral), geographic coverage, and the intensity of the links within the network, etc.

Resources, finances and incentives

With respect to finances, on-farm demonstration activities can be fully or partially funded; ideally, the budget should cover all expenses (BMEL, 2016; Bailey et al., 2006; Braga et al., 2001; Franzel, 2015). Additionally, with regard to human resources and capacity building many on-farm demonstration programmes offer/require the training of the agent and/or the demonstration farmer. Therefore, professional training/mentoring sessions designed for both advisors and farmers are offered, in order to successfully accomplish their duties (Smallshire et al., 2004; Franz, 2009; Fischer and Vasseur, 2002; Kumar, 2014; Bellon, 2001; Franzel et al., 2015; Bailey et al., 2006). Such training can be related to key aspects of the new technology, communication skills and relationship building i.e. learning group processes, participatory educational tools/methods, facilitation skills, etc.

Structural characteristics – Farm (event) level

Practice/technology demonstrated

In planning and designing on-farm demonstrations, different types of technologies and practices can be demonstrated, varying from: (1) experimental projects for testing the workability/feasibility of a practice/innovation under operational conditions, to (2) exemplary projects which demonstrate the utility of the innovation/practice to potential adopters and provide supporting evidence (that is, to diffuse the innovation) (Myers, 1978) to which (3) the showcasing of existing experience can be added. A further categorization of on-farm demonstrations can be made according to the technology type (see Pappa et al., 2018) and the adjustments of the existing system as follows: a) single intervention or one practice demonstrations and b) package or complete or all-practice demonstrations or a whole farm approach (DAE, 1999; Hancock, 1997; Kittrell, 1974).

Location and layout

The selection of the demonstration farm is important for effective demonstrations. The farms' biophysical context and farming system are important determinants of a demonstration's success. Moreover, according to the available literature one of the most critical factors for demonstration effectiveness is the farmer's ownership of the demonstration farm (Gibbons and Schroeder, 1983; Bailey et al., 2006; Miller and Cox, 2006; Lauer, 2009); there is a greater chance of making an impact when a demonstration occurs on an actual working farm, i.e. when placing innovations firmly within the bounds of a farmer's everyday experience. Therefore, demonstrations should be carried out on local farms, rather than on an extension plot or research stations (Gibbons and Schroeder, 1983; Miller and Cox, 2006; Oakley and Garforth, 1985; PACC, 2015; Bailey et al., 2006).

Demonstration sites can be distinguished according to the agroecosystem within which they operate, the farming system they represent as well as their location vis-à-vis urban centers. The location may be remote or in areas with a high population density, with or without many peers in the neighbourhood.

The type of comparisons and location(s) involved in on-farm demonstrations can be distinguished as follows: 'Proof of concept'; Test strips or plots; Strip Trials in multiple fields; Replicated plot/strip trials in one field; and Replicated strip/plot trials in multiple fields (see Pappa et al. 2018). Additionally, a demonstration can involve paired comparisons i.e. two treatments within a field – usually the new and the standard practice- or operate randomized complete blocks, i.e. multiple treatments – three or more – per field with a number of different test strips/plots (Lauer, 2009).

A further distinction can be made according to the number of farmers engaged and the plot's location as follows: Single farmer demonstrations; Block demonstrations; Clustered sites demonstrations; and Scattered farms with sites being located across the target zone (see Pappa et al., 2018).

The demonstration site characteristics are mentioned in the literature as key factors determining the success of a demonstration effort. First of all, demonstration sites must have good and easy access (Okiror, 2016; Franzel et al., 2015). The site should also be centrally located and visible, in order to attract maximum attention of potential audience/farmers (Cunningham and Simeral, 1977; Gibbons and Schroeder, 1983). Furthermore, the sites have to be representative/typical of surrounding lands and must be managed in a representative fashion. The existence of appropriate farm infrastructures and welfare facilities (toilets, rest area, shelter from rain and wind, etc.) is also required (Gibbons and Schroeder, 1983).

Frequency, duration and timing

With regard to the frequency of on-farm demonstrations, it is important to distinguish between single and repeated events. The frequency of repeated demonstration events varies according to the site setup and the purposes of the demonstration programme. (see DAE, 1999). Repetition of demonstration events concerning the same topic may add to the effectiveness (Hancock, 1997); a series of events, especially in cases in which the demonstration is available for a season/year and showcases a cropping pattern, provides an ideal opportunity for farmers to meet again (DAE, 1999).

With respect to the design of demonstrations, demonstrating one practice at a time (Hancock, 1997) and keeping the demonstration simple in character, direct, and limited to a few fundamental things (Knapp, 1916) have also been found to be important.

With regard to the duration of a demonstration event, this may vary from half or one full day, to several consecutive days. The timing of a demonstration is another important factor for characterising demonstration events. In general, demonstration events are arranged when particular management activities are implemented or when the benefits of the demonstration would be most beneficial. A key period to organise a (result) demonstration event is harvest time (Harvesting Demonstration). A field day during this time, when yields, costs and benefits can be compared, is considered the optimum time to achieve the greatest impact (DAE, 1999).

Methodology

Data were collected in the framework of the AgriDemo-F2F aiming at a) understanding the role of European commercial demonstration farms, in the application of scientific findings and the spreading of best practices and innovative farming approaches within the farming community and b) building on this understanding, synthesizing and making available evidence and tools for organizing effective farmer-to-farmer learning approaches.

To this end various research tools were used in order to delineate demonstration events. Such tools included interviews with organisers at the programme and/or the event level, demonstrators and host-farmers, as well as questionnaires filled out by demo participants before and after the event took place. Additional information on events were gathered through an observation tool which was kept by a national researcher who was attending the event.

While the AgriDemo-F2F research team used all available information related to any event to inform the subsequent steps of the analysis, the current piece of work, given its particular objective on structural characteristics, based the quantitative analysis

that follows on the responses of participants collected through the post-demonstration questionnaire.

At the end of demonstration events, participants were requested to take some time to express the level of agreement/disagreement upon certain statements regarding their experiences during/from the demonstration and the level of their satisfaction. A structured questionnaire covering different areas such as structural, functional, and learning characteristics of the event, along with their opinion on the event's effectiveness was thus used. Participants' agreement with a variety of statements was measured with a four point Likert scale.

Overall, 345 questionnaires were used in this analysis, filled out by participants of 31 demo events in 12 EU countries.¹ Responses were cross-checked to confirm that there is not any event and/or country dominating their distribution as well as that there are no outliers.

Out of the 42 items of the questionnaire that were using the 4-point Likert scale, 21 variables focusing on the structural and social interaction aspects, along with variables aimed to capture respondents' assessment of the demo effectiveness, were selected. Thus, variables which were mainly linked with functional and/or learning characteristics related to demo events were excluded from further analysis. A factor analysis with principal component analysis and Varimax rotation was employed as a next step to reduce the number of variables. The Factors generated were further used to compute new continuous variables that fed a Multiple Linear Regression, which had as a dependent variable demo effectiveness.

Results

Inasmuch as the effectiveness of an on-farm demonstration is a multifaceted concept the research team worked to construct a combined factor to better capture respondents' assessment of demo effectiveness. Thus, six (6) out of the 21 variables were selected to form a factor, which was named "general effectiveness". This factor comprised of three variables describing the general effectiveness of the event(s) and another three, which were focusing on

¹ See Table I (Annex) for the distribution of respondents/questionnaires per country. the actions that participants stated that were ready to take on, as a result of the event they attended (Table 1).

Table 1 - The list of variables, which formed 'general effectiveness'*"General Effectiveness" Cronbach-a = 0,804*

The demonstration met my expectations regarding what I wanted to learn.

The demonstration exceeded my expectations.

How effective did you find the demonstration for you to learn something?

I thought about how I could implement some of the ideas and practices on my own farm.

I felt like the demonstration increased my ability to rely on myself as a farmer.

I'm thinking about an action I could undertake myself, because of the demonstration.

The reliability test of this factor returned a Cronbach-alpha score of 0.80, which implies a very good internal consistency of the scale created. (Malhotra et al., 2006).

Following, a factor analysis with principal components and Varimax rotation was run with the remaining 15 variables. Three factors were generated through this procedure:

- The 1st Factor, which is called "social interaction", consisted of 8 items, forming a scale with Cronbach-a = 0.82;
- The 2nd Factor, which is called "structural impact", consisted of 4 items, forming a scale with Cronbach-a = 0.70; and,
- Finally the 3rd Factor, which is called "group impact", consisted of 3 items, forming a scale with Cronbach-a = 0.68

Table 2 offers a more detailed view of which variables formed each one of those three factors

Interestingly enough, one may see in those factors structural characteristics, and there-

Table 2 - The lists of variables comprising the three factors'

| <i>Social Interaction Cronbach-a = 0,815</i> | <i>Structural Cronbach-a = 0,703</i> | <i>Group () Cronbach-a = 0,678</i> |
|---|--|--|
| If participants didn't agree with each other during discussions, somebody (demonstrator/other participant) tried to reach a consensus between them. | I think the day was well structured | A lot of the other participants are part of the same farmer network as me. |
| I had the feeling that I could share my own knowledge as relevant information. | I think the host farm operation was well suited for this demonstration | I could relate well to other participants |
| I got along very well with the demonstrator. | I think the demonstrator had the right skills to carry out the demonstration | I think consisted interesting people the ofmix group an of people. |
| The demonstration felt like an informal activity to me. | The group was the right size. | |
| I felt encouraged questions during demonstration to ask the demonstration. | | |
| When there were any discussions, I felt comfortable sharing my opinion | | |
| It was my own choice to be here | | |
| I had the feeling the demonstrator was like one of us | | |

Source: Table II – Annex

of their importance, either directly and quite evidently as in the case of the 2nd factor in which items refer to the host farm characteristics, the structure of the day, the demonstrator, and the size of the group; or the 3rd factor which encompasses information which highlight the significance of working carefully to target participants so as to include an interesting mix of experiences and views. Albeit less directly, this connection is still evident in the 1st factor comprising items/variables which are heavily influenced by decisions related to structural characteristics such as the overall climate of the event, the use of a facilitator, the time dedicated to discussions, or the selection of an appropriate demonstrator.

The factors that emerged through the factor analysis (Principal Components) were then used to form new variables by computing the mean of the responses given to the questions comprising them. Thus, the new, continuous, scale variables, now use numerical values between 1 and 4, a step which was essential in order to proceed with linear regression.

A multiple linear regression was run to predict general effectiveness from the factors of social interaction, structural and group. The model equation has developed as follows: $GEN_EFFECT = 0.274 + 0.426 * (\text{social interaction}) + 0.268 * (\text{structural impact}) + 0.172 * (\text{group impact})$

The F-test was found significant at the 99.5% confidence level ($F(3,327) = 100.605$, $p < .005$),² and it can be assumed that this model explains a significant amount of the variance of the 'general effectiveness' of the event. More specifically, as it may be observed in Table 3 below, the multiple linear regression model summary and overall fit statistics table shows that the adjusted R^2 of the model is 0.475. This means that the three independent variables/factors used in the multiple linear regression explain 47.5% of the variance of the dependent variable/factor. All three variables contributed positively and statistically significantly to the prediction of the dependent variable ($p < .05$) meaning that at a 95% confidence level, the hypothesis that each factor makes no impact to the model is rejected. Finally, coefficients presented in the B column in Table 4 that follows, imply that "social interaction" is the factor with the strongest impact to the dependent variable (general effectiveness), as an increase in its mean score by 1, will improve the general effectiveness by 0.426. Respectively, an increase in the mean score of the structural factor by 1, will improve the general effectiveness by 0.268 and a similar increase in the mean score of the group factor will improve the general effectiveness by 0.172.

The Durbin-Watson $d = 1.839$, lies between the two critical values of $1.5 < d < 2.5$, and it can be assumed that there is no first order linear auto-correlation in the multiple linear regression data. Finally, from the collinearity statistics columns it can be concluded that there is no implication of multi-collinearity in this multiple linear regression model, as the Tolerance is > 0.1 and $VIF < 10$ for all variables

Table 3 - Regression model – summary of results'

| <i>Model Summary^b</i> | | | | | | | | | | |
|----------------------------------|-------|----------|-------------------|---------------------------|-------------------|----------|-----|-----|---------------|---------------|
| Model | R | R Square | Adjusted R Square | Std Error of the Estimate | Change Statistics | | | | | Durbin-Watson |
| | | | | | R Square Change | F Change | df1 | df2 | Sig. F Change | |
| 1 | ,693a | ,480 | ,475 | ,37781 | ,480 | 100,605 | 3 | 327 | ,000 | 1,839 |

a. Predictors: (Constant), social interaction, structural, group

b. Dependent Variable: gen_effectiveness2

Source: Table II – Annex

Table 4 - Regression coefficients^a

| Model | Unstandardized Coefficients | | Standardized Coefficients | | t | Sig | Collinearity Statistics | |
|-------|-----------------------------|------------|---------------------------|------|-------|------|-------------------------|-------|
| | B | Std. Error | Beta | | | | Tolerance | VIF |
| | 1 | (Constant) | ,274 | ,170 | | | | |
| | interaction | ,426 | ,056 | ,393 | 7,593 | ,000 | ,594 | 1,683 |
| | structural | ,268 | ,053 | ,245 | 5,060 | ,000 | ,681 | 1,469 |
| | group | ,172 | ,044 | ,193 | 3,928 | ,000 | ,659 | 1,517 |

a. Dependent Variable: general effectiveness

Conclusions

On-farm demo literature has long placed considerable effort to identify and assess the critical structural characteristics that should be taken into consideration when planning and organizing demonstration programmes and events. Following this line of thinking, this paper has sought to examine how/what decisions on the structural characteristics of on-farm demonstrations impact upon participants' evaluation of a demo event's effectiveness and success.

Results indicate that there is a statistically significant relation of structural characteristics with demo effectiveness. Among them decisions related to characteristics such as the overall climate (in/formality) of the event, the use of a facilitator, the time dedicated to discussions, or the selection of an appropriate demonstrator seem to have the greater impact; the host farm's characteristics, the structure of the day (programme), the demonstrator's skills, and the size of the group follows; effectiveness is also affected by network/group of attendees characteristics. Therefore, demo organizers, at various levels (programme – event), should pay quite some attention to the proper preparation of the events, i.e. on the simple and quite straightforward, but sometimes underestimated, structural characteristics of demo events. Further analysis including other characteristics (functional and learning) is expected to yield equally interesting and useful, at least in practice, results.

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Disentangling success factors and principles of agricultural demonstrations

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Keywords

Agriculture, demonstration, success, factors, principles

Abstract

The paper aims to identify, outline and categorise establishment and operational factors that contribute to successful agricultural on-farm demonstration. The paper is based on a desk study of literature on demonstration activities and a set of 24 original case study reports on demonstration activities in 12 European countries produced as part of the H2020 project PLAID. Insights from earlier studies are contrasted and enriched with the results of the PLAID research. The success factors are classified into nine key factors deemed important in designing any agricultural demonstration: Purpose, Problem, Place, Personnel, Positioning, Programme, Process, Practicalities, Publicity (the “9Ps”). Each factor is then framed in terms of success principles to provide a guide to their enactment. It is further argued that the success of a demonstration lies not in simply addressing single factors but in the complex interplay between the measures taken with regards to each of those. The paper broadens the perspective on the character, interlinkages and relative importance of the factors underlying demonstration and their successful application within the agricultural knowledge and innovation system.

Introduction

Research on the adoption and diffusion of innovations has consistently confirmed that one of farmers’ most commonly cited sources of information and ideas is other farmers (Rogers, 2003). Farmers and small scale foresters tend to be most influenced by proof of successful farming methods by their peers (Kilpatrick and Johns, 2003; Warner 2007; Schneider et al., 2009; Hamunen et al., 2015). Such farmer to farmer learning, or peer learning in general terms, involves participants learning from and with each other and is possible anywhere on the scale between informal and formal learning.

In this regard, on-farm demonstrations allow farmers to see a new/innovative technology, practice or system in operation on a working farm not too dissimilar to their

Access to the right information at the right time in the right format and from the right source may shift the balance between success and failure of the farmer (Opara 2008: 289).

Gender norms in on-farm demonstrations: Why new approaches to increase female participation are needed

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Keywords

Gender, demonstrations, gender relations approach, peer-to-peer learning

The problem: where are all the women?

This paper presents empirical data and critical reflections regarding female participation in 30 on-farm case study demonstrations across Europe. The data reveal attendance at demonstration events was highly gendered; over 75 per cent of attendees were male. This gender imbalance was consistent across 11 partner case study countries.

Aim and purpose

The aim of the paper is therefore twofold: to explore using a gender relations framework the impact of structural factors on levels of female representation in on-farm demonstration and secondly, to identify why this is problematic for enabling and boosting innovation in the agricultural community both at the local and aggregate levels. A wealth of work over many decades and cultural contexts has demonstrated the importance of farm women to on-farm decision making (Whatmore, 1991; Gasson and Errington, 1993; Morris and Little, 2005). By reviewing this research we argue that women's lack of participation in on-farm demonstrations is of significant detriment to the agricultural industry at both the local and aggregate levels.

Approach

The paper draws from research conducted for the Horizon 2020 funded AgriDemo-F2F project. The analysis is framed in a gender relations approach, which understands gender relations as a product of power structures that determine expectations and behaviour (Whatmore, 1991; Little and Panelli, 2003). Critically, in the farming

context, Whatmore (1991: 71) affirms that within gender power relations “ideologies of appropriate gender roles are shaped and reshaped in everyday practices of the family farm”. The proposed paper seeks to use this approach to understand the strongly gendered participation in on-farm demonstrations. Only through an understanding of gendered participation can we begin to consider ways to increase women’s access to on-farm demonstration.

Results and implications

Taking a particular focus in case study demonstrations from the UK, Ireland and Austria, we consider potential solutions and approaches to make demonstrations more accessible to women. We use the combination of empirical data and critical researcher reflection to argue that a new agenda for more accessible approaches to on-farm demonstrations is an urgent priority for those responsible for agricultural training and extension across Europe. The paper offers practical solutions, i.e. women only demonstrations, more targeted marketing and communications and whole farm invitations, that we hope will encourage exchange and dialogue (in the ESEE session and more widely in the literature).

The adventurous adoption processes of innovations: three Greek cases

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Keywords

Advisory services, micro –AKIS actors, innovation adoption, innovation dissemination, trigger events

Abstract

Purpose: Three innovative cases are explored aiming at highlighting the broader conditions as well as the specific events that triggered the adoption of the relevant innovations as well as the actors involved. The cases are as follows: the mating disruption of insects in the framework of Integrated Pest Management implemented by peach producers in Imathia, Northern Greece; the widespread cultivation of avocado in Chania, Crete, which came as a consequence of the volatility of the markets; and the cultivation of stevia in Karditsa, Central Greece, a response to the need of replacing traditional cultivations with innovative and more profitable ones. Of special interest is the exploration of the actors who advised/ supported farmers, given the demise of extension services in Greece.

Methodology: The innovation cases were selected in the framework of the Horizon 2020 project AgriLink. The paper is based on qualitative and quantitative data derived from surveys and in-depth interviews with farmers and micro-AKIS actors involved in the innovations.

Findings: Results highlight a) the need for intensive flow of information and knowledge through reliable channels, b) the crucial role of innovation support services with regard to bridging farmers with knowledge/ innovation centers and c) the need for strategic planning aiming at AKIS structuring and innovation support.

Originality/Value: The study contributes to a better understanding of major changes in farms, caused by trigger events deviating farmers from their dependency path and bringing them in a fragile position while searching for support in assessing and implementing innovations.

Introduction

In Greece innovations evolve in a highly fragmented farm advisory landscape, characterized by complexity as well as by extremely weak linkages and lack of coordination among the AKIS actors (Koutsouris 2014). Within such a fragmented and weak AKIS the isolation of the Ministry of the Rural Development and Food (MRDF), the provider of public extension services since WW II up to the 1990s, from the regional and sub-regional agricultural services - which are under the Ministry of Interior despite the fact that their tasks derive from MRDF- is worth noting. In parallel, the consolidation of agricultural research and education organizations into one organization (ELGO DIMITRA), has not yet generated the expected improvements in terms of collaboration and synergies among them. Furthermore, farm based organizations are often extremely weak to play

a decisive role since many of them collapsed during the last decade, because of organizational failures and the “market- and incentive-distorting government interventions” (Iliopoulos and Valentinov, 2012).

The gap created due to the weakness of the public and farm based organizations to provide efficient advisory services to farmers is covered, locally, by private agronomists - consultants and input suppliers (Koutsouris, 2014; Kaberis and Koutsouris, 2012). Private consultants mainly support farmers interested in having access to EU programmes so their scope is rather limited. Input suppliers provide advice for free in the framework of their selling of inputs practices. Private agronomists/companies also support producers groups mainly in the framework of the Integrated Production schemes, thus constituting an exemption to the general “rule” –according to which technical advice is not paid- since in their case the provision of advice is their unique business which is uncoupled from farm input.

Under such conditions one would wonder how are innovations generated and/or disseminated in Greece. To answer this question three innovation cases from Greece were explored in the framework of the AgriLink project:

1. The case of mating disruption (MD; also known as ‘sexual confusion’) within Integrated Pest Management in Imathia (IPM) (Northern Greece); the latter is currently practiced by 29 peach-growers’ cooperatives;
2. The case of avocado in Chania (Crete), which came as a consequence of the decreasing or even collapsing prices in the olive oil and orange markets and the increasing demand for avocado globally
3. The case of the cultivation of stevia in the area of Karditsa (Central Greece), that came as a response to the abandonment of traditional cultivations, also characterized by high input and water consumption, and the need to replace them with more profitable and environmental friendly ones.

The analysis is based on two concepts as conceived within the AgriLink project proposal. The first one is the micro-level Agricultural Knowledge and Information System (micro-AKIS), i.e. the knowledge system that farmers personally assemble, including the range of individuals and organisations from whom farmers seek services and exchange knowledge, the processes involved, and how they translate this into innovative activities (or not). The second one concerns the Regional Farm Advisory System (R-FAS) denoting the full range of organisations providing advice to farms in a given region, and their connection to wider AKIS organisations.

The paper explores the role of the actors who supported farmers throughout the abovementioned innovation cases. It examines the broader conditions and events that triggered and guided adoption processes (or not) and highlights the advisory methods used by advisors/supporters as well as their knowledge resources, the policy measures affecting advisory work, focusing on the interplay among advice providers and advice seekers and the role of peer-to-peer learning throughout the innovation processes.

Methodology

The study draws data from interviews conducted from April to December 2018 with farmers and regional AKIS- actors involved in the abovementioned innovations. It follows the methodological framework of the AgriLink project, employing a mixed-method approach. Farmer’s survey was conducted on the basis of a questionnaire with open and closed questions aiming at gathering both qualitative and quantitating data. A total number of 108 farmers (Table 1) were interviewed based on information provided by key informants in the regional AKISs: In the case of Peach Producers’ Groups 3 cooperatives, one advisory company, one input supply store and one farmer were the key

informants used in approaching integrated peach producers; in the case of avocado two cooperatives, a public service and an agronomist employed in a local organization; in the case of stevia, the stevia cooperative, the local development agency and a local agronomist. The interviews were recorded, entered in a database and analysed; nine of them (3 per innovation case) were used to provide a descriptive in-depth account of the qualitative data (narratives).

Table 1 Farmers interviewed per case study'

| <i>Innovation case study</i> | <i>Adopters</i> | <i>Non-adopters</i> | <i>Droppers</i> | <i>Total</i> |
|---|-----------------|---------------------|-----------------|--------------|
| The implementation of IPM–MD by Peach Producers' in Imathia | 25 | 17 | 0 | 42 |
| The dissemination process of avocado in Chania | 27 | 9 | 1 | 37 |
| The introduction of stevia in Karditsa | 16 | 18 | 2 | 34 |

Source: AgriLink – Country Report, Greece

survey addressed 23 advisory suppliers; all identified key actors were interviewed and were asked to suggest other actors engaged in the innovations. Some input suppliers who were mentioned repeatedly by the interviewed farmers were also interviewed. In the case of Peach Producers' Groups representatives of three private independent advisory organizations (which comprise all the advisory services engaged with the innovation), one public research institute, two cooperatives and four input supply shops were interviewed. For the case of avocado key actors employed in a public service, one public research institute, a nursery, two cooperatives, an input supply shop and a pensioner academic (with significant contribution and continued presence in the innovation process) were contacted and interviewed. For the case of stevia two researchers, the local development agency, and members of the cooperative of stevia were interviewed. Additionally, a number of actors/organizations mentioned by the interviewed farmers (a coop/limited company, an input store and a private consultant) were interviewed aiming at providing insights on the innovation.

Results

Farmers' profile

According to the survey the large majority of the interviewed farmers were (co-)owners and managers of the farm holdings. Most of them were experienced farmers (64 % and 95 % professional farmers for more than 15 years in the case of MD and in the cases of avocado and stevia respectively). In the case of MD 40 % of the sampled farmers were above the age of 50; the respective number for avocado and stevia were 70% and 57%. The vast majority of farmers (more than 80 % of interviewees of the peach and avocado cases and 64% of the stevia case) had been employed outside the farming sector as freelancers, public and private sector employees, etc. Concerning the interviewees' educational level, in the cases of avocado and MD no more than 5% of farmers have had vocational training in agriculture, while 16% held a university degree in agriculture; On the contrary, 26% of the stevia interviewees had vocational training in agriculture and only 3% held university degree in agriculture. Less than 15% of the farmers were engaged in other activities, mainly contracting out their machinery. Almost all farmers received subsidies, contributing to different degrees to their family income.

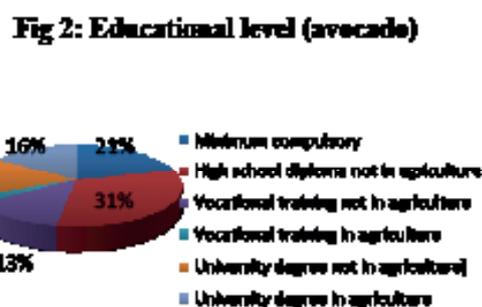
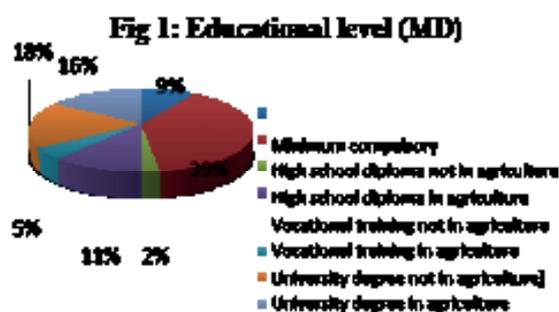


Fig. 3: Farmers' educational level (stevia)



The implementation of IPM- MD by Peach Producers' Groups in Imathia

The farmers' survey in Imathia

IPM was introduced in Imathia, a region of highly intensive agriculture, by a leading cooperative (A-Coop) that, placing their produce in markets of high standards and competing at the international level, identified a demand for certified fruits. This demand became obvious in 1999 due to a failure in the peach market of the USA, which made the A-Coop to turn to IPM (Vlahos et al., 2017). This event also resulted in the launching of collaboration with an independent advisory company (A-Co) specialised in the implementation of quality systems. The collaboration between the advisory company and the cooperative initiated their search for techniques that would help the cooperative to get rid of the use of pesticides and strengthen its environmental-friendly profile.

In 2001, during a visit to a Research Institute in Italy, the advisor in charge of A-Co became aware of MD; simultaneously he was informed that the Department of Deciduous Fruit Trees of Naoussa (DDFT), Greece, carried out relevant experiments. Along with the A-Coop they decided to test MD locally but giving shape to this decision proved difficult since the necessary material (preparations and micro sprayers) were not registered and thus were not available in the market while implementation incurred considerable costs as well. The situation changed in 2003 when the advisory company was successful in its proposal for a three-year pilot project in the framework of a public call for proposals under the measure 'enhancement of competitiveness' of the Ministry of Economy and Development. Thus, in 2004 a small number of peach producers installed a network of micro sprayers across their fields and started implemented MD in close collaboration with A-Co, which was in charge of monitoring the method implementation as well as of the evaluation of the results and the provision of recommendations for improvements. The promising results of the pilots encouraged two other cooperatives to join the initiative; together with A-Coop they exerted pressure to the Ministry of Rural Development and Food (MRDF) to register the necessary materials. When this was done (2008), the cooperatives decided to subsidize the adoption of the MD up to 50-60 % of its cost through the producers groups' operational programs. In parallel, the cooperatives, demonstrating a consistent and ambitious plan aiming at making the innovation a widespread practice, lobbied at the MRDF for the inclusion of MD in the agri-environmental

measures of the NRDP. The attempt was successful; the relevant action, implying the subsidization of MD, was activated in 2014 and resulted in the rapidly increasing dissemination pace of the method by more than 2,000 peach growers, covering 2,800 and 5,500 Ha in 2017 and 2018 respectively.

The very first, few adopters of the method were members of the coop Board or friends of them, who shared common interests and were connected with long time, trust relationships. Gradually more farmers were becoming aware of the method as a result of information activities based mainly on their personal interactions with advisors and events jointly organized by the cooperatives and the advisory company as well as through personal contacts with peers (Fig. 4 -7). The dissemination of the innovation, however, has not been uncomplicated, since many growers, although they recognize MD's potential, are reluctant to adopt the method, since they do not trust that their neighbours will be also involved to the extent necessary for its success.

Fig. 4: Actors -Awareness (MD)

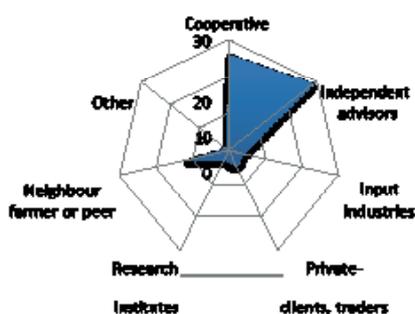


Fig. 5: Communication methods -Awareness (MD)

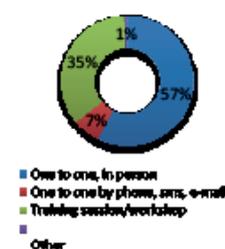
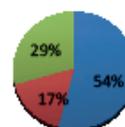


Fig.6: Actors, implementation (MD)



Fig. 7: Communication methods, implementation (MD)



AKIS-actors survey in Imathia

The advisory landscape of the farmers cultivating peaches in Imathia comprises a combination of private, public and farmer-based organizations, some of which are activated beyond the local or regional (Prefectural) level (Table 2).

Table 2 The advisory landscape of peach producers in Imathia

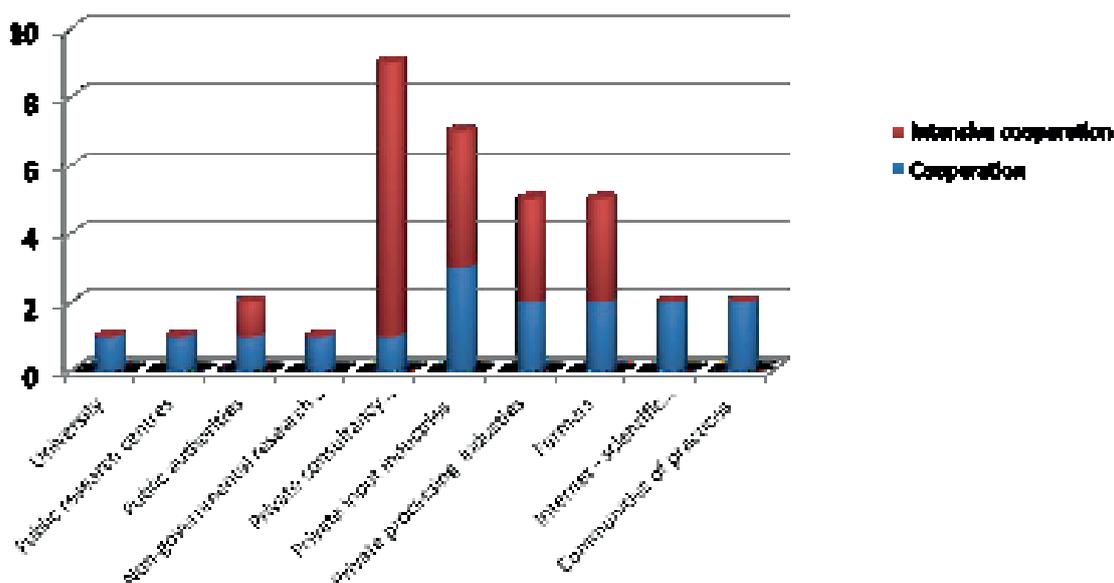
| Advisory organization | Type of organization- Scale of action |
|---|--|
| The Department of Deciduous Fruit Trees of Naoussa (DDTN) | Public Research Institute - National |
| The Directorate of Rural Economy & Veterinary | Public sector- Local (Prefectural) |
| 3 advisory and consultancy companies | Private sector- Local - Regional- National |
| Individual consultants | Private sector- Local |
| Input supply shops | Private sector – Local |
| Cooperatives- Producers' Groups | Farmer-based organizations – Local |

Source: Fieldwork, 2018

The dissemination of MD in Imathia owes to the efforts of the A-Co and other local cooperatives that achieved its inclusion in the agri- environmental measures of the NRDP. This event, along with the 'collegial pressure' exerted by A-Co, helped the two other independent advisory companies activated in the region and, also, several input supply shops to start supporting the adoption of MD. Nevertheless, A-Co still plays a leading role in all stages of the innovation process. While continuously exchanging opinions and influencing each other, producers may occasionally ask the DDTN as well about the effectiveness of the method.

Reaching effectiveness is a major challenge for the advisors engaged in the innovation, since on the one hand, a considerable number of small holders abandons farming, thus leaving their land uncultivated, thus discouraging their neighbours from adopting MD and, on the other hand, exceptional weather conditions during the last cultivation season let producers down, intensifying, in turn, fears for further losses of income and discouraging new undertakings. Producers' reservations make them adopt a wait-and-see attitude, which slows down the pace of adoption and prevents positive outcomes from becoming more visible. The inclusion of MD in the agri- environmental measures and the relevant subsidy constitutes a strong incentive for adoption, alleviating (some of) these fears. But, at the same time, lack of knowledge and lack of interest to participate in information/training activities hinders the diffusion of the innovation.

Fig. 8: Important sources of knowledge, MD



Source: Fieldwork

The local actors recognized that producers' participation in training varied considerably, depending on the effective organisation of such activities and especially the willingness and the ability of the local cooperatives to influence farmers' attitudes. Moreover, it was noticed that the involvement of certain actors in the endorsement of the innovation was poor, especially in the very beginning of the process, and that the links between the local AKIS actors remained weak. But the critical challenge for the advisors involved in the development of the innovation is that the flow of information to farmers remains slow, mainly because the number of advisors activated is not enough to cover needs.

Concerning advisors' sources of information (Fig.: 8), the exchanges among the cooperatives and the consultancy companies are of paramount importance; similarly, a number of local actors, such as the consultancy companies and input suppliers, reco-

gnize farmers as an important source of knowledge. Input and processing industries were valuable sources of knowledge for the local actors as well. The fact that the consultancy companies played a critical role in the dissemination of knowledge about MD, points the significance of peer-to-peer exchanges among advisors too.

In this framework, the role of the European and national policies is critical in two ways: The first one concerns the fact that the inclusion of MD in the agri-environmental measures foresees the provision of advice to potential adopters. This is important since it is the first time that the implementation of an agri-environmental measure is related with the provision of advice, thus supporting and enhancing the role of advisors. The second concerns the expected activation of the national Farm Advisory System and the setting of a working framework for farm advisors. There are many expectations concerning the operation of FAS; all the local AKIS actors pointed out the urgent need for qualified advisors in order to boost developments in the farming sector, and as one of them said: "advice is the missing element that will allow for the continuous improvement of quality systems".

The dissemination process of avocado in Chania

The farmers survey in Chania

The cultivation of avocado, in the first place, attracted the scientific interest in 1968, when the Research Institute of Olive Tree, Subtropical Plants and Viticulture of Chania established an experimental plantation with avocado. The first adopters who stimulated the interest of other farmers for avocado were an individual producer, who first cultivated and exported avocado in France, and a private company, which tried to establish a commercial avocado plantations but soon stopped its activities. In 1985-1995 a project aiming at the wide-spreading of the cultivation took place in the framework of the Integrated Mediterranean Programmes and the cultivation was subsidized. However, the project did not bear fruits; only 11% of its original target was reached, since olive and citrus growers were reluctant to abandon traditional and profitable cultivations to adopt a new one whose demand, at the time, was low.

This situation started changing in 2008 due to decreasing/collapsing prices in the olive oil and orange markets and the increasing demand for avocado, globally. This triggered an explosion in demand for locally well-adapted varieties of high marketability as well as for healthy propagation material. Estimations refer to a rapid expansion of cultivated with avocado areas - especially over the last 3-4 years (80,000-100,000 new trees per year) - expected to cover more than 1,000 ha, in comparison to 450 ha. in 2000. In fact, only farmers who are near retirement, without a successor, or farmers who practice farming only for self-consumption have not been engaged in the cultivation of avocado with the cultivation been expanded even in marginal fields.

The raising of awareness about and the dissemination of the cultivation of avocado in Chania was a long process involving several private and public actors (Fig.9-12) with peer farmers playing a key role throughout the process. The most widely used communication method for awareness and assessing the cultivation of avocado was one to one in person contact among the actors involved. Peer-farmers had leading role in awareness activities; during the assessment stage the role of researches was strengthened since farmers searched for valuable knowledge and justified information to support their decision (and their investment). During the implementation local departments of public services and input suppliers emerge as equally important actors. The most valuable sources of knowledge for farmers were discussions with others, their conclusions from running tests and experiments in their farms and their observations on other farms.



Fig. 11: Actors, implementation (avocado)

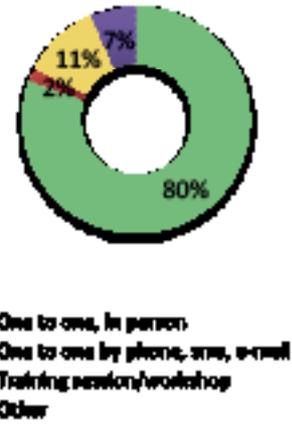
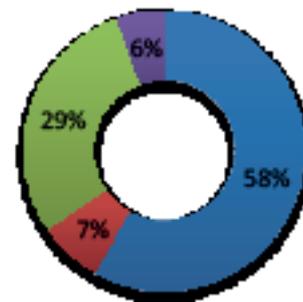


Fig. 12: Advisory methods - assessment (avocado)



Nevertheless, the whole innovation process was hampered by poor organization and coordination of actions related to the production and dissemination of reliable knowledge tailored to farmers' needs; their interaction with public and private advice suppliers was not satisfying. Particularly the interviewees pointed out that:

- a. There is a knowledge gap since the introduction of the cultivation in Chania. There is a lack of a strategic plan and thus of investment in knowledge generation on the part of the State and other actors involved. In the past this resulted in crop failures due to inappropriate propagation material and incorrect cultivation practices, since avocado growers had no access to technical advice based on properly validated scientific knowledge. The public organizations/ services, in general, are not able to provide proper answers to growers' questions; the seminars they organize are not enough to guide growers to solutions on their cultivation problems.
- b. Because of these failures, many of the first avocado growers almost abandoned the cultivation to turn again to it only when they were 'forced' by the worsening conditions prevailing in the orange and olive oil markets.
- c. There is urgent need for advice from experts and lifelong education/training activities, with emphasis especially on the young farmers' training. Such a lack undermines sustainability, since input suppliers based on farmers' ignorance promote the use of (unnecessary) inputs. On the other hand, uneducated farmers do not always fully perceive the need to protect the environment and consumers' health as well as

to take measures against climate change or, even if they understand, they are not motivated enough and they do not know how to manage their crops properly.

- d. Private input suppliers are just traders and not reliable advice providers.
- e. The local agricultural cooperatives fail to support farmers, because of lack of conciliation and concerted action, especially as opposed to some successful cooperatives in the Northern Greece which play a leading role in the exportation of certain agricultural products.

The AKIS-actors survey in Chania

The advisory landscape of avocado growers in Chania is formed by private, public and farmer-based actors/organizations activated at local, regional and/or national level (Table 3); they are also characterized by the fact that their primary mandate is not to provide advice to farmers. Advice is provided mainly on the basis of one- to-one in person communication with the most important sources of knowledge for the key advice suppliers being the avocado growers, public research centres and the public authorities (Fig. 10).

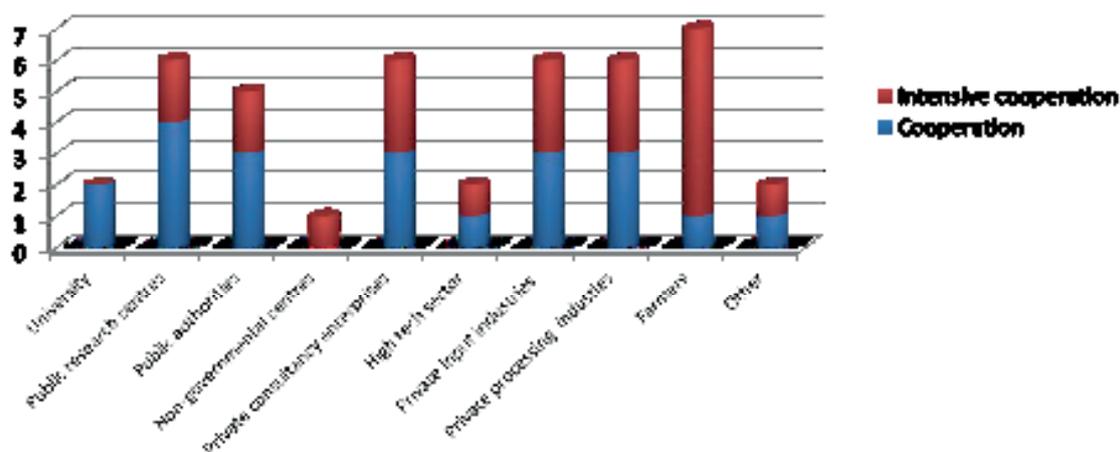
The Institute of Olive Tree, Subtropical Plants and Viticulture of Chania was the critical player triggering the initiation and the dissemination of the innovation for more than a decade, resolutely affecting the decision of the first adopters, partly due to the effort-

Table 3 - The advisory landscape of Chania

| Organization | Type/ Scale of action |
|--|---|
| The Mediterranean Agronomic Institutes of Chania (MAICH) | Intergovernmental organization/ International |
| Institute of Olive Tree, Subtropical Plants and Viticulture | Public research institute/ National |
| Directorate of Agricultural Economy and Veterinary | Public organization/ Local |
| Organic Producers' Cooperative | Farm based organization/ Regional |
| Agricultural Cooperative of Chania / Orange and avocado producers' group | Farm based organization/ Local |
| Input supply shops/ Nurseries | Private sector –Local / Local - Regional |
| Individual consultants | Private sector – Local |

Source: Fieldwork, 2018

Fig. 10: Important sources of knowledge, AKIS actors (avocado)



Source: Fieldwork, 2018

ts of its director who was a well-respected and influential actor locally. Nevertheless, some of these early adopters soon found themselves dealing with severe cultivation and marketability problems due to the lack of knowledge; thus some of them started decreasing the cultivated area or abandoning the cultivation. On parallel, the Institute gradually stopped playing its leading role due to of administrative problems. However, its impact is still evident since the majority of the nursery owners and researchers who played a key role in the dissemination of avocado the subsequent years had, earlier, collaborated with the Institute. Quite characteristic is the example of an academic researcher - today a pensioner- who has been providing advice to avocado producers (nowadays through participating in seminars) since 1970s, when he started collaborating with the Institute as a young researcher. The situation in the Institute started changing recently as new scientific staff, willing to collaborate and support avocado producers, has been recruited.

In this framework, a scientist of the Institute participates in an informal working group along with three other agronomists employed in the local Directorate of Agricultural Economy and Veterinary Service, the local Organic Producer's Cooperative, MAI-CH and the abovementioned retired academic. This group aims at supporting avocado growers by putting forward project proposals, which the regional government is invited to accept and realize. Their cooperation includes regular meetings on a voluntarily basis and the organization of information events and training for farmers.

The abovementioned actors recognize the importance of establishing permanent communication channels with farmers. They also point to the significance of peer-to-peer exchanges among producers but also highlight that, these exchanges often result in the perpetuation of false cultivation practices. In addition, they agree that this communication behavior accelerates the dissemination of avocado but they attribute the rapid expansion of the cultivation mainly to the worsening conditions in the citrus and olive oil markets. Furthermore, some of the interviewees point out the lack of public strategy as regards the empowerment of avocado producers to deal with fluctuating demand and price volatility as well as the inability of the authorities to take measures alleviating the consequences of climate change, especially with regard to water management.

Furthermore, the AKIS-actors identified severe deficiencies in public policies concerning the support that both avocado producers and advice providers need. They especially highlight the heavy bureaucratic structure and attitude of the public services "characterized by a 'down-at-heel' administrative culture.... focusing on subsidies instead of development". They also recognize that "scientists who provide advice should be supported ... Scientific platforms and databases with useful research material and tools, such as soil maps, are needed and they should be available to advice providers". Some actors also consider that "the State should organize special training for advisors to enable them to obtain a holistic view [of advice] and provide farmers with coherent and comprehensive advice on avocado" and that, in any case, "an advisory system should be able to gain farmers' trust...". Finally, some of the interviewees concluded that they "do not anticipate any change in advice provision", although there is qualified scientific staff willing to help avocado growers in Chania.

The introduction of the cultivation of stevia in Karditsa

The farmers' survey in Karditsa

The introduction of stevia in the Prefecture of Karditsa was based on the results of research programs co-funded by the EU aiming at alleviating the severe competitiveness problems of traditional crops such as tobacco, cotton and sugar beet. Searching

for alternative crops, two public research institutes -the Tobacco Research Centre and the University of Thessaly- carried out experimental fields with stevia and concluded that it is well adapted in several areas throughout the country, including the Prefecture of Karditsa. The outcomes of these projects were disseminated through the press and seminars targeting specific groups of farmers.

In 2012, a local group in Karditsa Prefecture took the initiative to organize such a seminar. This group, named Fanariotes, originating from the local community of Fanari, was active in calling experts to provide information on topics of interest to local farmers. They invited two academic researchers from the University of Thessaly and the Technological Education Institute (TEI) of Larissa as key speakers, who provided information on stevia cultivation practices and a new experimental method for the production of steviol glucosides, respectively. During the seminar participants became also aware of a preliminary market research depicting a growing interest for stevia in the markets. The fact that the academic from TEI could make the processing method available to farmers convinced some of them to establish a cooperative engaged in the cultivation, processing and trading of stevia (ASYST), aiming at the vertical integration of the production chain through the establishment of a processing unit. The cooperative was established by 21 farmers and its membership increased over time to 64 (Koutsouris and Zarokosta, 2018). During the next cultivation period the cooperative run pilot fields, under the guidance of the University professor; the following cultivation period the farmers, acting on their own, imported seeds from Paraguay and Spain and started establishing their stevia plantations

Raising awareness for stevia among Karditsa farmers was the result of the above-mentioned seminar with the two researchers stimulating the interest of farmers; some of them had already been in a process of thinking about changes and recognized stevia as an opportunity to increase their income. In the following years awareness activities were undertaken by ASYST members on the basis of one to one in person interaction or through workshops and group discussions (Fig. 11-14).

The assessment process for most of the adopters was triggered during the seminar and continued during the subsequent cultivation period, when they run pilot fields; members of ASYST attended seminars delivered in the University of Thessaly, while the University professor visited some farms and suggested cultivation practices to farmers. Then the farmers disseminated the knowledge they gained to their colleagues organizing discussions and visits to the pilot farms. Some farmers also sought information from a company engaged in the production and trading of aromatic and medicinal plants and stevia in another region; additionally, some looked for information from the input suppliers they collaborate with but none of them could advise them since stevia was unknown to them. During assessment the main motivation for adoption concerned the prospect of profits related to the potential operation of the processing unit. On the contrary, factors of non-adoption included financial constraints since farmers' involvement entailed the financing of the processing unit; uncertainty as regards the efficiency of the experimental processing method to produce products of the expected quality along with the lack of an alternative marketing plan; lack of advice on cultivation issues and worries of loss of income were also important. During the implementation process ASYST farmers collaborated closely, organizing discussions, paying farm visits and exchanging valuable knowledge. The main challenges they had to overcome were related to the supply and the treatment of seeds and planting material as well as to the drying process requiring special and very expensive facilities.

Conclusion

This paper explores the roles of advisors in three innovation cases. In the case of MD

the leading independent advice supplier, though it developed some intermediary activities, was confined to the traditional extension paradigm, creating awareness among farmers for a technical innovation and bridging the gap between researchers and farmers. On the contrary, the cases of avocado and stevia were characterized by the ab-

Fig.11: Actors- Awareness (stevia)

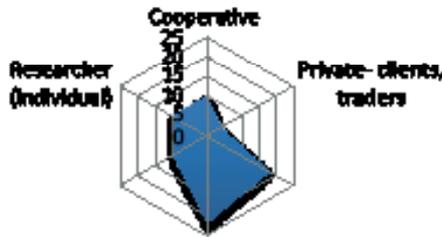


Fig.12: Communication methods- Awareness (stevia)



Fig. 13: Actors - assessment (stevia)

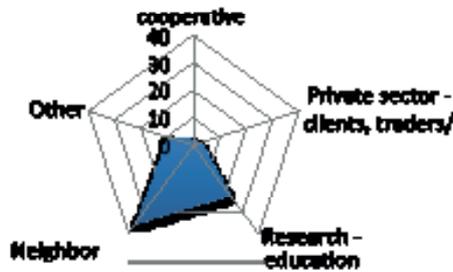
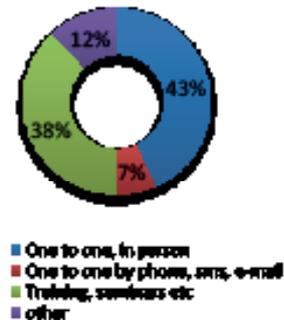


Fig. 14: Advisory methods, assessment (stevia)



sence of provision of extension services; instead various actors (agronomists, researchers, input sellers as well as individual farmers or/and farmers' organizations) tried to support and influence, to varying degrees, farmers' decisions making processes. The advisory landscape in the three regions varied significantly as well. In Imathia the collaboration between a cooperative and an independent advice company created conducive conditions for the adoption of MD, became an example to follow for other cooperatives and independent companies and, thus, contributed to a more structured support environment in comparison to the two other cases. In Chania the advisory landscape was muddled; various actors tried to support avocado growers and enhance knowledge with dubious results. Avocado growers relied at large on peer-to-peer exchanges throughout the innovation process. The main collective activity of the key advice suppliers was their engagement in an informal working group aiming at promoting proposals, which the regional government was called to endorse; however, this activity did not yet produce significant results. In Karditsa, the stevia cooperative was involved in experimental/experiential activities that enhanced its members' knowledge and ability to interact with each other. Nevertheless, the fact that all activities were confined within the cooperative did not allow for the creation of space for the development of interactions and synergies with other actors and, consequently, did not generate changes in the advisory landscape.

Advice suppliers in all cases identified farmers as valuable sources of knowledge; this indicates a possibility for co-creation of knowledge. Moreover, peer-to-peer interaction is a widespread practice among farmers, which also occurs among advisors in Imathia and Chania to some extent. However, important structures and capabilities for

co-creation and synergies seem to be lacking.

In a nutshell, first, in all the cases examined here it is quite obvious that, despite some efforts for synergies, the links among the local AKIS actors are weak; this, in combination with a lack of research outcomes tailored to the farmers' needs, affects advisors' ability to obtain and disseminate knowledge and consult farmers effectively and efficiently. Moreover, both farmers and advice suppliers admitted, to different degrees, inability in the provision of satisfactory advice services, with advice suppliers highlighting the lack of staff, necessary data and tools facilitating advisory work.

Second, there is a considerable lack in terms of farmers' vocational education as well as life-long training activities that would make farmers capable to distinguish between justified information and personal opinion and make reasoned decisions.

Third, a lack of advice suppliers' vocational skills was detected relating to both the technical knowledge and the advisory methodologies and tools.

Forth, there is a lack of national policies regulating advice provision to farmers; the implementation of European policies such as the Farm Advisory System is currently delayed as well.

However, this inability or unwillingness of the State to generate and/or apply the policies necessary to satisfy farmers' and advisors' educational and vocational needs as well as to set a working framework for rural advisors perpetuates advisors' inability to play their role, i.e. to initiate/co-create and support innovative processes and prevent farmers' misuse of their resources. This, in turn, largely hinders the possibility for sustainable development in rural areas.

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The most important actors in the Czech Agricultural Knowledge and Innovation System in farmers' opinions - The Czech case study on advisory services towards Precision farming in the AgriLink project

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Keywords

AKIS actor, MicroAKIS, advisory services, trigger change model, AgriLink (H2020), the value of information

Abstract

In the last decades, the EU strongly has focused its agricultural policies on innovation. The aim is to support cooperation and transfer of cross-cutting information among the actors of Agricultural Knowledge and Innovation System (AKIS) and farmers. This research is part of a project AgriLink (Horizon 2020, no. 727577). Particularly, AgriLink addresses the question of the role of farm advice regarding farmers' decision to adopt (or not) various types of sustainable innovations. This article includes a case study of precision farming. The research question is, "Who is the influencer in the farmer's decision-making process towards innovations?" This question was incorporated into a semi-structured questionnaire and conducted in two regions. The concepts used are the Trigger Change Model (TCM) and the MicroAKIS. The sample was collected by the snowball method.

The findings of the interviews show the type (namely size characteristic) of the farm as an important factor of implementation of the precision farming. In addition, they show that the most significant influence have suppliers and their activities. Furthermore, the experiences of other farmers in the area have also strong impact. The substantial attributes are the reliability and reciprocity of the actor, mainly established on long-term cooperation.

The personal opinions of the farmers are unique. The in-depth interviews conducted by independent researchers give us high-valued insight into the decision-making process.

Introduction

This research is part of an AgriLink project that has received funding from the European Union's Horizon 2020 research and innovation programme, under the number 727577.

Particularly, AgriLink addresses the question of the role of farm advice regarding farmers' decision to adopt (or not) various types of sustainable innovations (technologi-

cal, process, market, social or organisational). The research intends to identify the main actors (person/organisation) in the farmers' decision-making process towards innovations. Thus, the Trigger change model and AKIS concepts at different levels were used. In the Czech Republic, the Soil Improvement Technologies and the Precision Farming were chosen for closer examination. The innovation areas were explored in two focus region, particularly South Moravian Region and Central Bohemian Region. For this article, just findings related to precision farming will be presented. Detail description of both innovations will be published in the national report (Konečná M.M. et col., 2019).

Precision farming in the Czech Republic

Precision farming is the set of the particular technologies allowing the farmer to tailor the applications on the particular part of the field. Technology which allows the application of the development of od Precision farming is the GPS. The history of the GPS is quite short.

The main advantage of GPS is correlated with the measure of accuracy. Up to the time when the GPS started to have good accuracy, and accessible prize, the daily usage of the advantage of GPS navigation had been meaningless. The first supplier of the GPS technologies was John Deer, who introduced the first agricultural navigation to 15-30 cm. Nowadays, the farmers can use several possibilities of signal accuracy:

- Accuracy to ± 25 cm, free of charge, navigation through free public satellite
- Accuracy to ± 5 cm, paid, navigated through further satellite (in 2017 new satellite was introduced) which allows this accuracy.
- Accuracy to ± 2 cm, using the RTK correction, the stationary stations correct the inaccuracy of the moving satellites.

According to the description of the academic L two main waves of the innovation development occurred. The first wave was after 2000 when the US had stopped the intentional degradation of the Global Positioning System signals available to the public. Furthermore, in 2002, the deviation of GPS with enough accuracy started the boom of GPSs pioneer for farmers. The second wave started after 2010 when the prize of the GPS incredibly decreased, and usage became easy. The good experience was spreading fast and therefore the GPSs started to be spreading. Moreover, GPSs became a normal part of new machines.

The boom of suppliers is correlated with the accessibility of the precise public signal of the satellite and farmers' willingness to buy GPS and other related services.

According to the farmers perceiving, the current situation (about innovation in Precision farming). The accessibility of the GPS signal causes the boom of GPSs. Almost all farmers who bought a new tractor in the last 10 years have the GPS.

Although a lot of the farmers have the GPS on their machinery, only some of them used their GPS (30-40 % of farmers with tractor and GPS).

In which less than half of them – used GPS on an addition tool/machine (such as sprayer).

In which less than half of them – has autopilot and used them for the elimination of the over spraying.

In which only a few decades of them - use the machine (such as harvester with a yield meter per small unit) to evidence the yield per less than a field block.

In which just a few individual farmers used the data for full Precision farming (e.i. getting the information transferring them into the yield maps and providing the operations by autopilot according to the prepared yield maps).

AKIS concepts

AKIS in this paper – identify and define the organisations involved in knowledge production and exchange in the agricultural sector as a major activity (Röling and Engel, 1991) and includes process-oriented approaches AIS (Dockès et al, 2011), in order to assess the evolution of the relationships between AKIS actors and how innovations emerge, evolve and are taken up. This complex concept is hardly evident because of the fact that many actors important in the process have a primarily different occupation and there is no evidence of them (such as suppliers, distributors, other farmers)

Important is also the concept of the MicroAKIS, - personal advisory network of the farmer (farm). The micro-AKIS describes the micro scale knowledge-system that farmers personally assemble, including the range of individuals and organisations from whom they seek service and exchange knowledge with, the processes involved, and how they translate this into innovative activities (or not).

For the policy makers, the narrow range of AKIS is more feasible to work with. The strategic plans of the Czech ministry of agriculture (MoA) mainly the actors who could be influenced directly by the policy instruments (such as accredited farmers, supported NGOs, supported farms (demonstration farms, EIP), activities of the National Rural development network (NRDN).

This phenomenon has to be taken into account in further policy recommendation.

Advisory services in the Czech Republic

Before 1990, farm advisory services practically did not exist in the Czech Republic. Advisory services, as we understand them in their present state, were established in the years 1990-1992. In a view of large changes in ownership of land and farm buildings legislative advisory and solving of transformation, problems prevailed in advisory services. In 1999, the Ministry of Agriculture prepared, from existing experience, the Conception of farm advisory services. After the Czech Republic joined the European Union advisory system was harmonised with EU law (Pulkrábek & Pazderu, 2014).

In the last period (2007-2013) the FAS were established. By the end of the period, the databased included over 300 accredited advisors who carried out services for more than 1300 applicants. In the new period 2014-2020, the measure advisory services were prepared. Nevertheless, it was not started in 2018, the allocated money was reallocated to Measure 1 (Education transfer of information). It caused a decrease of accredited advisors to 202 nowadays. The new conception of advisory services for period 2017-2030 was introduced by the Ministry of Agriculture (Pulkrábek & Pazderu, 2014).

Nowadays, advisory services are supported by different tools and intensity. The national program support services such as demo-farms, associations and personal consultation with researchers. The Czech Republic is a relatively small country with a very integrated advisory system (Pulkrábek & Pazderu, 2014). Therefore, the rules for advisory services the advisory challenges are almost the same in all regions.

The accredited advisors are the main part of the narrow AKIS. Although they do not have direct support from the ministry.

Trigger change model

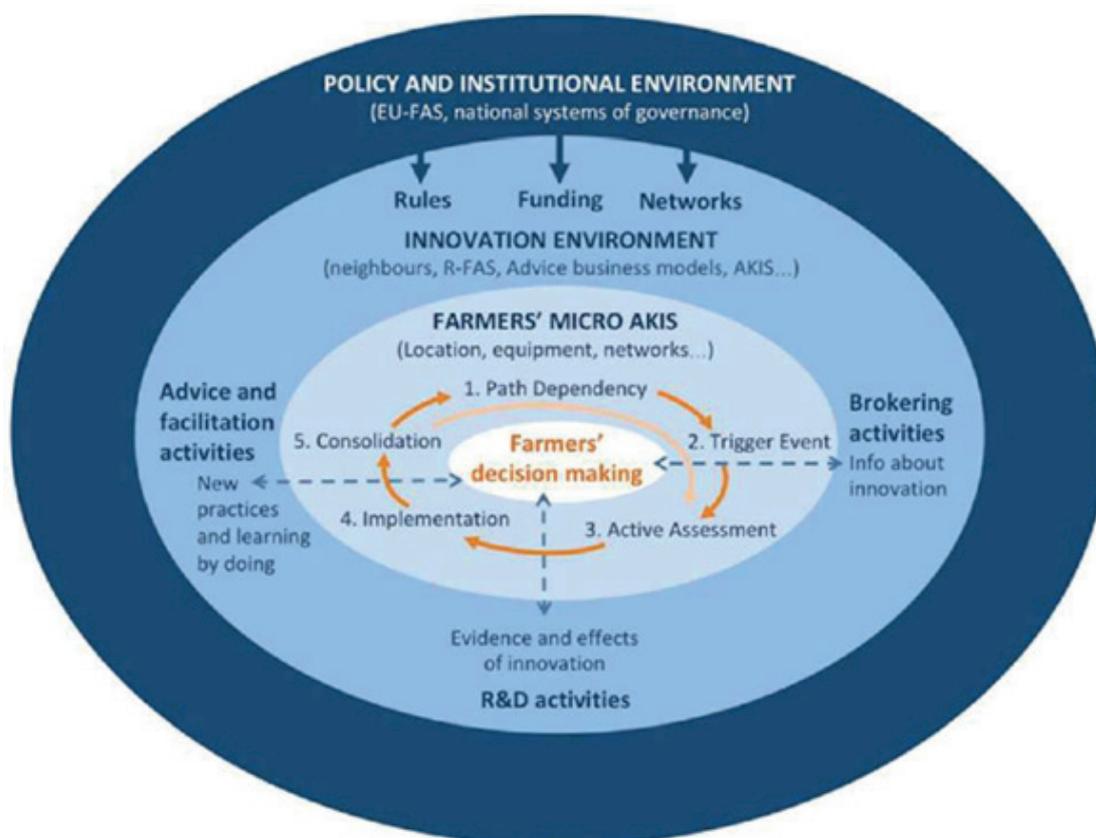
The trigger-cycle model established that farmer's decision-making regarding the innovation uptake is driven by a triggering event that initiates a path-dependency break cycle composed by three main phases, that can be described to account for the advisors role:

a) farmer's awareness of the innovation, encompassing brokering activities developed by advisors to disseminate the innovation and to (co-)create trigger events influencing farmers' decision-making processes; b) active assessing innovation entailing advisors

assemblage of information on the innovation costs, benefits, and side-effects by developing and involving in R&D activities; c) supporting farmers in innovation implementation by delivering advice and carrying out facilitation activities. Figure 1 offers an integrated view of the TCM and the key concepts that were implemented in WP2 through the case studies delimitation and the data collection at farm micro-level and at the R-FAS meso-level. More detail in the project conceptual framework (see Deliverable D1.1 (Sutherland et al., 2018)).

The Trigger Change Model describes the main stages of a decision-making process like awareness, assessment and implementation.

The detail description of the concepts used in the AgriLink Project is elaborated in the project conceptual framework (Sutherland et al., 2018).



Source: AgriLink (Sutherland et al., 2018)

Figure 1 Integrated view of the TCM and AgriLink key concepts

Sampling

There has been a methodology carried out to assess if the farmer introduced an innovation, or he only acquired new machine or equipment as a replacement for the old one.

In the beginning, we decided to make a wide pre-survey among the stakeholders to realise a possibility to identify relevant farmers. We asked our colleagues (researchers), representatives of the NGO in the regions, the accredited advisors etc. for a suggestion to innovative farmers and the type of innovation in the Czech Republic. We got approximately 45 suggestions. From this sample, we categorised the farmers according to region and type of innovation.

To ensure the relevant outcome, a sample was collected by the snowball method. To identify the first respondent, the AKIS actors (i.e. universities, advisors) were asked to determine innovative farmers in the region. Consequently, the interviewed farmers were asked to suggest other innovative farmers. The sample was closed when the new suggestions named the questioned farmers. The regional association helps us to complement the sample with non-innovative farmers with the required characteristics. The target population for sampling purposes was a group of farmers with similar technical-economic orientation amongst whom the innovation is already widespread, enabling to identify adopters and non-adopters that choose to not adopt the innovation. Hence the target population to be sampled is defined by two criteria: a) innovation adopters and (informed) non-adopters; with, b) a similar technical-economic orientation, whilst addressing farm structural heterogeneity among the targeted group of farmers, which might lead to the inclusion of farmers with different farm styles and/or business models. In addition, specific categories of non-adopters, such as droppers, or of adopters, such as partial adopters, were accounted for sampling purposes when found to be relevant in the targeted population.

To be able distinguished adopter and non-adopter, in Precision farming, we decided to make a threshold. As the adopters are considered only those who are using GPS with accuracy less than 5 cm and who are using that for more than just monitoring the track on the display. The farmers usually use the GPS on a tractor in combination with other equipment (like harvester, sew machine, tillage machine, sprayer). A lot of farmers use the GPS just to check the coverage of the field during the spraying. In case they do it by autopilot, we consider them as adopters. In case they do it by manual steering, then we consider them as non-adopters. The setting of the threshold for adoption of Precision farming is an academic discussion. The farmers mainly perceive the use and introduction of the technologies as the common and ongoing development of the farm. Some farmers monitor the quality of the soil on their fields and adjust the application of the fertilisers according to the results from field analysis. According to our interviews, this part of precision farming is implemented also in small farms. The service is provided by the supplier of the service.

The large farms usually complain that the services are not transparent, and they could not be sure about the quality of analysis and following application of pesticides or fertilisers. They said, "We are not willing to pay expensive services with unsure quality and results." Therefore, they prefer to have as many processes under control as possible. This approach leads the farmers/agronomists to make their own analysis of the field and buy (or construct) the relevant machinery and equipment. The essential factor is that they have enough capacity to invest in this process.

The interviewed AKIS actors were selected according to the farmers micro AKIS identified in the interviews. It includes both AKIS actor from the innovation area and a main actor of the daily base decision making.

Results and Implications

Development of Precision farming

The following tables show how precision farming was spread among the interviewed farmers in the farmers' opinions. And who is the most frequent influencer. The process is divided into three main phrases of TCM: Awareness stage, Active assessment and Implementation phrase. In relation to the historical development of GPS technologies mention in the text above, we divided the time-period into three time-periods: before 2000, between 2001-2010, and after 2011.

The tables also show that the process of implementation is really new, although the

idea of Precision farming is not new. The farmers are always trying to decrease of the inputs while increasing the yield.

Only 20 % of the respondents were aware of Precision farming before the year 2000. 49 % of respondents got aware in the period 2001-2010 and 31 % after the year 2011. The phrase of active assessment is shifted into later periods. Only one respondent (3

Table 1 The key players in Farmer's innovation micro-AKIS in different time periods

| | Time period | AKIS Play ers | | | | | Number of Respondents |
|-----------------|-------------|---------------|-----------|----------|----------|---------|-----------------------|
| | | NGO | Suppliers | Advisors | Research | Farmers | |
| Awareness stage | up to 2000 | 4/3 | 6/4 | 2/2 | 6/3 | 5/3 | 7 |
| | 2001 - 2010 | 9/6 | 8/3 | 6/3 | 9/5 | 9/6 | 17 |
| | 2011 - dtto | 4/4 | 8/4 | 1/1 | 2/1 | 4/1 | 11 |

Source: AgriLink – Country

% of the total number of the farm where they went through the active assessment). 30 % assessing in period 2001-2010 and 66 % actively assessed precision farming in the last period.

The stage of implementation is 12 respondents who implemented precision farming.

Table 2 The key players in Farmer's innovation micro-AKIS in different time periods

| | Time period | AKIS Play ers | | | | | Number of Respondents |
|-----------------|-------------|---------------|-----------|----------|----------|---------|-----------------------|
| | | NGO | Suppliers | Advisors | Research | Farmers | |
| Awareness stage | up to 2000 | 0/0 | 0/0 | 1/1 | 1/0 | 1/0 | 1 |
| | 2001 - 2010 | 6/3 | 6/4 | 2/2 | 5/3 | 6/4 | 10 |
| | 2011 - dtto | 15/11 | 16/8 | 5/2 | 8/6 | 15/10 | 22 |

Note: the first number shows the total amount of incidence, the second number shows cooperation on regular bases

Source: AgriLink – Country

5 of them implement in the second period (2001-2010) and 7 of them (58 %) implement in the last period. The interesting is the number of advisory services used in each period. 5 respondents mention they consult the implementation only with 9 advisors organisations (it is 1.8 advisor services/actors per farm). In comparison with the last period, where 39 advisor services/consultation were provided to 7 farms (so 5.7 advisor services/actors per farm).

In the last period the other farmers (31 %), already experienced, have a strong influence. The suppliers which play significant role in the middle period (55 % of all advise services). They were slightly after other farmers in the last period (just 28 %). So they keep their position in the micro AKIS

Table 3 The key players in Farmer's innovation micro-AKIS in different time periods

| | Time period | AKIS Play ers | | | | | Number of Respondents |
|-----------------|-------------|---------------|-----------|----------|----------|---------|-----------------------|
| | | NGO | Suppliers | Advisors | Research | Farmers | |
| Awareness stage | up to 2000 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0 |
| | 2001 - 2010 | 0/0 | 5/5 | 1/1 | 2/2 | 1/1 | 5 |
| | 2011 - dtto | 4/2 | 11/5 | 4/3 | 8/7 | 12/11 | 7 |

Note: the first number shows the total amount of incidence, the second number shows cooperation on regular bases

Source: AgriLink – Country

The comparison between the total amount of incidence and the cooperation on regular bases shows that actors significant for the implementation have regular based cooperation with farmers. As the farmers mention the reciprocity and the trustful relationship with AKIS actors is the most significant factor to accept and to follow the given advice.

Farm characteristics by adoption

The sample was collected according to the methodology mentioned in the chapters above. The average size in the sample is 1546 ha in the range from 63 ha to 8000 ha. The correlation of adoption and the possibility to implement is obviously related to the size of farms. According to the

Table 4 - Farm size by the adoption

| | <i>Total sample</i> | <i>Adopters</i> | <i>Non-adopters</i> |
|---------|---------------------|-----------------|---------------------|
| Average | 1545 | 2241 | 357 |
| Min | 63 | 140 | 63 |
| Max | 8000 | 8000 | 1377 |
| Number | 35 | 19 | 14 |

Source: AgriLink – Country

size and other characteristics, we divided farms into the groups of farmers. The description of the groups demonstrates that the characteristics like the size, type of holding, age of the leading person, (the capacity of the farmer/their employees) and owned land are main characteristics to identify the groups of farmers who are considered to practise precision farming (by our definition) more likely than others. Due to the most visible feature, we divide the farms according to the size

- The highest probability to implement an innovation - The big farms there are mainly farms over 1 000 ha (in the range from 140 to 8000 ha). Holding, young leading person/persons, (specialists), huge technology and large-scale machinery base,
 - The probability to implement related to the combination of the named factors. - The middle farms (200-1 800 ha),
 - The lowest probability to implement an innovation - The small farms they have mainly a size less than 500 ha. Rather sole holders, few small-scale machines.
- The significant outcomes of the in-depth interviews are identifications of the huge differences in the capacity of the farm innovation leaders and their co-workers. The divided groups are coping the size and other characteristics mentioned in the previous paragraph.
- The big farm has specialists who almost know what they want in the particular phrase of farming. Moreover, they have the capacity to attend all agricultural events related to their specialisation. The wide range of activities is spreading among more specialists. The accessibility of the main person, usually the head of the farm, is more complicated than on the smaller farms.
 - The middle farm must integrate multiple functions/issues into one person. Despite they are not big, they are profitable for market agents (suppliers). The head of the farm is usually accessible for decision making and direct discussion. Moreover, they are more feasible for trial experiments on the farm.
 - The small farm must integrate all farming knowledge, administration, physical work into one or two persons. Therefore, their capacity is limited to entry into such complex and expensive innovation. Although, they have a great overview about their fields and they are able to fulfil the idea of precision farming

(i.e. variable application according to the soil/crop condition) without the high investments into the technology and machinery.

Conclusion

To sum up, the main distinguish characteristics between adopters and the rest of farmers are the size, the type of holding and the number of workers. The adopters are usually holdings or group holdings, larger than 1000 ha with over 20 workers. Their manager is about 40-50 years old. The usual AKIS actors in the decision-making process are the suppliers and other experienced farmers (Konečná M.M. et col., 2019). The level of adoption is highly related to the accessibility of the GPS technology. Thanks to the fast digital development, we could expect that the proportion of the adopters and the non-adopters among the farmers will be growing.

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Top-down farm advice is still alive! Farm advice as a tool of symbolic imposition: insights from a French case- study

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Context:

Today researchers and experts highlight the virtues of farm advice – not top-down, based on a transfer of knowledge from the adviser to the farmer – but interactive, allowing the co-construction of knowledge adapted to the challenges faced by the farmer. However, in some countries as France where technical prescriptions is mainly carried out by farmers' coops, farm advice follows a top-down process: based on a case-study, we will show that it favors a phenomenon of symbolic imposition that transforms farmers into 'contract workers', stripped of autonomy in the production process.

Purpose, question

After having shown the phenomenon of symbolic imposition favored by (top-down) farm advice, this communication aims at understanding the mechanisms through which it folds. Identifying these mechanisms makes it possible to denaturalize the phenomenon, to give it a social existence to denounce it.

Design, method, approach

This communication, rooted in the sociological tradition, rests on a case study: the introduction of a new production (chickpea cultivation) in a French rural department (Gers). It displays a structural thinking: actors, who carry their own history, are caught in systems of relations. Focusing on their social properties, this reasoning aims at identifying the actors' dispositions to act (which are informed by their history) and their position in the balance of power (which is informed by the systems of relations).

Data collection

Carried out in the framework of Agrilink, this communication is based mainly on about fifty semi-structured interviews. Part of it was conducted with farmers who introduced chick pea cropping. The first farmers we met were contacted through their advisers. To circumvent this elitist bias (advisors telling us farmers they think models), we then relied on the farmers surveyed, asking them to tell us colleagues growing chickpea. Part of the interviews were conducted with advisers accompanying farmers. We have taken care to conduct interviews with the main service providers of the Gers department, which correspond to the main agricultural cooperatives. This survey also relies on written sources, but these are scarce, given the novelty of the production studied.

Results

We will show that the interlocking of the agricultural production field with that of agricultural trade whose organizations - the cooperatives in particular - claim the activity of farm advice blurs the existence of interests specific to these distinct spaces. De jure the “technico-commercial” of the cooperative that carries the technical prescriptions is the employee of the cooperative whose farmer is a shareholder. Though, the agricultural trader de facto holds the keys to the markets open to farmers: the technical prescription is endowed with an economic force that the production contract linking the farmer to the cooperative materializes. The interlocking of spaces blurs the interests of each party, a phenomenon accentuated by the (claimed as exclusively) technical dimension of farm advice activity. Although resistances are waged by trade union dissidents, the cooperative enterprises that they have initiated tend nevertheless to reproduce the pattern denounced.

Knowledge Diffusion and Precision Farming: Farmers and Advisory Suppliers in North-East Scotland

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Keywords

Precision farming, advisory suppliers, knowledge diffusion, AKIS, North-East Scotland

Abstract

The 'AgriLink' project is looking at the role of advisory services related to the adoption of precision farming. Precision farming is understood as the adoption of technology to reduce variation and add a degree of control and accuracy to farms whether arable or livestock. Precision farming potentially provides cost savings, environmental benefits and increased levels of efficiency. However, little is known about the role played by advisors in the decisions of farmers seeking to adopt precision farming technologies. This paper is based on research in the H2020 'Agrilink' project which seeks better understanding of these knowledge flows and decision-making processes.

Purpose

The goal of 'Agrilink' is to foster more sustainable transitions in European agriculture through an analysis of the role of advisory services. Precision farming is one such transition and this paper highlights the complexities faced with effective communication of knowledge from the advisory suppliers to farmers interested and capable of adopting precision farming technology.

Methodology

The North-East of Scotland is identified as a key area of innovation in the H2020 'Agrilink' framework. Across July 2018 – February 2019, interviews were carried out with: farmers who have adopted the technology; farmers who initially adopted but then dropped the technology; non-adopters; and key AKIS informants involved in advising on precision farming, including both independent and private advisory suppliers. The interviews explored the role of advisors in decisions to adopt precision farming technologies. This paper is based on insights from these interviews.

Results and Implications: Farmers are known to be active in their pursuit of knowledge. Precision farming has become both a common term to a mass audience, and an area of interest to farmers looking to innovate their agricultural practices. Following the 'Elaboration Likelihood model' (Petty & Carpaccio, 1986), farmers are identified as capable of storing much knowledge around different farming techniques and applications and calling upon this knowledge at a later date, notably when a farmer intends to make a change. The 'Triggering Change model' (Sutherland et al., 2012) posits that a trigger event

can cause peripheral knowledge to become centralised. Our research findings demonstrate that a cohort of farmers dismiss opportunities to engage in precision farming on the basis of such peripheral route processing. The challenge for advisors is how to encourage farmers to actively engage with the potential of precision-techniques. This can be influenced by the position of the advisor within the Agricultural Knowledge and Innovation System, particularly if the advisor is associated with a for-profit company (e.g. precision equipment sales).

Possible roles and functions of education of advisors for boosting innovation in the Hungarian sheep sector:

Extension and Education: roles, functions and tools for boosting interactive approaches to innovation

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Keywords

Innovation, extension, sheep breeding, Hungary

Context description

In Hungary, sheep breeding has a long-standing tradition and an unique status in livestock farming. It produces almost exclusively one product (lamb) and nearly the whole stock (80- 90%) is exported every year as live animal. The income from the wool and milk is unremarkable. Furthermore, 90-95% of yearly exported 600.000 lambs has only one market: Italy. The export is concentrated to only three periods of the year before Easter (spring), Ferragosto (August) and Christmas (December). The mentioned circumstances ('one product' to 'one market' with a short sales period) create a very vulnerable market situation.

It is important to note, that the country's sheep stock consists mostly the Hungarian merino breed with weaker-than-average growth, carcass and meat quality parameters and low prolificacy. This reduces the competitiveness of the Hungarian sheep sector as well.

Purpose, questions

On the other hand, there is a large scale of ready-to-use new techniques and innovations to reduce the very vulnerable market situation of Hungarian sheep breeding and raise its profitability. Despite of this situation, these innovations are absolutely not widely prevalent and farmers do not use them in every-day practical life. There is a lack of knowledge-transfer, the mediator actor is currently missing.

Design; methodology; approach;

To understand the current situation, firstly, we should examine the possible mediator actors to fulfill the missing role in knowledge-transfer, and the gather information about the operation and structure of extension in Hungarian sheep breeding and answer some questions about its long-ago unserviceability. On the other hand, studying the sheep breeding sector's (mostly the farmers') demands is also a key aspect of the paper as

well as the extension's present dysfunction, actualities and all the existing circumstances and influencing factors, to reach the general aim successfully: the elaboration and development of a new professional and training structure to grow the availability of innovations for farmers.

Data collection and analysis; evidence;

Data and information were collected from the Hungarian Chamber of Agriculture and the Hungarian Sheep and Goat Breeders' Association to get a clear overview about the operation and structure of extension in Hungarian sheep breeding. To help the deeper analysis, the examination included further consultation of the main stakeholders (agricultural advisors and farmers) by means of questionnaires and interviews.

Results and Implications.

According to the processing of data collected from Hungarian Chamber of Agriculture, 217 agricultural advisors are registered with expertise on sheep breeding. 46 instructors are involved in the work of Hungarian Sheep and Goat Breeders' Association. The number of the registered agricultural advisors and instructors could mean a solid basis to improve the knowledge-transfer and innovation in the sector, but after the evaluation of interviews and questionnaires, the true picture presents a different situation. The instructors are involved only in the administration work of farm management, and only some of the registered agricultural advisors work together with sheep breeders and they could not cover the market needs.

According to the examination of the farmers' requirements, the younger generation requires the information about the ready-to-use new techniques and innovations. The need of the state-of-the-art advisors is a real market demand in their case.

The evaluation of questionnaires are lightened that beside the professional training, the advisors have a demand for practice-oriented methodological training as well. As long as the advisors do not possess appropriate methodological competences, there is no efficient knowledge-transfer towards the farmers. It is necessary to elaborate and develop a new professional and methodological training structure to ensure the farmers the access to the up-to-date knowledge.

Multi-actor approaches to innovation in organic farming: role of Organic districts in Italy

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CREA – Council for Agricultural Research and Economics

Keywords

Interactive innovation, organic district, operational group, EIP

Abstract

The common values pursued by the European Innovation Partnership for Agricultural productivity and Sustainability (EIP-AGRI) and the organic farming, fostered the participation of a relevant number of organic operators in Operational Groups (OGs), where they are consolidating collaborative and multi-actor approaches for the purpose of spreading innovation towards a more sustainable agriculture.

Indeed, out of actual 207 Italian OGs, 12 projects deal with innovating organic farming practices, although several other operational groups indirectly address this topic also and at least 25 OGs still in setting up are related to the organic field. According to recent studies (Cristiano and Proietti, 2018; Sturla et al., 2018), some Organic Districts (ODs), as partners of the OGs, are playing a valuable role in boosting and intermediating innovation processes for organic agriculture. The ODs can be defined as territorial agreements that collect actors, local institutions, and stakeholders around organic farming and its values. Indeed, the nature of collective subjects provides the ODs an attitude to act as typical innovation support services (Mathé et al. 2016; Faure et al., 2017), such as collecting innovations' needs, aggregating partners, identifying possible solutions and opportunities coming from the territory, and a privileged standing point for disseminating them.

The number of ODs in Italy has rapidly grown during the last decade. In 2018, INNER, the association that gathers most of the organic districts, has counted 32 established ODs, 2 of which are partners in selected OGs (OD Bio Venezia and OD Colli Euganei) and 5 have participated in groups which applied for Measure 16 of RDPs (OD Bio Altopiano Asiago, OD Balticòs, OD Montalbano, OD Chianti, and OD Val di Vara).

Considering these evidences, the objective of the study is to analyse in depth the role of ODs in boosting and intermediating innovations in their territories.

The theoretical background of this study is based on the literature and previous studies on innovation support services.

The methodology applied for the analysis is based on desk research and case studies. Desk research relied on the databases of the OGs (National Rural Network, European Commission, Managing Authorities) and the INNER website, which provides updated information about the ODs.

The conduction of case studies on ODs are aimed to acquire qualitative and descriptive information about the role and functions undergone by ODs in OGs. The results of

this study put in evidence that ODs are effectively acting as innovation support services in cooperation projects. Particularly, building on their strong link with the territories and their trustiness among the communities, ODs are able to intercept the local demand of innovation, to facilitate the relations among research and productive worlds and to mediate transition processes to sustainable agriculture.

Given the novelty of the ODs in Italy, the knowledge acquired on the roles and functions played by them in OGs provides significant insights about their better configuration as territorial actors and promoters of local (innovation) initiatives aimed at raising the level of sustainability along the organic supply chains and of integration with other activities on the territory.

Policy implications of this study regard mostly the recognition of ODs as a new actor to be considered in policy design and implementation, specifically of the AKIS strategic plans. In Italy, this would be possible if the process of approval of the new law on organic farming, often launched in the past legislatures, would come to an end. Also the identification of specific tools and methods to facilitate the role of organic districts as supporters of innovation and training services would be appropriate, although not specifically supported by the law proposal.

Finally, the results of the present study could help the identification of a precise role for the ODs and, more broadly, to agro-food districts and similar subjects (eco-regions, bio-regions and so on) in the next programming period of the CAP 2021-2027.

Farmers' use of information sources and adoption of reduced soil tillage technologies – the case of Russian Siberia

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Keywords

Innovation adoption, information sources, extension, reduced till

Abstract

Background and objectives

This paper addresses environmental challenges in the supply side of the ecosystem services from a farmer point of view. Major emphasis is placed on the role of information provided by various institutions and organizations on Russian farmers' adoption of reduced tillage in Altai region.

The Altai region (southwestern Siberia) is one of the largest agricultural production areas in Russia. Due to inappropriate cultivation in the past, the soil is threatened by soil degradation (Illiger et al., 2014).

Previous studies recommend "reduced tillage systems" as a sustainable method of cultivating land endangered by soil degradation in the former steppe areas of Altai krai (Damman, 2011). Up to now, the adoption rate by farmers is still low. Deep soil cultivation that is especially blamed for the negative effects on soil structure and thus on soil erosion is still used.

One of the reasons behind the low number of adopters of the reduced tillage systems is the difficulty of understanding and accounting of new systems' benefits by farmers (Jelínek and Bavorová, 2015).

To our knowledge, a comprehensive empirical analysis of the information-seeking behaviour and its effect on farmers' environmental land use behaviour has rarely been carried out in Russia. The main aim of this study is to fill this knowledge gap and to contribute to the understanding of how use of various information sources on agricultural management influences farmers' reduction of use of intensive deep tillage cultivation and instead adoption of new soil cultivation systems.

Design and data collection

The presented study uses survey information on farmers (N=107, year 2016) collected in Altai region. The survey includes information on the farm and farm manager

characteristics, adopted soil cultivation technologies, and information sources used by farmers.

The logit model is applied to predict the probability of farmers' application of new soil tillage system. Study considers the application decision (the share (%) of arable land on which the environmentally unfriendly old style deep tillage with depth of more than 20 cm is applied) as a dichotomous problem (1=adopters with less than 20% of area with deep cultivation and 0=non-adopters with more than 20% area of deep cultivation) for estimation.

Results and implications

Our findings demonstrate that a large farm size, high labour intensity and high share of rented farm land decreases the probability of use of tillage with reduced depth by farmers. Furthermore, the results provide a first indication that large corporate farms and farms with high profit-oriented objectives less probably apply new reduced depth tillage.

Farm managers' participation frequency on trainings increase the probability of adoption of less intensive soil tillage systems. Differently, farm workers' participation frequency to trainings decrease the probability of use of less intensive tillage systems. The reason for this is difficult to explain. Opposite of our expectations, consultation frequency on agricultural management issues from private consulting firms and from Ministry of Agriculture was found not to be a statistically significant determinant for explaining adoption behavior in our model. This imply that the extension services fail to provide farmers sufficient knowledge about the negative effects of deep, intensive soil cultivation on soil fertility as it contributes to soil degradation and erosion. As the Altai Krai region soils are endangered both by water and wind erosion the problem is a public one. Therefore, we would recommend the policymakers to introduce measures that would increase the effectiveness of extension services by Ministry of Agriculture in information provision on positive effects of reduced tillage on prevention of soil degradation and soil erosion such as impact assessment of training and consultations provided.

Advisor conceptions of roles and functions in the context of privatised extension: A comparison of Australian and New Zealand advisors

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Keywords

Extension agents, rural advisors, roles, functions, privatised extension

Abstract

Purpose: To assess if advisors' conceptions of their roles in an established privatised extension system: (1) match the goals of privatised extension, and (2) differ systematically from those of advisors in an emerging privatised system.

Methodology : We surveyed advisors regarding their conceptions, beliefs and assumptions about their roles. The survey included: (1) degree of agreement with five topics (e.g., dialogue and horizontal coordination, diffusion of technologies); and (2) questions on: (i) levels of action (e.g., individual, group); and (ii) fundamental objectives (productivity, commercial strengthening, wellbeing). The survey was sent to over 600 advisors in New Zealand and Australia. Data from 57 respondents was analysed for statistical differences.

Findings: Australian and New Zealand respondents agree that extension is an interactive and farmer-led process, and identify strongly with advisors as a professional that helps improve farmers' productive or organisational practices. Advisors from both countries prioritise management of natural resources, however, Australian advisors place less priority on building farmer business capacity.

Implications: Respondents identified the provision of a public good as the top objective of extension. This is counter to previous observations that privatised extension can result in gaps in advice on topics such as environmental sustainability. Our findings may be related to increasing requirements for compliance with environmental regulations, and suggests this could stimulate advisor prioritisation of this topic.

Originality/Value: When addressing privatised extension, researchers have taken a predominantly institutional view. There is less research on the view of advisors themselves, particularly regarding how they understand their role.

2 Education and Extension: roles, functions and tools for boosting interactive approaches to innovation

Utilising a campaign strategy instrument to influence behaviour change in crop farmers

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Keywords

Facilitation, communication, innovation, behaviour, farmers, campaign.

Abstract

This paper demonstrates the experience of using a tool to develop effective and innovative behaviour change campaigns and focuses on the challenge of using data generated on-farm to support informed decision-making. The ability for the industry to use this data is underpinned by environmental and individual behaviour factors which must be addressed to ensure quality of research, education, advisory, knowledge exchange and support services.

A cross-sector team of horticulture, arable and farm economic specialists utilised the campaign strategy instrument 3.0 (CASI) and RESET mindset model (rules and regulations, education information, social pressure, economic impulses, tools) to complete a campaign analysis, behavioural analysis and development of a strategic approach, including a goal for each of the factors identified as having the greatest influence on behaviour.

The campaign of interest in this paper has the behavioural ambition of farmers using in-field pest monitoring to reduce pesticide usage, and therefore costs, while maintaining yields. Having investigated the factors with the greatest influence, the campaign activity focused on a stimulus nudge, specifically a sticker, designed to challenge farmer mind-set on whether they need to apply plant protection products by introducing specific features into the physical environment.

Communication and advice services to support farmers and other rural stakeholders must start with understanding the context of the challenge, behavioural factors and appropriate working methods. The methodology presented in this paper can be adopted by extension services to increase the efficiency of innovation and the adoption of research, good practice and advice within commercial farming systems

Why doing what you have always done will not get you where you want to be - Making impact through evidence based behavioural change

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Keywords

Campaign, behaviour, knowledge, research, innovation, strategy, communication

Abstract

The paper outlines the process undertaken by a group of livestock and economic specialists to develop a farmer-facing campaign, aiming to stimulate responsible use of antibiotics. Changing behaviour using campaigns begins with a full understanding of the current and desired behaviour to choose effective communication instruments. The Campaign Strategy Instrument (CASI) and RESET Mindset model were used to guide the group through a step-wise process. This process included:

1. Policy analyses and understanding current and desired behaviour. The current context of farmers' behaviour regarding responsible use of antibiotics was analysed, resulting in opportunities for campaigns directed to change behaviour. The desired behaviour was formulated to utilise current available medicine records and increase understanding by discussing these records routinely with farm advisors.
2. Behavioural analyses identified the key influential behavioural determinants to display the desired behaviour: the physical resources required to fulfil the behaviour (e.g. availability of an easy-to-review medicine book), knowledge and understanding (e.g. data analyses) and the creation of a new habit (e.g. frequent review with farm advisors).
3. Strategic approach to select the most effective communication strategies directed to influence the behavioural determinants. The strategic plan included developing cartoons for use on advertisements to promote the topic and forms designed to enable farmers to analyse medicine use.

This stepwise approach led to new insights on effective campaign design directed to farmers. Although effects need to be evaluated, this new approach may result in a more efficient use of resources available to change farmer behaviour leading to a sustainable livestock industry.

Women in Agri-tech: Increasing participation in the future of agriculture

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Keywords

Agri-tech, Female, High school teachers, STEM, Mentoring

Abstract

Women are underrepresented in the Australian agricultural workforce and to ensure the industry reaches its economic potential, this needs to be rectified. The 'Women in Agri-tech Program' aims to increase the skills and knowledge of female high school teachers to inspire and enable them to implement agri-tech tools and concepts in the classroom. Over 12-months, the 15 teachers from across Australia who were selected to participate in the program will develop an agri-tech learning module with support from industry experts and agricultural researchers. As teachers are key influences of student's post-school pathway, it is anticipated that participants will act as role models for the young women they teach which will see more females enter the agricultural industry. This paper reports on the preliminary results of the recruitment and selection process developed for the Women in Agri-tech program, looking at how teachers believed they would benefit by participating in the program and their current perception of further study and careers in agriculture and STEM disciplines for their female students.

Background

While agribusiness has been named as a key driver of potential economic growth in Australia in future years (Deloitte, 2015), educators and their students are often unaware of the abundance of opportunities available to them in this sector which demand science, technology, engineering and mathematics (STEM), and entrepreneurial skills (Bray and Cay, 2018). The agricultural industry is changing with the ever-increasing use of technology demanding a workforce with a higher degree of digital literacy, STEM knowledge and skills (Australian Government Parliamentary Committee 2016). More than this, a culture of innovation and entrepreneurship is necessary to see the full potential of digital technologies applied in agriculture.

Improving gender equality in Australia has the potential to add \$225 billion to the gross domestic product (GDP) by 2025 (McKinsey and Company, 2018). Advancing the equality of women in the agricultural workforce could assist the industry in realising the target set by the National Farmers Federation of farm output valued at \$100 billion by 2030 (Poole et al., 2018). Currently, women comprise close to 50% of the Australian workforce across all industries. However, in agriculture, females make up only 32% of

employees (Binks et al., 2018). Of primary concern is the lack of women in leadership positions in agricultural businesses, with only 14% of females in management roles (Brown, 2017). When it comes to board representation, only 6.5% of boards and governing bodies in agriculture have at least half of members being women, with 70% having no female representation (Cassells et al., 2016). To change this trend, the next generation of young women need to be inspired, have access to female role models and encouraged to consider a future in the agricultural industry.

Purpose

This paper will report on the first phase of a new professional development approach to providing support services for female teachers involved in training the next generation of innovation entrepreneurs in agriculture. Known as 'Women in Agri-tech: Increasing participation in the future of farming', and funded by the Australian Government's Department of Industry, Innovation and Science (from 2018 to 2020), the project aims to build the capabilities of participants from rural, regional and remote communities, inspiring and enabling them to incorporate an innovation ecosystem into their teaching programs. Central to the innovation ecosystem of the project is the knowledge-construction relationship between the disciplines of STEM and agriculture; the curriculum frameworks of secondary schooling systems that are subject to jurisdictional differences in content and administration; and agriculture-related industries operating in globally competitive environments.

Consequentially, there are three anticipated outcomes of knowledge exchange and enhancement. First, the female teachers themselves will have deepened and extended their knowledge of STEM and agriculture for curriculum enhancements in their subject teaching areas; and developed entrepreneurship skills as leaders in agriculture education. Second, through their efforts, their students will be among the next generation of female agricultural leaders to pursue future farming related careers. Third, participants will be able to advise colleagues of agri-tech related curriculum developments in their own teaching areas.

The participation of high school students in STEM subjects in their final years of schooling have consistently fallen, with the percentage of females choosing these subjects traditionally lower than their male counterparts (Kaspura, 2017). Research has shown that there is a higher chance of female students choosing to study STEM subjects at school and then university if they are taught by women (Bottia et al., 2015; Bettinger and Long, 2005). Providing female students with both formal and informal learning opportunities in STEM is also known to influence participation in these disciplines (Weber, 2011). Furthermore, professional learning opportunities and continued support have been identified by teachers as valuable to assist them in incorporating technology into the classroom (Hayden et al., 2011).

Based on the research, it is anticipated that the Women in Agri-tech program will build a cohort of teachers who can act as advisors for their colleagues who wish to incorporate agri-tech into the classroom and role models for female students who are considering the direction of their future careers. The program is innovative in scope and design with this being the only initiative aimed at female high school teachers to improve the participation of females in the agricultural workforce in Australia. Program design will see teachers develop a unique agri-tech learning module with support from industry and researchers. An agri-tech symposium, mentoring and webinars over the 12-month program will build participant capabilities, both in content knowledge and leadership skills.

Methodology, data collection and analysis

This paper reports on phase 1 of the project, the recruitment and selection of participants. Female STEM and agriculture teachers from regional, rural, and remote regions of Australia were invited to apply via the project web-site (<http://womeninagri-tech.com/apply-now/>). The project received ethics approval via CQUniversity's Human Ethics Research Committee and applicants were advised that data collected would be used in anonymised research outputs from the project. Applicants had to meet the following criteria:

- Female
- Classroom teacher of STEM and/or agriculture
- Teaching in an inner or outer regional or remote or very remote high school
- Can commit to participating in the whole program – see key dates
- Have Principal permission
- Be willing to participate in the research program
- Survey of at least one class of students at your school about perception of agriculture and technology
- Evaluate effectiveness of learning module developed with students
- Online surveys, focus groups and interviews to evaluate the impact of the Women in Agri-tech program

The definition of remoteness was determined from that of the Australian Bureau of Statistics Statistical Geography Standard (ASGS) Remoteness Structure (Volume 5, cat. No.1270.0.55.005).

Fifteen female teachers (from 68 applications) from each State across Australia and the Northern Territory were selected to participate in the 'Women in Agri-tech' program. All teachers were from regional, rural and remote areas of Australia as students from these regions are generally at a greater educational disadvantage than their city counterparts (Lamb et al., 2014). Participants all teach a wide variety of subjects related to STEM; including agriculture and earth and environmental science across Year 7-12 (12-18-year olds).

Applications were submitted online via the project website. They included data on school name and location, contact details, subjects taught, year levels taught, and two short statements (150 words or less). The statements were in response to two questions: 1. How do you incorporate technology, industry tools and/or novel activities into the classroom? and 2. How do you believe your participation in the program will benefit you and your teaching?

Data were collected via two processes: 1. the application process that utilised the short online questionnaire in which they shared their experience using technology in the classroom and potential benefits for their teaching practice with female colleagues and students; and 2. an online survey completed prior to participation in the inaugural 2-day 'Women in Agri-Tech' Symposium conducted in Brisbane, Australia in February 2019. This pre-symposium survey of participants was also conducted to obtain their perceptions on female students and their attitudes towards a career in the fields of STEM, digital literacy and agriculture using Likert scale questions (Likert, 1932).

Data in the form of words were analysed thematically (Clark & Braun, 2013), with descriptive statistics used for the Likert scaled responses. Results reported in the next section focus on the responses to the second question from the application form and the pre-symposium survey responses of successful participants. Information gleaned from the application's first question will be analysed and reported later in conjunction with other findings relating to participants' incorporation of technology, industry to-

nefit them. Participants saw the program as an opportunity to develop their skills and knowledge to ensure they were teaching what was current industry best practice and had real world application. Another teacher stated:

“This program would broaden my knowledge of the agri-tech industry and help me develop an effective and engaging teaching program. Importantly, it would also help me develop relationships with industry experts and other teachers so that I can continue to develop my curriculum as the industry progresses.”

Careers in agriculture & connections with industry

Prior to the Women in Agri-tech symposium participants were asked to complete an online survey that was used to gain a baseline dataset of their perceptions on a range of topics. Table 1 outlines the responses (n=15) to a series of questions that examined teachers’ perception of careers in agriculture and their thoughts about female students entering the industry prior to the ‘Women in Agri-tech’ symposium. It is encouraging to see that 100% of participants would encourage their students to consider a career in agriculture (Table 1, Statement 1), as teachers are known to have an influence on their

Table 1

student’s future path (Patton, 2005).

| | <i>Strongly Agree</i> | <i>Agree</i> | <i>Neutral</i> | <i>Disagree</i> | <i>Strongly Disagree</i> |
|--|-----------------------|--------------|----------------|-----------------|--------------------------|
| Statement 1: I would encourage my students to consider a career in agriculture | 87% | 13% | 0% | 0% | 0% |
| Statement 2: I believe my students could use their STEM skills if they were to have a career in agriculture | 87% | 13% | 0% | 0% | 0% |
| Statement 3: There are many job opportunities available in the agricultural industry for my students | 67% | 20% | 13% | 0% | 0% |
| Statement 4: Female students are considering careers in agriculture and STEM at a lower rate than male students | 20% | 27% | 40% | 13% | 0% |
| Statement 5: Female students need greater encouragement to consider agriculture and STEM careers than their male counterparts | 33% | 33% | 20% | 13% | 0% |
| Statement 6: Inspiring female role models are essential for girls when considering further study or a career in agriculture and STEM | 87% | 13% | 0% | 0% | 0% |

Additionally, it is promising that all participants can see the link between STEM skills and the agricultural industry, as again this is not always the case (Bray and Cay, 2018). The majority of teachers (87%) understood there are many job opportunities in the agricultural sector (Table 1, Statement 3), which is demonstrated by the estimated four jobs available per agricultural graduate (Pratley and Botwright Acuna, 2015). However, it is hoped that the Women in Agri-tech program will highlight the vast variety of jobs that are available across the industry, and perhaps participants will learn about careers that they didn’t know existed.

Participants’ perceptions that female students are considering a career in STEM or agriculture at lower rates than males were varied with 40% of participants answering neutral to this statement (Table 1, Statement 4). Also, respondents were mixed in their

response to whether female students need greater encouragement to consider agriculture and STEM careers than their male counterparts, with 66% strongly agreeing or agreeing, 20% neutral and 13% disagreeing (Table 1, Statement 5). It is often reported that the lower rates of participation by female high school students in STEM subject is limiting an increase of women undertaking careers in the field (Department of Industry, Innovation and Science, 2019). It is hoped that by building the skills and knowledge of female teacher participants they will increase their own confidence in the sector and be able to highlight the pathways and opportunities for young women in the STEM and agricultural disciplines. Overwhelmingly, participants agreed that inspiring female role models are important when attracting young girls into tertiary study and careers in agriculture or STEM disciplines (Table 1, Statement 6).

Conclusion

Phase 1 results suggests what when applying to the program participants were seeking the development of strong networks with other female teachers to enhance their capabilities to incorporate agri-tech into their teaching program. It is encouraging that all participants would encourage their female students to pursue a career in the agricultural industry and they recognise the many job opportunities available in the sector. It is hoped that their participation in the program will lead to increased female participation in the agricultural and STEM workforce through their development as role models to which their female students may aspire. These results inform the symposium design which will consist of a wide range of speakers from varying backgrounds all of whom work in the agri-tech industry. The majority of speakers (70%; 7 of 10) will be female, providing participants with networking opportunities and role models which they can use for their own continued professional development, and as examples for their students of successful women in the field. With the number of women in senior positions in STEM careers (14%) incredibly low (Department of Industry, Innovation and Science, 2019), it is important that the next generation are exposed to female leaders in the sector to understand that it is possible to be in a leadership or managerial position in the industry. There is the potential for the Women in Agri-tech program format to be replicated with further educators' cohorts and across other related disciplines

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The role of extension and advisory services in the adoption of precision farming tools by farmers. The case of crop input modulation tools for fertilization

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Keywords

Extension services, advisory services, precision farming, adoption process, controversies

Abstract

Precision farming technologies are presented as a driver of transition towards a more sustainable agriculture. However, there are still controversies regarding their efficiency and impacts on sustainability. This article aims at better understanding the role of extension and advisory services in the adoption of precision farming tools by farmers. It relies on 34 semi-directive interviews with farmers in one French region. Following the Triggering change model, interviews aimed at specifying the role of farm advisors at each step of the adoption process (awareness, assessment, implementation). The results show that several situations of adoption coexist. One third of farmers are not entirely adopting the tools' technology: they adopt either only the software or only the hardware. It leads to a paradoxical situation of adoption in which they cannot make the most of the tools. Only few farmers tend to evaluate thoroughly the interest of using the tools' technology. Advisors play a very little role in this evaluation. However, they are pushing its development by proposing directly the tools to farmers through the subscription to a drone or a satellite service. This offer is crucial because it triggers the adoption. This offer targets farmers who are integrated in local cooperatives and unions and does not seem to support an ecologisation of their practices. This situation raises questions about the capacity of extension and advisory organizations of reducing uncertainties about precision farming and its impact on sustainable development of agriculture. It also opens a broader debate about the production of evidence for farming digital innovations.

Advisory role in farmers' micro systems of agricultural knowledge and innovation (microAKIS)

Pierre Labarthe, Lee-Ann Sutherland, Boelie Elzen, Anda Adamson-Fiskovica

Keywords

Advisory services, microAKIS, knowledge, innovation, farmers, decision-making

Abstract

Purpose

The aim of this paper is to present some key elements of the conceptual framework of the H2020 project AgriLink (Agricultural Knowledge: Linking farmers, advisors and researchers to boost innovation). The aim of the project is to better understand the role of advisory services in farmers' decision-making regarding different areas of innovation (technological, marketing, process and organisational) related to sustainable development of agriculture.

This paper will be the introduction of a special session that we propose to organise at the ESEE conference to present the first results of the AgriLink project. The session would thus also comprise a set of papers presenting findings in various European contexts: Czech Republic, France, Greece, Italy, Latvia, Portugal. These papers enable to explore the role that advisory services play in various innovation area (digitalisation and technological innovation, crop diversification and marketing innovation, soil management techniques and process innovation...). A concluding paper will allow for synthesis and reflexivity about the first findings of the project.

Approach

This paper is a theoretical paper. It presents and develops the concept of 'microAKIS', i.e. the micro knowledge- and innovation-system that farmers personally assemble to manage their agricultural practices and ensure sustainability. It includes the range of individuals and organisations with whom farmers seek services and exchange knowledge, and the processes involved in the formation and working of this system, including the way farmers translate these resources into innovative activities (or not). Utilising the concept of microAKIS enables us to identify and assess the range of information sources and media through which new knowledge is generated and transformed. We can thus address more specifically the present knowledge-gap on the use of advisory services by farmers within the current context of deep transformations of both farm structures and supply of such services (Knierim et al. 2017). In a broader perspective, we will defend the idea that, at a micro-scale, it is necessary to combine both a process and an infrastructural view on microAKIS (Klerkx et al. 2012). The knowledge systems that farmers build to source knowledge and information might be specific to a given innovation area. At the same time, however, these systems might also be influenced by farm characteristics: size, access to ICTs, geographical location, etc. These factors

could both induce path-dependency mechanisms and trigger change cycles for farmers (Sutherland et al. 2012).

There are three main implications of the conceptual model for the empirical approach that we will develop in AgriLink:

- i) The field work will be based on farmers' interviews that integrate the different steps of the triggering change model. Our aim is to understand which sources of information and services enable farmers to go from one step to another in the Triggering Change model.
- ii) The sampling strategy is designed to cover a wide diversity of farmers' contexts, not only in terms of innovation areas, but also in terms of farming contexts. In that respect, we have decided to implement data collection in 26 focus regions that represent the diversity of rural and agricultural contexts.
- iii) The methodology combines a quantitative and a qualitative perspective. The quantitative analysis (with close to 1000 farmers in our sample) will enable to propose a typology of microAKIS across innovation areas and focus regions. The qualitative dimension will make it possible to highlight narratives about farmers' decision-making process regarding different innovation areas.

The comparison across countries and across case studies will enable to better understand whether the transformation of the supply of advisory services fit with farmers' needs for knowledge and innovation support.

Different knowledge and knowledge providers to fulfil the needs of direct marketing farmers: experiences in Portugal and Italy

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Keywords

Direct marketing, Extension services, Knowledge sharing, Innovation, Small-scale farm

Context description

Direct marketing of farm products (vegetables, fruits, cheese, meat, wine etc.) is an interesting option for small and medium farms not too far from cities and towns. It can improve farm economic sustainability, pave the way to other activities, also not strictly related to farming and offer space for innovative jobs to family members, so becoming appealing also to younger generations.

But to be successful in direct marketing different knowledge is needed, especially if the initiative is collective or somehow shared with other farmers

Approach

To analyze the question two case studies were investigated, within the framework of the H2020 AGRILINK project. They share direct marketing as an innovation recently introduced by the farmers in order to enhance their sustainability (mainly from the economic point of view but also for certain environmental and social traits). In the Italian case the direct marketing is implemented collectively while in the Portuguese case it is farm specific initiative.

Data collection and analysis

In both cases the farmers were interviewed, not only the ones who decided to implement the innovation but also a smaller group of farmers who decided not to implement it and also the droppers (who initially implement it but later drop it). The semi-structured interviews were about 35 per case study. Moreover the other actors involved in the innovation were interviewed: advisers, local development associations, officers of the unions, members of the Agriculture Chambers, organic farming association consultants and also consumers. The interview were mainly done individually but in certain cases there was also the chance to discuss in small groups the points for improvement and the needs of information and knowledge.

Data gathered were elaborated for the quantitative part and then for the qualitative aspects.

Results and Implications

The outcome of the study shows that usual advisers often do not have the skills and expertise needed to support farmers in the implementation of direct marketing initiatives and the result is that farmers have to look for the information by their own, or to find solutions through trial and error, but it can be costly, risky and require too much time, leading them to abandon the innovation in some cases.

The knowledge and skills required is partly linked to agriculture (new management, new varieties etc.) but for the major part linked to other sectors, such as processing, legal aspects, logistics, packaging and conservation, communication, use of social media etc.

Sometimes associations or unions can provide support or, at least, help in establishing useful connections to non-farming experts who have the skills needed. The diversity of knowledge needed and the complexity of skills that need to be developed is a challenge for the actors who intend to have the role of advisors in the near future.

Enhancing Crop Farmers' adaptive capacity and resilience to Water Crisis in the North West of Iran

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Keywords

Direct marketing, Extension services, Knowledge sharing, Innovation, Small-scale farm

Abstract

Objectives

This research aimed to analyze the adaptive capacity and resilience of farmers against water crisis.

Methods

Research has mainly benefited from a descriptive-analytical methodology using a survey methodology, though a case study was conducted using documents and focus groups.

Quantitative data were collected using structured interviews through a questionnaire. A sample of 270 out of 3220 farmers having irrigated lands in the Soltanieh Township, in the northwest of Iran was selected using a multi-stage sampling technique.

Results

Farmers' livelihoods mostly depended on the small scale agriculture and they considered themselves vulnerable to climate change and unsustainable water management and they believed their water resources had decreased. However, farmers' knowledge of the water crisis management was low.

Farmers used some cropping practices, water management in their farms, and water resources management as resilient mechanisms. They had also a limited use of extension information and input supply supports. Farmers' adaptation to the water crisis were affected by the adaptive capacities, including the human resources of the households, farmers' knowledge, their natural capital and the physical capital of households. Vulnerability to water crisis (vulnerable to climate change and poor water management), the amount of information on water crisis management received from the extension media, and the use of resilient farm management and water resources management mechanisms were among the factors that affected their adaptation against this crisis.

Conclusion

Climate change and unsustainable water use are among the most influential factors of water crisis in the agricultural sector, which has made farmers vulnerable and has had adverse consequences on their livelihoods. The reduction and mitigation of vulnerability to adapt to the aforementioned crisis depends on farmers' adaptive capacity and applying their resilient mechanisms for managing the water crisis. Increasing farmers' adaptability and reducing their damage to the water crisis depends of enhancing extension programmes to increase farmers' knowledge and social capital and to improve their resilient mechanisms in their farm.

Requirements of Agricultural Occupational Health Extension in Iran: Causal and Contextual conditions

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Keywords

Agricultural Occupational Health, agricultural extension and education, Content Analysis, Farmers, Sustainable Development

Abstract

Agriculture is known as a high-risk sector all around the world and farmers are exposed to a wide range of occupational hazards by doing hard work. The objectives of this research were identifying the causal and contextual conditions as requirements for agricultural occupational health extension in one of the west provinces in Iran. The study was conducted based on the qualitative approach which used content analysis for analyzing data. The study population included faculty members of agricultural science and occupational health of medical Science, agricultural experts, occupational health experts and farmers who were selected through purposive and snowball sampling in Kermanshah province, west of Iran. The data were collected through interview and were analyzed in the form coding. According to the findings, six causal (cognitive domain, self-management, organizational factors, economic, cultural and social factors) and one contextual conditions (farm environment) were identified as the agricultural occupational health extension requirements. Agricultural extension and education with regard to the factors extracted as requirements for occupational health of farmers should do essential activities in the field of agricultural occupational health. Because of its consequences, including healthy society, healthy product and healthy producer, so that they are of the main goals and basic of sustainable development, also agricultural extension and education in a new role can realize these consequences.

Social Farming - New Challenge for Development of Advisers' Skills and Capabilities

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Keywords

Social farming, innovative knowledge, extension services

Abstract

As the complexity of challenges in extension increases, advisers need to be aware of the evolution of the agricultural system and prepare for those changes. Therefore, the specific research questions are: how the role of agricultural advisers has been changing and what skills and capability regarding social farming are needed for agricultural advisers? The social farming should be developed especially in rural areas because of the negative effects of the ageing population, searching for new sources of farm income as well as a serious problem with migration (it causes the interruption of traditional, local and family, social ties and support networks).

The paper uses literature studies and an expert interview methodology. The interviews show the dilemma for agricultural advisers regarding the extension process in the social farming sphere.

The social farming as a new theme is a challenge for public extension in Poland. Therefore should be prepared the methodology of advising and working with various actors involved in the social farms creation process. It is necessary to develop and implement new training methods and materials (detailed issues), including education in the working environment and the use of open educational resources.

Introduction

The traditional extension and education system is going to be changed according to the innovation paradigm. Recently, the emphasis has moved to the innovation related to social development. The example of social innovation for Polish agriculture is social farming which might be one of the new objectives for rural development policy.

Therefore, the public extension system needs to be reoriented to new technical competences as well as to a knowledge exchange attitude. The different aspects of social innovation such as social farming causes the need for supporting advisers' ability to change and close the gap between science and practice.

The paper uses literature studies and an expert interview methodology. The interviews show the dilemma for agricultural advisers regarding the extension process in the social farming theme. The data is collected by interviewing agricultural advisers in different regions in Poland. The interviews are made by using the scenario for individual in-depth interviews (IDI).

Innovation as a new paradigm in the agricultural extension system

Polish agricultural extension system

In Poland, the history of advisory service began in the first half of the XX century. It is the current structure and organisation was created in 2005 based on the law on advisory units of 2004. Agricultural advisory in Poland is subject to constant changes resulting from the changing requirements of rural communities and new conditions of running farms (Zawisza 2013). First of all, the development of consultancy results from the process of Poland's integration with the European Union, which requires constant adaptation to the requirements of the common market and regulations governing the functioning of various areas of economic activity. Public agricultural advisory centres play a special role in this area (Matuszak 2003, Kania 2006, Skórnicki 2005, Wiatrak 2006).

Advisory service comes under different institutions and organizations. There are two main sectors:

- (1) public advisory services;
- (2) private advisory.

Public advisory service is playing a dominating role in Poland. Currently, it is under the Ministry of Agriculture and Rural Development. It is available for all farmers and realized by Regional (Voivodeship) Agricultural Advisory Centres (Eng. VAAC, Pl. WODR) (Fig. 1). Besides the public sector, there exists different institutions and organizations like advisory of farmers' associations and private advisory, including processing companies, dairy and meat factories, seed companies and other commercial bodies, machinery and equipment dealers, and private services – consulting firms

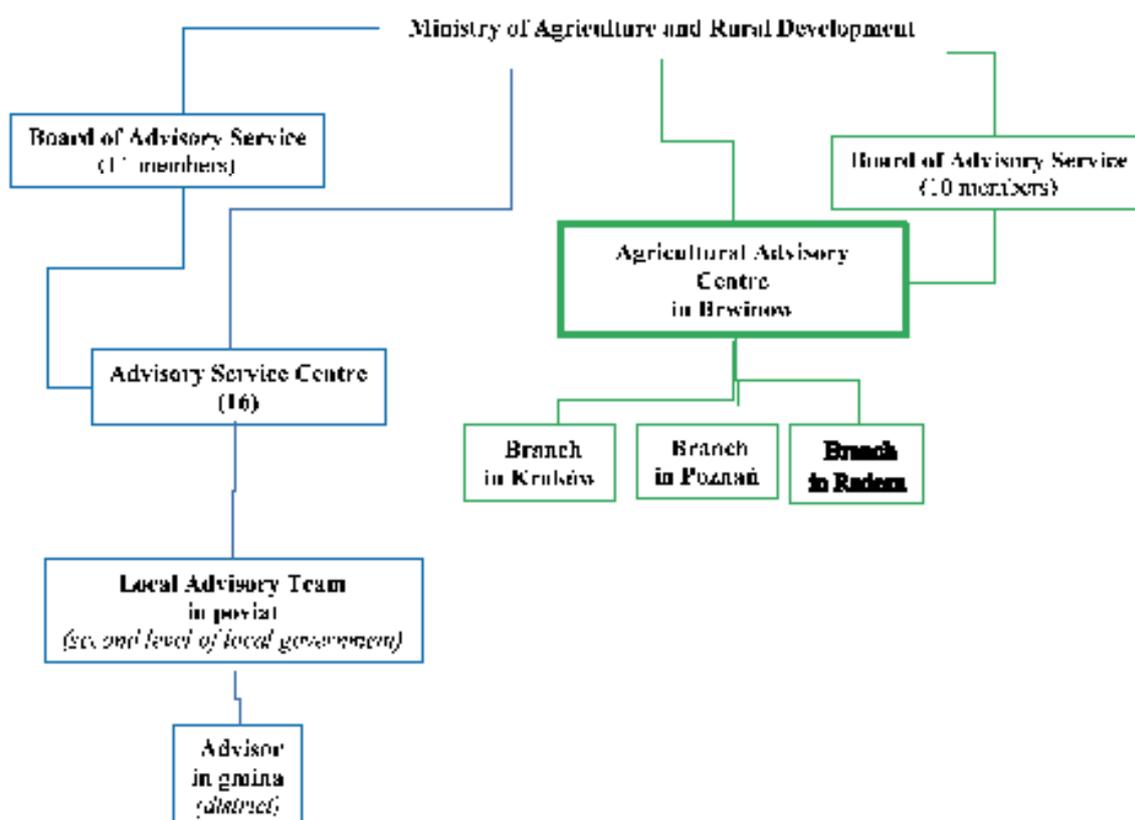


Figure 1 Agricultural extension system in Poland

Source: CDR (2019).

The main categories of agricultural advisory are (Wiatrak 2008):

- (1) technology and organizational advisory;
- (2) agricultural and environmental advisory;
- (3) economic and organizational advisory;
- (4) advisory in the sphere of multifunctional rural development.

The importance of the last one is particularly underlined. Regarding the social advisory for agriculture and rural areas, the key segment of the advisory system is the public one.

Innovation in Polish agriculture – SIR network

The development of the Polish agriculture and rural areas need to be innovative and multifunctional. Therefore, the Polish Network for Innovation in Agriculture and in Rural Areas – SIR was established. It is a national network under the European Innovation Partnership for Agricultural Productivity and Sustainability – EIP AGRI.

The SIR network is run by the Agricultural Advisory Centre (AAC) together with 16 Regional Agricultural Advisory Centres (VAAC). Implementation is dependent on advisory staff – innovation brokers and coordinators experienced in working with farmers, rural entrepreneurs and research centres. The brokers located in AAC and VAAC liaise between the network partners. AAC and VAAC offer a wide range of tools and services that facilitate networking activities; enhancing communication, knowledge sharing and exchange through conferences, workshops, seminars and publications (CDR 2019). The SIR network support exchange of professional knowledge and good practices, creation of operational groups, dissemination of proactive involvement and identification of partners for joint actions. The most important is to encourage in innovative activities solutions for the agri-food sector and in rural areas, such as social farming.

Social farming may be treated as a social innovation because it meets the following criteria :¹

- cooperation (necessity of cooperation between farmers, people from the medical service, social workers and other employees of the social sector);
- cross-sectoral (social assistance, health care, agriculture);
- bottom-up (created on farms);
- creating new roles and social relations (the farmer as a tutor and manager);
- better use of resources (new ways of using farm resources and natural resources);
- developing resources and opportunities.
- In addition, social innovation has features such as:
- novelty (the care farms in Poland are implemented as a project only in the Kujawsko-Pomorskie Province);
- implementation (the idea of the social farm can be implemented across Poland)
- implementation of social needs (on the assumptions the social farm should meet the social needs of people);
- efficiency (the social farm should be effective in the social and economic dimension);
- activation of the society (the social farm should be a bottom-up initiative supported by public institutions).

Social Farming as an innovative activity in rural areas

Social farming is “an innovative approach located within two concepts: multifunctional agriculture and community-based social/health care. Social farming includes all activities that use agricultural resources, both from plants and animals, in order to promote (or to generate) social services in rural areas. Examples of these services are rehabilitation, therapy, sheltered work, life-long education and other activities that con-

tribute to social inclusion.” (SoFar 2009, p. 20). The concept of social farming was presented in the same way in the Opinion of the European Economic and Social Committee on ‘Social farming: green care and social and health policies’ (own-initiative opinion) (2013 / C 44/07). According to this document, social farming is “innovative approach that brings together two concepts: multipurpose farming and social services/health care at local level” (ECSC 2013). At the same time, the lack of a definition of this concept and the lack of standards regulating the scope, framework and criteria of actions in all European Union countries were pointed out.

According to F. Di Iacovo, social farming is an innovative use of agriculture in which small groups of people work together with a farmer. Social farming covers all activities related to the use of farm resources, such as plants and animals, to support therapy, rehabilitation, social inclusion, education and the provision of social services in rural area (Di Iacovo 2008).

From the economic point of view, social farming is associated with a multifunctional development model. From a technical point of view, it is an option to use natural resources. Moreover, for agricultural practice it is an opportunity to enter into other sectors (Di Iacovo 2008). Social farming, may lead to:

- Increase in innovative activity in agriculture, health care, education, and the social sector;
- Increase in connections between the rural areas and the urban areas, changes in the economic situation of farms and rural areas through diversification;
- Changes in the perception of enterprises and their social responsibility;
- Increase in social capital;
- Development of social services in rural areas;
- Promoting a healthy and active rural population.
- The effects on the clients of social farming can be divided into three groups (Di Iacovo 2008):
 - Physical effects (abilities, physical health, employment, day and night rhythm);
 - Psychological effects (self-esteem, responsibility, consciousness, enthusiasm);
 - Social effects (social skills, social interactions, social integration).
- Three approaches can be distinguished in organizing social farming (ECSC 2013).
 - Institutional approach with a predominance of public
 - Institutions / health services (Germany, France, Ireland, Slovenia);
 - Private approach based on therapeutic farms (the Netherlands, the Flemish part of Belgium);
 - Mixed approach based on social cooperatives and private farms (Italy).

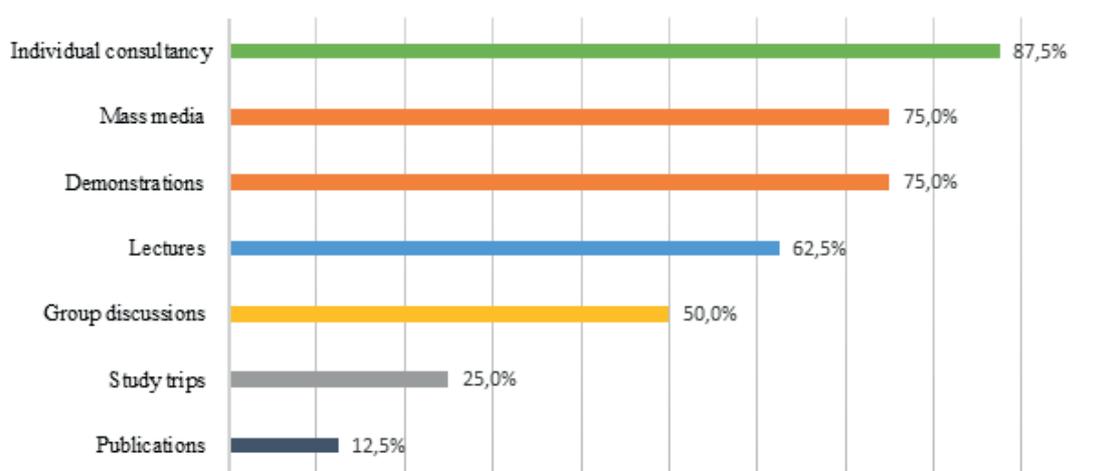
Social farming in Poland, as a subject that belongs to the trend of multifunctional development of agriculture and rural areas, has been spreading with increasing interest for several years. The development of social farming in the long-term perspective in Poland refers to three areas: development of entrepreneurship in rural areas, agricultural income and demand for care services. Thanks to the development of social farming in the long-term perspective, it will be possible to use some of human and material resources that have been unused so far. This will affect the better allocation of farm resources, and thus may contribute to the increase in income in agricultural families. Secondly, the need to open a business to provide social and care services on an agricultural farm will affect the development of entrepreneurship in rural areas, which will also contribute to the multifunctional development of rural areas. The third important effect will be the increase in the number and quality of social and care services offered in rural areas. The increasing demand for this type of services, resulting from demographic changes, will be able to be partially satisfied through the supply of these services by the social farms. All these effects will have a positive impact on the development of rural areas and the image of the village as a place for life and professional development.

Regarding social farming meaning as an economic activity, it is a challenge for the agricultural advisers and influences the advisory process. Advisory assistance offered by the public sector should be prepared to the best extent and adapted to the customers. Thanks to this, it will be possible to implement the socio-economic policy in a consistent manner. The condition for such implementation is a system based on the knowledge of advisers and continuous improvement in accordance with the adopted advisory programs (Wiatrak 2013).

Cutting-edge skills and capability in the extension system in the sphere of social farming

In Poland social farming topic is disseminated mainly through the Regional Agricultural Advisory Centres. Therefore, the agricultural advisers working in the rural development departments should have very specific knowledge and skills. Moreover, it is necessary that advisers, as a channel through whom knowledge is transferred, have also acquired practical knowledge in the field of management of the social farm. Regarding the advisory process related to social farming, the conducted research shows that the most important is the individual consultancy, subsequently information in mass media and demonstrations (Fig. 2).

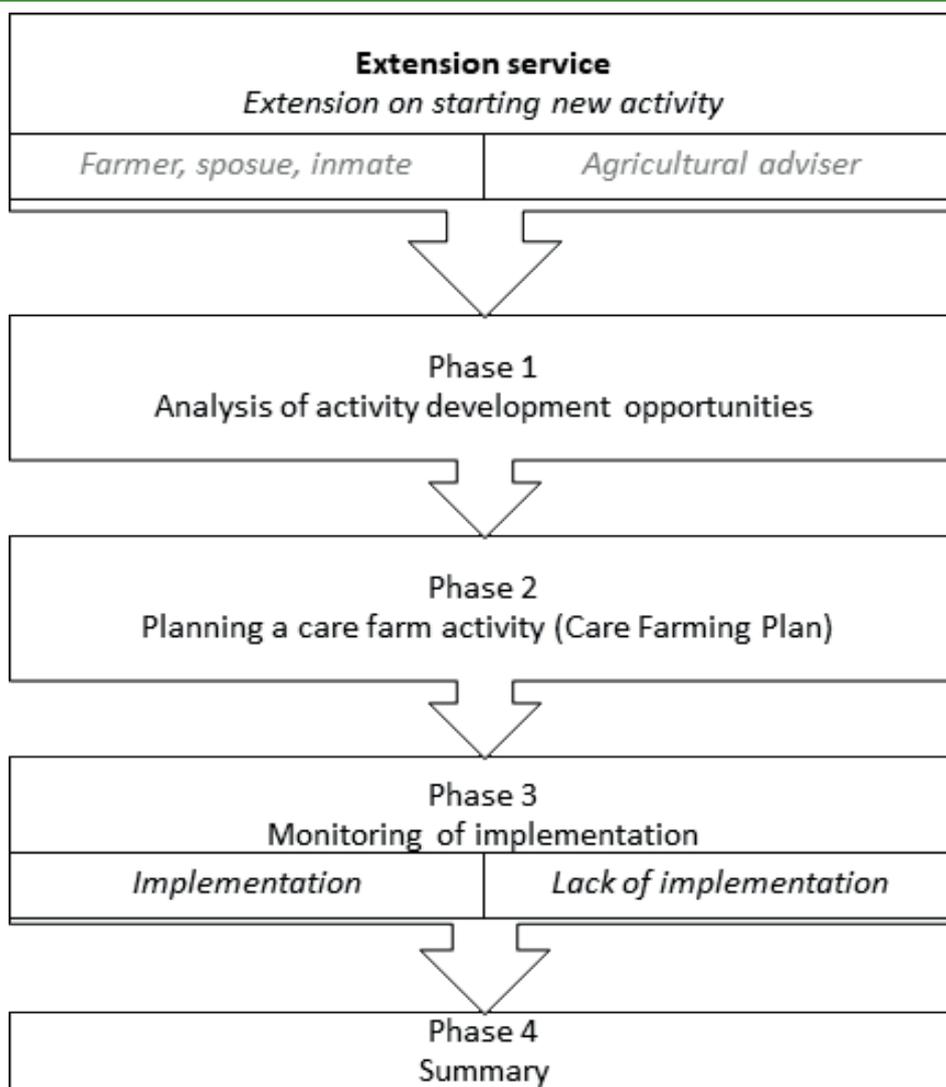
One approach to the social farming model in Poland assumes that it can be developed as a business activity. Even if the social farm activity has a strong social component, it is still a business that needs to be managed with an entrepreneurial approach in order



Source: own elaboration based on IDI 1-8.

Figure 2 Agricultural advisory methods particularly important in the advisory process related to social farming

to be sustainable. The advisory service in the scope of starting non-agricultural activities (business activity according to the Polish regulation) is addressed to the farmer, farmer's wife or household member, as well as to rural inhabitants. The advisory service includes four stages, two related to the design of the activity and two related to the implementation (Fig.3).



Source: own elaboration based on: MRiRW (2018) *Doradztwo w zakresie rozpoczęcia działalności pozarolniczej. Metodyka doradzania. Świadczenie usług doradczych w ramach Programu Rozwoju Obszarów Wiejskich 2014-2020*, Brwinów: MRiRW.

Figure 3 Extension service process

On the basis of the analysis, the beneficiary should obtain full information about the strengths and weaknesses and the risk of the planned activity. Based on the developed Care Farming Plan, the beneficiary will be able to make the final decision on the implementation or discontinuance of the activity.

- In order to carry out the whole process, the adviser needs to have very specific knowledge.
- According to the advisers' opinion, the key skills and competences are as following:
- Substantive competences - knowledge of the subject, and the ability to combine agricultural and social issues (IDI 3, 4, 5, 7)
- Knowledge about broad legal regulations, e.x. legal regulations for facilitating the start of this activity type and functioning of care farms in Poland, adult tutor course, architectural law (IDI 1, 2, 4, 6, 7)
- Knowledge about broad financial support (IDI 1)
- Creativity (IDI 3)
- Interdisciplinary (IDI 3)
- Ability to efficiently manage projects and human resources (IDI 3)
- Communication skills - the ability to communicate effectively with the interlocutor, empathy (IDI 3, 5)

Methodological and organising competences - choosing the appropriate form of information transfer (IDI 5)

In Polish condition it is unnecessary to have an organized training system, because the advisor's job requires constant activity and training. There are still the problems and barriers regarding the law regulation and obligations. Furthermore, the advisor should have support from those professional organizations and institution.

At this stage of the social farming development in Poland, the role of advisory in the context of disseminating good practices is particularly important. Spreading the information and organizing study trips by agricultural advisors is currently undertaken in most regions in Poland. Thank to them, the transfer of knowledge and innovation from foreign good examples of functional social farms may result in the number of innovative activities undertaken in the field of social farming by Polish farmers and residents of rural areas.

The development of the social farming topic is currently implemented mainly in the form of projects. Actions undertaken by agricultural advisers are mainly financed from the National Network for Rural Development or the Polish Network for Innovation in Agriculture and in Rural Areas. In the period of 2016-2019 there was implemented 16 regional projects through the Regional Agricultural Advisory Centres and 2 nationwide projects through the Agricultural Advisory Centres Branch Office in Kraków (Fig. 4).

One of the nationwide project was "Care farms – building the cooperation network". It



Source: own elaboration based on IDI 1-8 and CDR database..

Figure 4 The projects on the topic of social farming in Poland financed by the National Network for Rural Development or the Polish Network for Innovation in Agriculture and in Rural Areas in 2016-2019

was carried out by the Agricultural Advisory Centre Branch Office in Kraków in 2017. The project objectives were: promotion of the idea of social farming, including in particular the concept of farms combining agricultural activities with provision of care to people in need, and the development of the care farms in Poland which will contribute to the sustainable development of rural areas, the activation of their residents and the

diversification of farmers' income sources. As a results there were:

- Creation of the concept of the care farms in Poland,
- Training for agricultural advisers
- Creating the network for care farming development in the rural areas through 48 information and training meetings in 16 voivodships, attended by one thousand representatives of local communities.
- Conducting a survey which allow to assess farms in terms of their potential for care functions.
- Publication of the information brochure.

The project was the first step to dissemination of the concept of care farms for elderly people in Poland. The acquired knowledge is used in further work on networking the institution interested in social farming in Poland.

Conclusions

Social farming not only creates new opportunity for farmers and rural areas inhabitants, but it is a challenge for agricultural advisers. Regarding this topic it is still lack of research and publication in Poland.

Therefore should be prepared the methodology of advising and working with various actors involved in the social farms creation process. It is necessary to develop and implement new training methods (individual consultancy, publication, demonstration, study trips) and materials about social farming management, implementation and effects. The agricultural advisory system needs to take part in the dissemination of the social farming idea. The public system of agricultural advisory in Poland have a great experience in dissemination of the social farming idea. Therefore, the potential of this institution should be used. Moreover, there are possibility to create some networking for interested institution through the Polish Network for Innovation in Agriculture and in Rural Areas – SIR.

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New Area of Interest of Rural Extension: Care Farming

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Keywords

Care farming, care farms, rural extension

Abstract

Agriculture is not just a production activity in the rural areas. Multifunctionality of agriculture is based on that agriculture do not only have economical dimension but also have an ecological and a social dimensions. Within the economic dimension of agriculture, issues such as production and marketing, within the ecological dimension of agriculture, issues such as protection of biodiversity, protection of the environment and protection of agricultural land are considered. Some of the topics covered in the social dimension of agriculture are the provision of food security and the protection of cultural heritage. The development of non-agricultural activities in the rural areas can also be considered as a part of the social dimension of agriculture. Care farming is an alternative field of activity that can be evaluated within the social dimension of agriculture. Care farming is based on the therapeutic use of agricultural activities. The target groups of care farming include those with mental illnesses, elderly people, children, problematic young people and long-term unemployed people. The purpose of care farms is to contribute to the integration of these people into society, physically, mentally and socially. As is known, rural extension is a nonformal education program that helps farmers to develop economic, social and cultural development. This study focuses on the role of rural extension in the development and expansion of care farming. For the development of care farming, first of all, farmers should be aware of the care farming, informed about the activities to be carried out in the care farms and the opinions of the farmers about care farming should be determined. Rural extension will contribute to the development of care farming by performing these services.

Introduction

As a result of the deficit in agricultural production experienced after the World War I, the first priority of the agricultural policies in many countries of the world was to increase agricultural production and ensure food security. In other words, the purpose of agricultural policies at that time was to increase production at all costs. During this period, agriculture was seen only as a centre of agricultural production; agriculture-environment relations and natural resources were ignored. The application of intensive

agricultural methods to increase agricultural production, the negative effects of inputs such as the use of large amounts of pesticides and chemical fertilizers have come to be increasingly harmful to the environment, human and public health. These negative developments have revealed that agriculture should not be considered as one-dimensional. It was revealed that agriculture did not have only the production dimension but also environmental and social dimensions that should be taken into consideration.

The term multifunctional agriculture was first introduced at the Rio Conference in 1992. In Chapter 14 of the Agenda 21, it is stated that the multifunctional role, particularly the subjects of food safety and sustainable development should be taken into consideration while developing plans and integration programs. The definition of multifunctional agriculture was made by the OECD 6 years later. In the Declaration of the Ministers of Agriculture, the following statements regarding multifunctional agriculture were included. Beyond its basic functions such as food and fibre production, agricultural activities can shape rural landscapes, provide environmental benefits such as land conservation, ensure sustainable management of renewable natural resources, maintain biodiversity and ensure the socio-economic continuity of many rural areas (OECD, 2001). Multifunctional agriculture refers the production of physical and non-physical products together. While physical products include food and fibre production, rural tourism and other marketable products, non-physical products include food security and safety, soil protection, rural landscape, biodiversity, health and so on (Durand and van Huylbroeck, 2003).

Throughout the history, people have resorted to nature to treat the mental and physical diseases they are exposed to. Since the early ages, nature has been a guide through which people get rid of their problems in life and attain inner peace and whose healing power they believe in (Arslan and Ekren, 2017). Some theorists argue that living in cities is against the human nature and that it is necessary for humans to live in nature and that the main source of diseases is to live in cities (Kasar et al., 2018). The relationship between human and nature is highly complex, and the reasons why nature has a positive effect on stress reduction and human health are not exactly known, but they are often associated with the spiritual dimension of human development (Özgüner, 2004). It has been shown that physical exercises done in green areas have positive effects on health and contribute to the reduction of the risk of various chronic diseases (Bulut and Göktuğ, 2006). Green care is a comprehensive concept that includes health-enhancing interventions, and biotic and abiotic elements are used in the treatment (Haubenhofner et al., 2010) (Figure 1).

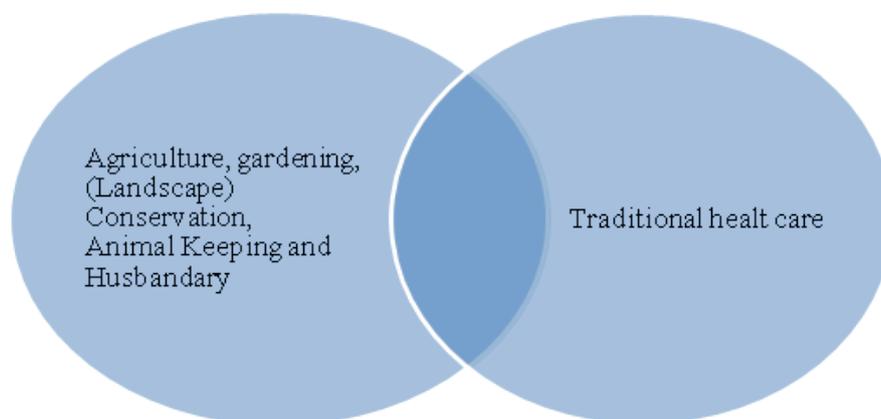


Figure 1 Green Care and Traditional Health Care

Source: Haubenhofner et al., 2010.

As seen from Figure 2, health care services, social rehabilitation, alternative education and employment are the elements of green care. Care farming concept is considered under the green care (Figure 3).

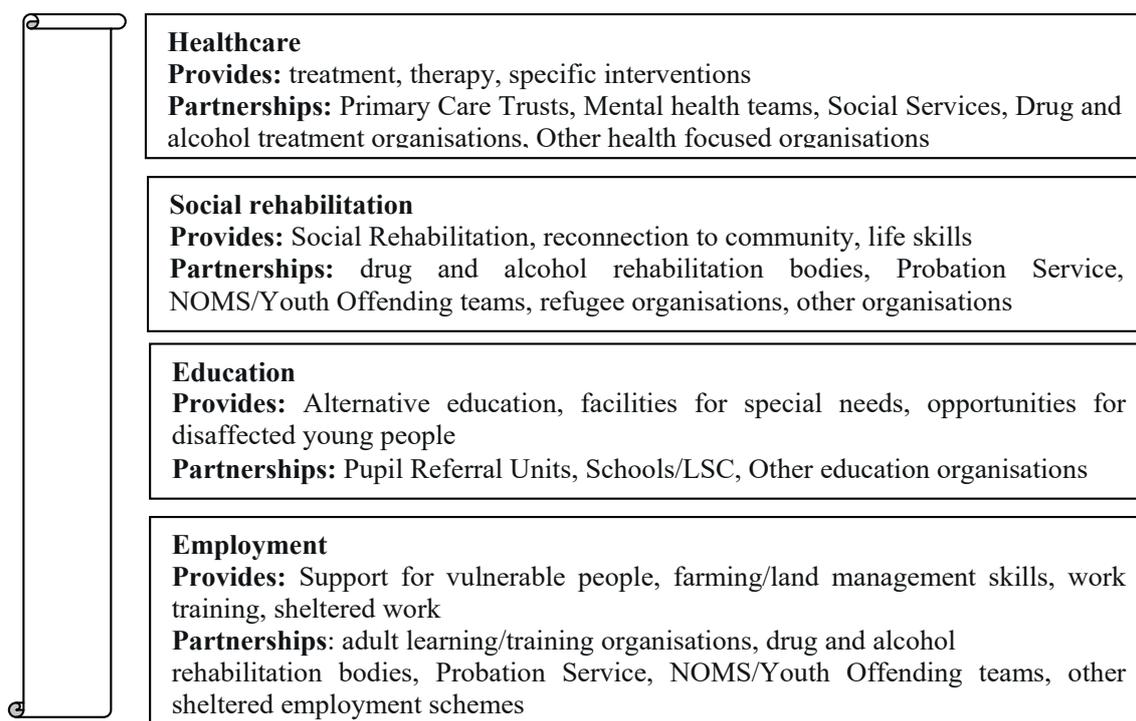


Figure 2 Different elements of care within 'green care'

Source: . Sempik et al., 2010

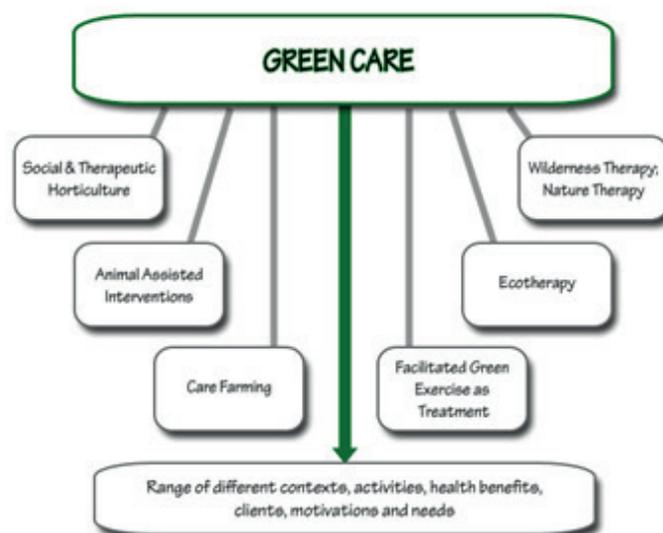


Figure 3 Green care

Source: . King (2011).

Care farming can be considered as an activity dealt with in the social dimension of agriculture. The use of agricultural farms to promote the mental and physical development of people is an example of multifunctional agriculture. Different terminologies have been developed for the combination of agricultural production and care. These include care farms, social farming, agricultural therapy, farming for health, therapeutic gardens and horticultural therapy (Hassink et al., 2007). In the care farm, the whole or some of

the farm is used to provide health, social or educational care. Farming activities are organized for the disadvantaged groups of people at the care farm (Bragg et al., 2015). When the ownership status of the care farms is examined, it is seen that there are care farms owned by health institutions and farmers.

Through care farming, individuals who have low self-esteem feel important and useful. Thanks to the activities carried out in care farms, they get rid of the monotony because individuals are engaged in different agricultural activities depending on the time (such as soil tillage, pruning, harvesting etc.). Agricultural activities serve as important therapy and rehabilitation tools by helping individuals to be active, to leave their daily routine and to produce something.

In the current study, first the concept of care farming is discussed; the target group of the care farming, the benefits of the care farming and the activities of the care farms are analyzed and the increase in the number of care farms in some European countries is shown. Then, the role and importance of agricultural extension for the development and dissemination of care farming is discussed.

Literature

Although the history of care farming is not very old, it is noteworthy that there have been many studies on the subject in recent years. Some of these studies are given below.

Hambidge (2017) conducted a study on young people and found out that spending time in care farms has a positive effect on hyperactivity and behavioural problems.

de Boer (2017) found that green care farms are an alternative to traditional nursing homes as they offer attractive activities in a home-like environment and affect social interaction positively.

Husbandry activities (63.6%) was the most important activity in care farms. Other popular activities were wood cutting (26.2%), cooking (19%), and taking care of flowers in the garden (17.9%) (Ellingsen-Dalskau et al., 2016).

Bragg et al. (2015) tried to find the number of visitors in a week and found that 34 clients were visiting the care farm in a week. Most of the customers (90%) visited the farm 1 to 3 times a week. The average cost was 48 pounds and the average duration of program was 30 weeks.

Iancu et al. (2014), found that the average age of people who goes to care farms for treatment was 42.5 and 61.5% of them were males. They also pointed out that the visitors of care farms were generally people with mental problems.

In a study conducted in UK by Leck (2013), it was found that 70% of care farms helped individuals with learning difficulties. It was found that 50% of the care farms served 5 days a week and the participants stayed on the farm for 4-6 hours a day. The fees paid to the farms were found to be varying, yet in general something between 35 and 50 pounds.

Ferwerda-van Zonneveld et al. (2012) investigated seven care farms. In three of them, it was determined that there was no agricultural production. In one of them sheep and horse breeding is engaged, in one of them dairy cattle breeding is engaged, in one of them egg poultry is engaged, in one of them dairy goat and lamb breeding is engaged and in one of them horse breeding is engaged.

In a study conducted by King (2011), the clients were found to be satisfied with care farms. It was determined that the clients' self-esteem increased, they gained new experiences, their health improved and they forgot their troubles.

Hassink et al. (2010) conducted a survey and declared that care farms have very important services as they carry out different activities in a safe and green environment.

Definition of Care Farming

Today, the agricultural sector is no longer the only sector invested in rural areas. Rural areas have now become suitable investment areas for agriculture-based industry and service sectors (Çukur and Budak, 2018). Today, only agricultural and plant production is not carried out in agricultural enterprises. In addition to food and fibre production, agricultural enterprises also offer other facilities and services to society. For example, agricultural enterprises have been hosting rapidly developing agritourism activities in recent years (Carpio et al., 2008). Agritourism is a subset of rural tourism. Agritourism is based on the use of agricultural activities for tourism purposes. Agritourism is based on the principle of visiting an active agricultural enterprise for the purpose of entertainment, training and participating in activities (Gao et al., 2014). Direct participation in agricultural activities (collecting fruit, milking cows), indirect participation in farm activities (shopping at farmers' markets), recreational activities where farm facilities serve only as a landscape (a wedding reception in a vineyard), accommodation at the farm (bed and breakfast) and food services are some of the activities that can be done within the scope of agritourism (Barbieri, 2013).

Another area of activity in agricultural organizations is the care farming. The concept of care farming is a very comprehensive concept. Some definitions of care farming are as follows: Care farming is based on the principle of developing mental and physical health through normal agricultural activities in a commercial enterprise and agricultural land (Hine et al., 2008b). Care farming is defined as the use of agricultural activities for treatment (Hemingway et al., 2016; Leck et al., 2014).

The objectives of care farming are as follows: Inclusion of disadvantaged groups in social and economic life, creating educational and professional opportunities for these individuals, ensuring the economic sustainability of land and rural development, agriculture and agricultural production (Anonymous, 2017). That is, the aim of these farms is to contribute to the social, physical and mental integration of these individuals with the society.

Care farming is an approach that deals with both people and land simultaneously. Health and welfare levels of people who are at risk of social exclusion are tried to be improved by using natural environments in care farming (García-Llorente et al., 2018).

Target population of care farming

Groups benefiting from care farms are quite large. The target population of care farming includes those with mental problems, those with physical problems, those with psychiatric problems, those with past addiction problems, autistic individuals, children, young people, elderly people, elderly people with dementia problems, individuals who have been unemployed for a long time, individuals with burn problems, individuals suffering from brain damage, individuals with learning disabilities and ex-convicts (van Someren and Nijhof, 2010).

Activities conducted in care farms

There is a positive relationship between spending time in nature and the health of the individual. Therefore, public institutions and voluntary organizations emphasize the importance of contact with nature. Care farms offering natural landscapes and contact with animals can offer participants a wide range of facilities (Hine et al., 2008). There are a lot of activities conducted in care farms. Livestock, crop production, horticulture and greenhouse activities are carried out in care farms. You can cook and eat and stay in the farm (Berget et al., 2012). In the care farms, different activities are carried out from product harvesting to milking, fence painting and cooking.

Benefits of care farming

Care farming has benefits for physical health and mental health. On the other hand, individuals participating in various activities in care farms socialize by integrating with the society (Table 1).

Table 1 Benefits of care farming

| <i>Effect on physical health</i> | <i>Effect on mental health</i> | <i>Social effect</i> |
|----------------------------------|--------------------------------|---------------------------|
| Becoming physically stronger | Increased self-esteem | Better social interaction |
| Increased appetite | Increased self-respect | More social communication |
| Skill development | Enthusiasm | More social skills |
| Better use of energy | Increased awareness | More independence |
| Better use of senses | Increased responsibility | Employment |

Source: Buist (2016).

Care farming applications in the world

It can be said that care farming has been intensively applied in Europe in recent years. In Netherlands, Norway and Italy, care farming seems to be practiced most intensively. In 2011, there were 1050 care farms in the Netherlands (Table 2).

Table 2 The numbers of care farms in some European countries

| <i>Countries</i> | <i>Number</i> | <i>Year</i> |
|--------------------|---------------|-------------|
| The Netherlands | 323 | 2001 |
| | 1050 | 2011 |
| Norway | 950 | 2010 |
| Flanders (Belgium) | 400 | 2009 |
| | 600 | 2011 |
| Italy | 300 | 2006 |
| | >1000 | 2010 |
| Finland | 200 - 300 | 2010 |
| Austria | 250 | 2006 |
| The United Kingdom | 76 | 2007 |
| | 189 | 2012 |
| Germany | 150 | 2006 |
| Sweden | 100 | 2010 |
| Ireland | 100 | 2010 |

Source: Leck (2013).

Expectations from the agricultural extension for the development of care farming

While extensionists undertake an important role in care farms on the one hand, they can take an active role in the adoption of these farms by the community and farmers on the other hand.

Different programs are organized in the care farms according to the target groups. Visitors to care farms are engaged in different agricultural activities in line with these programs. Extensionists have important duties in the conduct of these activities. Visitors to care farms are individuals who want special attention. Therefore, it is important to

communicate with these individuals. Extensionists can make significant contributions to the development of communication skills of care farmers. Thus, there will be an effective communication between the farmer and visitors.

Individuals visiting care farms meet with the soil, collect fruits and vegetables from trees and plants and are treated by getting away from the city life with farming. There is considerable population mobility from urban to rural areas through care farming activities. Seen from this perspective, care farming can be evaluated within the scope of agritourism. Extension services can carry out important works in determining farmers' perspectives and knowledge levels about agritourism. Moreover, they can also prepare extension and education programs to increase the available information.

Regardless of whether farmers or health care organizations own farms, extensionists have important duties to fulfil in these farms because one of the basic elements of care farming is rehabilitation and training. Therefore, the extension, which is an informal means of farmer training, is of great importance for care farming. In care farms, individuals are engaged in agricultural production and animal production activities. In farms, many agricultural activities from the cultivation of fruit trees to the cultivation of vegetables, from ovine breeding to greenhouse are carried out in a natural environment. In the conduct of these activities, extensionists play the role of a facilitator.

Result

Although care farming has been developing rapidly in recent years, especially in Europe, only in a very small number of agricultural enterprises, care farming activities are conducted. This rate is 1% in Norway, 0.5% in the Netherlands, 0.01% in Italy, 0.1% in Austria and 0.03% in Germany (Hassink and van Dijk, 2006). In rural areas, it is thought that agricultural extension should assume important duties in informing farmers about care farming and then in the adoption and implementation of these activities by farmers.

A large number of stakeholders take part in the execution of care farming activities in care farms. These include farmers, doctors, nurses, psychologists, landscape architects and extensionists. In care farms, extensionists have important roles and duties in ensuring communication and coordination between farmers and visitors, and in the organization of agricultural enterprises in compliance with care farming. For this reason, first of all, the information of extensionists about care farming should be updated and in-service training programs should be arranged for this purpose.

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The role of agricultural advisors in dealing with farmer stress - A case study in the Teagasc Kerry/Limerick region of Ireland

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Keywords

Farmer stress, advisors skills, empathetic support

Abstract

This investigation is an Irish case study of an agricultural advisory region in South-West Ireland which explored advisors' experiences with the roles dealing with farmers who were under stress. The methods used to collect data from the advisors for this case study were questionnaires and semi-structured interviews. The case study quantified the frequency with which advisors encounter farmers' stress and the types of issues raised, within the Kerry and Limerick region of Ireland. It found that advisors encountered farmer stress on a weekly basis and were not comfortable with their level of skill for dealing with this element of their work with clients. The most frequent causes of farmer stress according to advisors were found to be poor and unfavourable weather, regulatory inspections, disease outbreaks, succession worries, poor health and death. Advisors were comfortable in dealing with farm related technical and husbandry issues that caused or were related to the stress. Advisors felt that while they didn't want to be inappropriately involved in dealing with farmer stress, as they were not professionally trained in the areas of stress management, they did feel they were well positioned to discuss stress alleviating options. They expressed the need for supports in terms of training to identify signs of stress in farmers, guidance on referring farmers for specific help and also more information about locally available services for mental health available to farmers. It is hoped that this work will add to a better understanding of the needs and resources required by advisors to be effective when farmer stress is encountered.

Building advisory relationships with farmers to foster innovation

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Keywords

Trust, Farmer Advisor relationships, Farm innovation, Knowledge exchange

Abstract

This paper is based on qualitative research conducted in Ireland with farmer clients of the public agricultural advisory service (Teagasc) and with a small sample of advisors to identify the critical factors at different stages in the development of the advisory relationship and how these impact on innovation adoption.

The objective of this study was to identify the critical factors that positively and negatively affect agricultural advisor-client relationships and consequent adoption of farm innovations and to identify approaches and principles that can be used to strengthen advisor-client relationships.

A case study approach was taken to create an in depth, multi-faceted understanding of complex issues within the advisory relationship. Four farm advisors were purposively selected to include; different enterprises, different ages and advisors with different term relationships with their clients. Twenty eight farmer clients were then purposively identified from client lists provided by the selected farm advisors. Seven interviewees from each advisor were chosen to include; different enterprises, different ages and clients with different contract types within Teagasc.

Face to face interviews were conducted with each of the farmer clients on the interviewee's farm. Each interview lasted an average of forty five minutes. Face to face interviews were also conducted with the four farm advisors to get their perspective on how they believe effective agricultural advisor-client relationships can be established and maintained.

The interviews were recorded, fully transcribed and then analysed using the 'descriptive coding' method. This involved summarising the piece of text being examined and coding the key points using NVivo 10.

The main findings from this study suggest that to improve knowledge exchange and adoption of innovation among farmer-clients, a combination of high trust relationships is needed i.e. the farmer client needs to have a high level of trust in both the advisory organisation and the individual advisor with whom they interact. Trust in the advisory organisation is based on reputation and previous experience while trust in the individual advisor is linked to a number of attributes and behaviours. Where the level of trust in the individual advisor is high, the outcomes ranged from increased requests for technical and business advice to the client considering and adopting innovations they would not otherwise have considered. The study findings have implications for the recruitment, training and management of advisory personnel

Policy Makers as Free Actors, The case of the Province of South Holland

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Keywords

Multi stakeholder approaches, policy makers, regional transitions, free actor roles, leadership, training

Abstract

Good initiatives for developing sustainable solutions for the food chain and rural livelihood are everywhere. The institutional environment is not always favourable for such initiatives to flourish, although there is a growing awareness among policy makers that 'Multi Stakeholder Approaches' are promising for reaching their goals.

In this contribution we argue that policy makers can take a unique role in stimulating co-creative processes for regional development. However, it requires a change in perception of their task, as well as specific insights and skills to perform this role of -what we call- 'Free Actor'.

The argument is illustrated by the experience of the provincial government of South Holland in The Netherlands. Since 2012 groups of policy makers have been trained and guided to work with networks of stakeholders in the Province. One outcome is the 'Food Families Program', stimulating multi actor initiatives for shortening food chains.

First, we explore common concepts about multi stakeholder approaches, leadership and the role of government. Then, we tell the story of the Province of South Holland. In the third part of the paper we try to understand what happened here, by drawing a theoretical framework and analysing what made the difference. This leads to issues that are important to include in training and guiding policy makers in the role of free actor.

Three opportunities to improve Multi Stakeholder Approaches

Nowadays it is hard to obtain a subsidy for a rural development project in Europe without making it plausible that some sort of multi stakeholder approach will be applied. The LEADER program builds on active local groups of stakeholders, and the European Innovation Partnership (EIP) program (2014 – 2020) assumes that the gap between science and practice can be bridged by asking initiatives for sustainable innovations from practitioners and linking these initiatives to researchers in so-called Operational Groups. Approximately 3000 of such groups all over Europe are expected to be functional or finished in 2020.

Multi Stakeholder Approaches (Hemmati, M. et al 2002) differ from linear approaches for stimulating change in the sense that solutions are not invented by researchers and subsequently disseminated to end users but emerge from the interaction between those actors who have a stake in the issue of change.

Such approaches require policy makers and knowledge workers in a different role. This explains the attention for knowledge brokers, bringing demand for knowledge and the

supply of it together (Klerkx, 2008). However, this broker function is not enough when such solutions are not just sleeping in their castle of science waiting to be kissed alive, but simply do not yet exist. Very often this is the case, and then something more is needed for bringing actors into a mode of co-creation and for developing new solutions together with all the means, knowledge and relations all these actors can mobilise.

We see three opportunities to stimulate the discourse on what is required for stimulating genuine multi stakeholder processes. First, in management literature most attention is given to the management of organisations, while the dynamics of networks are much more interesting for understanding processes of change. Second, something similar is true for leadership. Someone does not need to be a leader for stimulating change. Networks are effective with persons who take the freedom to do whatever is necessary to connect people and stimulate their willingness to contribute. They do so regardless their mandate because they believe in the good cause. We call them 'Free Actors' (Wielinga 2001, 2008). Their role does not yet receive the attention it deserves. The third opportunity is in rethinking the role of regional governments. In the current mainstream of public management, they have become a kind of cash point for applicants for subsidy. This role of funding agency creates a distance between policy makers and stakeholders which makes it hard for public servants to be part of co-creative processes with actors in society. Our experience is that they can play a unique and valuable role when they adopt a different view of what is legitimised for them, as we will illustrate later in this paper.

'Network' has become a fuzzy concept

By definition, there are multiple stakeholders involved in a multi stakeholder approach. Stakeholders have a stake in the outcome of the process. While working on solutions that are satisfactory for them, usually also other actors should join in, such as knowledge workers, suppliers and funding agencies. It is better to speak of Multi Actor Approaches.

Common management principles based on leadership and hierarchy are not enough to guide such complex processes (Friedman, 1987). Leadership is not obvious, actors may come and go, and sharply formulated targets are rather the result of a good process than the start of it. This collection of actors is not an organisation and it does not behave like it either. How do we then define it?

In the EIP program the European Commission distinguishes groups from networks. A group is supposed to be a collection of actors working towards a certain goal. Regional governments in their role of 'Management Authority' administer EIP funds for 'Operational Groups' of multiple actors who take on the initiative to work on a certain innovation. An Operational Group should consist of entrepreneurs and at least one knowledge worker who can connect with research. In principle Operational Groups operate within a certain region. A network is a collection of actors exchanging knowledge and experiences. 'Thematic Networks' bring actors from all over Europe together for exchanging and developing knowledge on a specific theme (Van Oost 2012).

This distinction is problematic for understanding the dynamics of multi actor processes. At first sight it seems useful, and close to the common understanding of networks as relationships without any commitments in contrast to groups that are committed to reach results. But not every group is doing so. Identity is what makes a group: something that defines who is part of it and who is not. Looking at groups working on an initiative, the composition of it is not stable. Sooner or later the initial group will need other actors to join in. What counts is not only the dynamics within this group, but also how this group manages to make these other actors move who initially do not feel part of the group. When we reserve the word 'network' for a collection of actors who feel

related but without any commitments, then we miss a concept to draw the complete picture of actors who should be involved somewhere in the process.

Literally, a network is a collection of knots that are interconnected. A fishing net consists of rope with knots. Living systems consist of components that are interconnected through interaction patterns. Each component is a network in itself and a knot in a larger network (Capra, 1996). People are connected through interaction patterns of different sorts and intensity. We take the view that all constellations formed by people are networks that behave like ecosystems. Groups, organisations, families, markets and societies are all networks, each with specific characteristics. This view enables us to learn from the organising principles of life in order to explore what needs to be added to common management approaches that have been developed for the specific conditions of organisations.

A change agent is not necessarily a leader

Concepts of leadership (e.g. Senge, 2004) receive a lot of attention in management literature. Commonly, leaders are distinguished from managers in the sense that real leaders have a vision, they inspire people and they dare to take tough decisions when they feel this is needed, whereas good managers are clever in getting the job done within the mandate of their assignment. There are many training programs for personal leadership skills.

Usually, the frame of reference is the organisation for which these leaders and managers are active. This frame is too limited for multi actor processes where hierarchy is absent, goals and targets are not defined, and organisational procedures do not apply. Leadership is not obvious, and there are no mandates within which managers get their job done. When actors in such processes lose their interest, they drop out.

The 'change agent' is a well-known concept (van Poeck et al, 2017), already since the years that community development and diffusion of innovations became popular fields of scientific interest in the '50 and '60 of the last century. Change agents have a mandate to promote change among actors who are not necessarily organised in some kind of structure. In the revolutionary '70ies such change agents were supposed to promote participation of the oppressed, in order to give a voice to the voiceless. In more recent years there is attention for spontaneous leadership. It is observed that in communities often the same persons take the lead to mobilise people for changes: the 'champions' (Ludeman et al, 2014). Recently we notice the use of the concept 'Front runners'.

All these concepts have in common that such persons take the lead by indicating where to go and what to do. In situations where direction and goals should emerge from the interaction between the actors involved, another role appears to be crucial as well, as we will elaborate later in this paper. This is the 'free actor' (figure 5) who takes the freedom to do what is needed to connect people in order to create space for co-creation. Facilitators could do so as well, but they are restricted within the mandate of their terms of reference. Free actors take the liberty to draw beyond the lines whenever they think this is necessary.

Governments became clients in a market

The eldest role of governments is to provide safety: law and order, and protection against enemies. Later, especially after the Second World War, governments increased the number of facilities offered to the general public, such as education and health care. The Dutch government built a large agricultural knowledge system including high quality science, education and extension as facilities for the farming community, and it actively stimulated farmers to organise themselves in cooperatives and strong farmers organisations. This approach was so successful that the intensified system reached its

limits in the '80ies: overproduction and pollution could no longer be ignored. The role of government changed from stimulating growth to containing the damage. The perceived interests of government and farmers unions grew apart, and the feeling of shared responsibility came to an end in the early '90ies (Wielinga 2001).

This coincided with the neoliberal wave that went over the globe, stating that free markets were good for all. Governments should learn to behave like clients in the market and learn from businesses that were assumed to operate much more efficiently. In 1990 the Dutch public extension service was privatised, and research institutes were no longer funded for their input but for their output, for which researchers had to write project proposals. Many services that had been public facilities before were now seen as products to be delivered by independent actors in the market. At present, practically all services for the common good are being delivered by actors who must apply for money through funding schemes with their own criteria. These services are supposed to be products, with SMART formulated targets and clearly defined pathways for reaching them.

Whether or not this market approach for public goods (Osborne, 2006) is more efficient and effective indeed is not a question we will discuss here. The issue we address is the distance that has grown between public servants responsible for spending taxpayer's money and beneficiaries in society. According to the market approach, clients buying a bread in a bakery should not interfere in the baking process. They only judge if the bread is according to their taste. If not, they go to another bakery. Agents, responsible for funding, should keep their hands free to criticize the product, which is not possible anymore when they are involved in the production process.

This becomes problematic when political goals for the common good, such as reduction of CO₂ emissions, restoring attractive landscapes or improved animal welfare, can only be reached when stakeholders actively contribute in creating solutions that are both accepted and effective.

These problems were seen by an informal group of middle managers at the Province of South Holland. They understood that society had changed into networks like a rhizome, whereas the policy structure treated society as a tree with its hierarchy. How could they become part of the interaction among stakeholders for creating solutions together? A few years later the Province adopted the network approach as an important policy instrument, and this approach bears fruits, as the following example will show. What has happened here?

The Food Families Case in South Holland: policy makers in a co-creative mode

In October 2018 the 'Provinciehuis' [residence of the Provincial government] of the Province of South Holland was converted for one week into the 'Provinciehoeve' [Provincial Farm].

Agricultural entrepreneurs exposed their local products in boots at the courtyard of the office complex, and during the celebration day a range of 'Proeftuinen' [experimental gardens] presented the progress made in their network projects. The Provincial minister for rural development and other high-ranking officials expressed their support for the 'Food Families Program'. With this program, that started in 2016, the Province has the ambition to transform the food system in such a way that after 20 years 80% of all the food being consumed in the Province will be produced within the Province. This can only be achieved by creating space for local initiatives for involving stakeholders and shortening the food chains they are part of. At present 22 experimental gardens have received funding and a good number of new applications are being processed. A substantial part of this funding is coming from the EIP program for Operational Groups.

The idea for this program emerged from an initiative in 2014 from two policy officers, Hans Koot and Lucas Mutsaers, who wrote a policy document in which they proposed to address the challenge of sustainable food production by organising a co-creative process, starting with front runners in the farming community and creative consultants. They managed to get the support of their regional minister, and several creative sessions in an informal setting followed under the title 'Who follows the fool?'. The hardest and most time-consuming part of the process was to acquire enough political support in the provincial parliament for a substantial budget for the program. The first activities after this agreement started in May 2017.

What enabled these two officers to become so pro-active and effective? To answer this question, we rewind the story to 2011 when the informal group of middle managers undertook action. They managed to allocate funds for hiring expertise at two levels. One action was to engage the National School for Public Management (NSOB) for developing a policy document on the changing role of (regional) governments. The trigger had been an essay by the director of this institute, prof Mark van Twist, about the tree and the rhizome. At the same time, they invited consultants to assist policy officers involved in multi actor processes in order to become more effective. One of them was Eelke Wielinga (one of the authors of this paper) who had developed a training for working with networks at Wageningen Business School (Wageningen UR). The policy document was published in 2015. Martijn van der Steen distinguished four possible roles for a government to approach a certain policy problem. None of them is

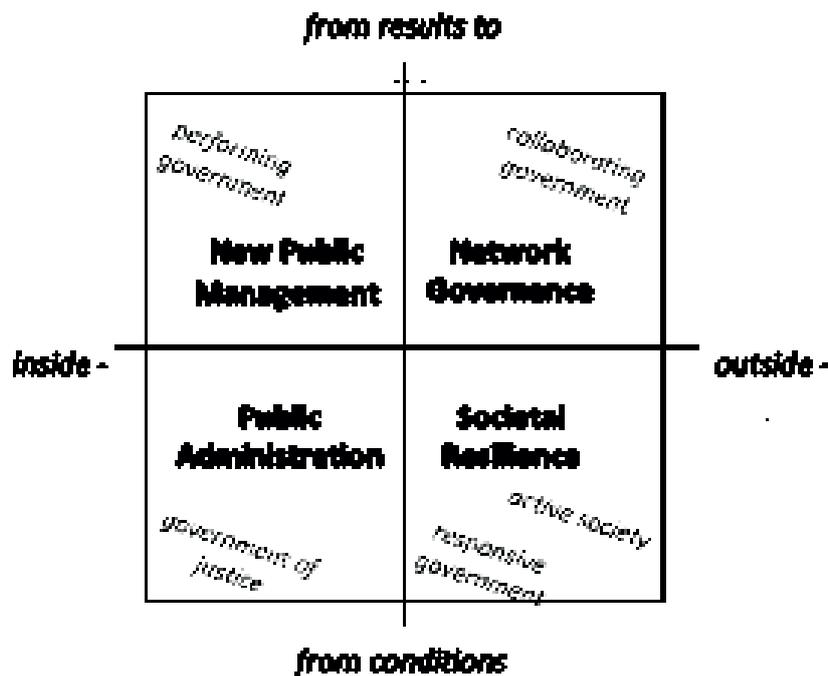


Figure 1: Four roles of government (Van der Steen 2014)

Figure 1: Four roles of government (Van der Steen 2014) better than others, the question is what role fits best to the challenge. These roles are: [1] Public Administration, [2] New Public Management, [3] Network Governance, and [4] Societal Resilience (figure 1).

As public administrator, a government sets the rules and maintains them. As new public manager, a government acts as an actor in the market and negotiates with other actors to achieve policy targets. As network partner, a government enters into co-crea-

tive processes with other actors in society for solving wicked problems. And as facilitator for stimulating societal resilience, a government actively facilitates initiatives in society that contribute to self management and self control of groups in society. It was remarkable how this new model was welcomed by managers within the province, and how fast it spread out to all government structures in The Netherlands. We suppose it gave a sense of relief to managers who were afraid to lose their means of power when this new fashion of working through networks would push through. They had a choice! The effect within the Provincial Government of South Holland was that the movement promoting interactive processes obtained more space for experiments.

Learning, social learning and the network approach

The network approach for stimulating initiatives and innovations, which was applied in the learning trajectories, was earlier referred to as the FAN approach 'Free Actors in Networks' (Wielinga 2008, 2009). It starts from the assumption that everybody can learn on the job by becoming open, curious, brave and reflexive. Working through networks is something to learn. Learning and social learning are the underlying processes that make change possible.

Learning can be defined as an interactive process that leads to some form of dissonance as a result to being exposed to alternative ways of seeing, knowing and understanding, coupled with a desire to overcome such dissonance by changing one's own thinking in sometimes subtle and sometimes more radical ways. Sustainability problems are best addressed when multiple actors with diverse interests and perspectives develop a shared frame on a jointly perceived problem or challenge, which enables joint action. This process is increasingly referred to as social learning. Social learning has been shown to facilitate innovation and possibly foster the pathway for positive transitions in social-ecological systems. Social learning is defined as 'an interactive and dynamic process in a multi-actor setting where knowledge is exchanged and where actors learn by interaction and co-create new knowledge in on-going interaction' (Sol, et al 2013).

The value of the network approach and learning from a transition perspective
Several Dutch scholars describe a transition as an entangled non-linear processes of social change by which a societal system is structurally transformed (Rotmans and Loorbach, 2006). This transition perspective suggests that society needs to radically reconsider the assumptions and values upon which society has built systems, practices and routines. This implies new ways of policy, such as a reflexive governance (Grin, 2006. This can include new behaviour (e.g. a shift from individual learning, personal development and competition to joint learning, community building and solidarity), new

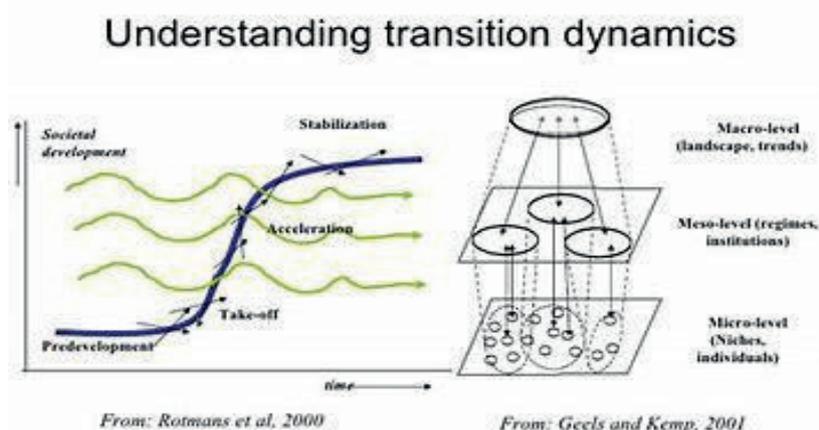


Figure 3: The transition process, after Rotmans and Gee

relationship building (trust) and radical new ways of knowledge creation and learning

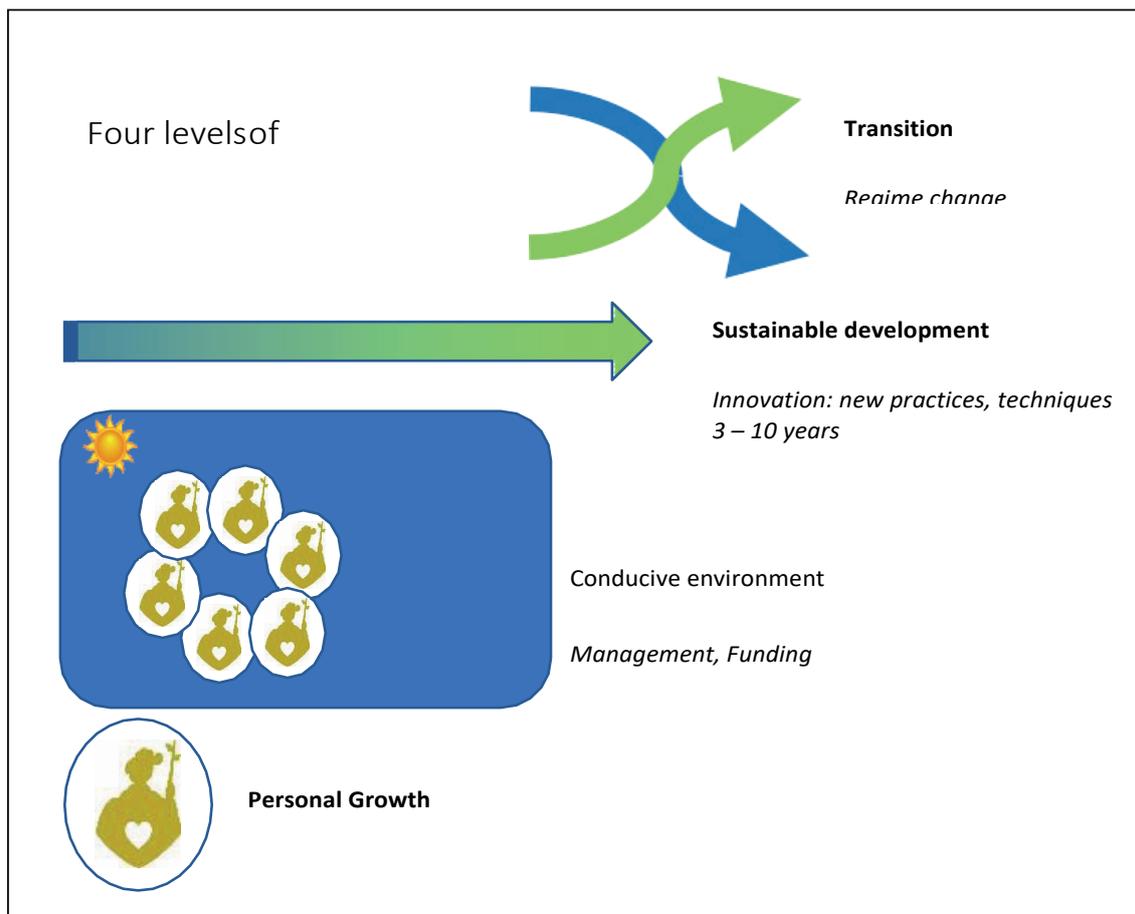


Figure 4: Four levels of learning in societal change

(Sol et al, 2013). We see the network approach as the catalytic intervention in the different learning pathways to transition (figure 3).

We distinguish four levels of learning in societal change (figure 4):

1. Transition is a regime change, which takes 10 – 15 years. It refers to the overarching question WHY.
2. Innovations for sustainable development, leading to new practices and techniques, e.g. in energy production, food production, nature conservation. Here, the question is WHAT.
3. Network governance, where co-creative processes take place between multiple actors. This level encompasses the conditions that can make it difficult or attractive to apply network approaches, as well as the methods and tools to intervene effectively in networks working on initiatives. At this level the question is HOW.
4. Personal growth including skills, awareness and leadership constitute a fourth level of learning.

How the Province started to perceive networked working as something important

The ball started rolling when in 2011 a '24 hours session' (from noon to noon) was organised for 14 participants, all officers responsible for policy issues involving stakeholders in society.

Four consultants were asked to demonstrate their own approach. It was an introduction, after which the participants knew whom to invite to assist in specific cases. And so, it happened that Koot and Mutsaers asked Wielinga to assist in a meeting with farmers

and other stakeholders. In this meeting some critical moments occurred: Wielinga asked the participants to create a Time Line with important moments that had generated energy or taken energy away in the course of their process. This revealed that an important mistake had been made: the state forestry organisation had been overlooked in the development of a long-term plan in the region. This really shocked the participants in the meeting upon which excuses were made. This cleared the sky and restored the relations. Not long after that meeting, the two policy officers of the province were invited for the annual member day of the State Forestry Organisation, in order to explain the new role of the province as a network partner. The intervention made use of the tools for networked working: the Time Line method. This approach stimulates to reflect jointly on a past period with a very open and curious attitude, which makes learning and social learning possible. It delivers eye-openers and learning surprises and new directions for actions. The province realised that this was what they needed considering their new challenges, one of which is participative regional network governance.

Working through networks: training and guidance

The aim of the training 'Working with Networks' is to offer a compass for navigating in unknown territory. There were policy makers need to act right outside of their comfort zone, the exploration starts. It can be quite uncomfortable and somewhat lonely in this unknown zone; therefore, some support is welcome. The training offers safe experimental and guided innovation and guided learning on the job. It is therefore possible to act as a free actor and to discover its plus value without the risk of becoming stupid, looked down upon or to be regarded as irresponsible. On the contrary, the policy makers that contribute to this field of new knowledge are basically very adventurous.

Practical network tools in the training

By Wielinga, Zaalmink et al (2008) a set of tools has been developed for training and mutual coaching; they are oriented on development of content, strategy and/or better interaction, for example:

The Spiral of Initiatives: Every new initiative goes through different stages before becoming an embedded practice. Each stage entails different types of activities, actors to connect with, and potential pitfalls.

The Triangle of Co-Creation: People relate to the initiative in different ways and take on different positions in the network. Some of these positions are necessary for co-creation and complement each other, whilst others do not contribute.

The Circle of Coherence: Interaction patterns either generate or drain energy from the network. The Circle of Coherence identifies constructive and destructive patterns, as well as corresponding interventions.

Impact of the training on working with networks

After the first incidental successes it was decided that learning about working through networks should become structural. In 2012 the first 'Learning trajectory' took place, consisting of one 24 hours session and 5 'Progress days' with intervals of approximately 6 weeks. These trajectories became popular. They were repeated for other groups of officers, and at present (2019) they still take place, partly facilitated by experienced colleagues from the Province. It clearly responds to a demand.

For the impact of these trainings, three types of questions are interesting to explore. Do participants act differently? Are projects for sustainable development more effective and may they lead to regional transitions? And do provincial policies transform and contribute to these processes?

Participants: from unconsciously to consciously competent

Probably the most important insight from the learning trajectory is that co-creation with different actors requires an attitude of equity: 'All actors are equal, and they have own possibilities, knowledge and access to resources'. Instead of 'I know what is good for you', 'somebody must be the boss', or 'the winner takes it all', the basic question becomes: 'What can we make possible if we pool all our resources?' This question starts a search for an ambition all actors share. Basically, this is something personal. So, even though public servants are supposed to stand for the interests of the public agency, their personal ambition matters in making connection as the starting point for the co-creative process. Of course, they must play the game so cleverly that they do not lose trust, neither from their partners in society, nor from their superiors in the provincial government. The network tools are instrumental to do so.

The more experienced and successful participants reflected on this, saying: "Actually, I worked along these lines already, but I had the feeling it was illegal". For them these insights were a relief. For others it was new, but after experimenting with it they gave as feedback: "I have got a nicer job!"

The training offers more awareness and feelings of safety for policy makers in their changing roles, and the competences that are needed for these roles. The joint reflection and mutual coaching is important for giving each other support in doing what needs to be done.

Another type of impact of the training we like to mention, is the self-steering effect; participants learn to organise their own learning process in future situations, they become 'reflexive' in the terminology of Van Mierlo et al (2010) and Mezirow and Taylor (2011). By zooming out on their role and listening to their intuition, they become public 'free actors', able to act flexible in and between roles. This means they can be either structured or innovative, supportive or directive, by choice.

Effectiveness of projects

When a network really becomes co-creative, the results are hard to predict. The good news is that the outcome might be better than anyone could have thought of before, because co-creation mobilises creativity and perhaps unexpected resources. But administrators are likely to become nervous. And so it happened that a few years after the learning trajectories had started, the auditors of the Province asked how the progress in these projects was to be measured. Luckily, they saw that good results were being achieved, based on stories that had been collected. After thorough consultation they developed the "Vitality Measurement Tool" [Vitaliteitsmeter] (Zoeteman et al, 2016). It is an assessment tool for network participants to determine if it is still worthwhile to carry on.

The 'Experimental garden' projects within the Food Families Program are partly funded as Operational Groups in the European Innovation Partnership program [EIP], for which the Province acts as Managing Authority. These projects have to abide to the administrative rules of the EU, and the more severe Dutch interpretation of these rules, which leads to lots of complaints from the people involved. The program managers of the provincial Food Families program created some flexibility by having the choice of sending project proposals through the EIP channel, or through the funding procedure of the Province itself.

Analysis: the role of Free Actors

What shows in the example of the Food Families Program is a remarkable degree of freedom some particular provincial officers acquired to do what was necessary to

realise it, in collaboration with a wide range of actors, both outside the Provincial government and within. When the major players in the Food Families Program (the 'Taste-makers' as they were called) were interviewed in 2018, this impression was confirmed. Without their initiative and continued involvement, the program would not have become what it was now.

How can we understand their role in this network? The Co-Creation Triangle (Wielinga, Dijkshoorn and Sol, 2009) distinguishes three positions that are essential for co-creation (figure 5): [1] Change agents take initiatives for change, they bring in the energy to make things move. [2] Managers have power over conditions and feel responsible for the structure. They have the power to open doors or keep them closed. [3] Suppliers deliver services (e.g. knowledge) or goods within the given conditions. Actors in these three positions complement each other, but the trust requires is not obviously there. Every actor is suspect of taking a position that does not contribute. Managers might act as gatekeepers, suppliers might be only survivors and change agents could be activists. Before a network reaches the level of trust that allows for co-creation, there needs to be at least one free actor, someone who takes the liberty to do whatever is needed to connect actors and stimulate them to become supportive to an ambition they all share. This free actor does so because (s)he shares the ambition as well and behaves in a way (s)he is trustworthy by all involved.

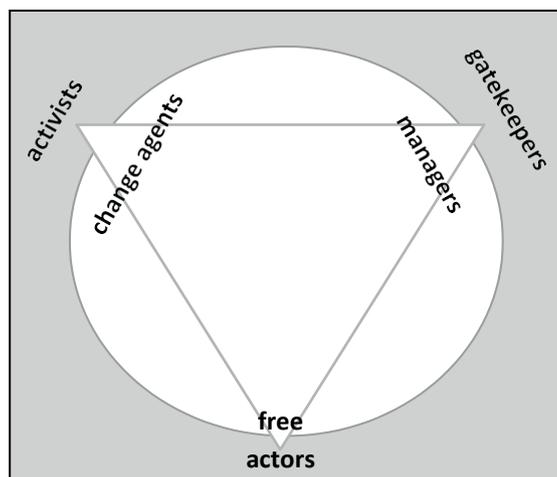


Figure 5: The Triangle of Co-Creation

The position of the regional provincial officers has special advantages. It is much easier for them to invite actors in society to discuss an initiative for the common good, than it is for a commercial partner such as an entrepreneur or consultant or for an NGO representing specific interests. Furthermore, they have access to colleagues responsible for regional public funds and also rules and regulations that are sometimes at stake in innovation projects.

To some extent, researchers can take this free actor role as well, provided that these researchers follow an action research approach. In several 'experimental garden' projects a good combination has been found.

From a transition perspective, the above story of change within the provincial programmes by free actors can be regarded as the so-called niche-regime phase (Loorbach, 2006) of change. This phase can be considered as an 'in between phase'. In the niche phase many experiments start or fail, and from these experiments lessons can be learned. An important lesson from the niche phase in this provincial case is, that policy makers can be free actors.

However, conditions to become a free actor also play a role. Two of these conditions in this case were 1) the availability of motivated policy makers and 2) people in key po-

sitions to decide on time and budgets of these policy makers. Especially this second condition can be seen on regime level; the phase in transition were acceleration and upscaling become possible. Key actors and critical mass together can increase the change dynamics in this phase.

It is not to be taken for granted that just a dozen free actors create change in a government context. Moreover, a risk is that a managerial change can wipe out a whole programme which is focused on networking working and learning. The main question in the case of Province of South Holland therefore is, what makes a culture shift towards a free actor culture possible? In other words, what is needed in governments such as Provinces to foster the development of a critical mass of change agents which contribute to organisational learning and change?

For this, we suggest to monitor the impact of free actor training programmes (for example by learning histories on changing awareness and behaviours) and to show the impact of these training programmes at regime levels, with different kind of communications (books, platforms etc). Moreover, we believe, that comparative (transnational) research with new models in divers governments where experience with free actor programmes is organised (for example the EIP programme) should be discussed with scientists, citizens and policymakers active in governance networks (Sol et al, 2017).

Conclusion and recommendations

In the regional programmes, where the participants are working on, change in outcomes can be witnessed, new knowledge, actions (including decisions) and relations are emerging and contributing to for example the above described Food Families programme, and other regional sustainability programs on circular energy, landscape and biodiversity.

For the province: it seems important to organise a set of conditions before a training of this kind can take a start. These conditions are:

- Decision makers (regime level) that understand the value of networked working and are able to turn keys, in other words: to change the rules of the game
- Motivated policy makers, who feel the need for change and the need for support for themselves personally and on an organisational level; they feel commitment for this way of working

As the network approach became quite popular (the 12th edition took place in 2019) and reached more than 300 policy makers in 8 years' time one might say: 'Yes this way of networked working in creating more and more free actors is very important for new ways of governance, especially in the context of regional transition, participation and cocreation'. Following on that, one might expect an upscaling policy in different provinces in spreading this training and philosophy. However, this is not yet the case: there is some critical mass growing, but the growth rate is slow. From a transition perspective, this is too slow. The take-off phase can take 20 years or so, which could be rather problematic when looking at the urgency of new participative policy. What is needed now, is a regime shift on the role of free actors. For this we see three lines of development:

- a) Understanding the value of policy makers as free actors
- b) The urgency and the transformative potential of free actors in governance networks in transitions
- c) The need for training programmes in governments as perceived by regime players (higher management)

For the future we hope that higher management and higher policy actors will take this message by heart and create the conditions needed. In the meantime, we suggest to perform monitoring research on the factors that enable a quicker breakthrough of adopting measures for trainings on networked working.

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The Agricultural Knowledge and Innovation System (AKIS) in Campania Region: the challenges facing the first implementation of experimental model

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Keywords

Innovation, Knowledge, Co-creation

Abstract

How new agricultural practices are developed and spread to obtain more sustainable agriculture has become an important issue for researchers and policy makers. Sustainable development in agriculture sector requires a reordering of stakeholders' relationships. A linear model of knowledge creation and transfer of technology dominated the approach to agricultural innovations. Nowadays, its difficulty to include goals related to modern dimensions of farms and agro-ecosystems gave space for a new system perspective. The innovation systems perspective represents an analytical framework to analyse innovation in agriculture as an interactions process among a diverse set of actors engaged in generating, exchanging, and using knowledge. In this study, we aim to understand, in detail, an analysis of a first implementation of knowledge network in Campania Region. This Region has implemented, using Measure 1, Measure 2 and Measure 16 of Rural Development Plan 2014-2020, an experimental model of AKIS. This network is called "AKIS Zootecnia Campania" and is based on a living-lab approach where involved actors have an active role as co-innovators. The results could give hints to implement, in the last period of the Cap 2014-2020, others experimental AKIS using the possibilities offered by Rural Developments Plans.

Introduction

The development of human capital is the pillar of the ambitious EU strategies to obtain a more resilient, sustainable and competitive agricultural sector. In the 2000s, the role of research system in the innovation development and dissemination was overestimated. Nowadays, well-established thinking upholds that research actors should elicit the needs of the economic and social systems in which they are located, carrying

out coherent study activities (Rabellotti et al., 2011). Some important consequences derive from new approach to innovation process: The first one is related to the role of the consultants and the need to develop a personalized and local approach to promote change. The second one concerns the role of public institutions in the development of knowledge and innovation systems for agriculture. Public authorities and policies are important pillars of the innovation systems as stakeholders and authors of rules and incentives for the process. In the context of innovation system, the rationale of policy intervention is linked with new typologies of market failures (Arnold and Thuriaux, 2003; Dobrinsky, 2019) such as:

- › Failures in social institutions
- › Network failures
- › Capability failures in firms and other stakeholders
- › Framework failures, related to difficulties in the broad framework conditions.

To create network and cooperation among innovation stakeholders is the most efficient strategy.

To reach this aim, a large number of innovation policy instruments are implemented to foster cooperation among the actors in the 'innovation ecosystem' characterized by collaborative and dynamic interactions (Autio and Thomas, 2014; National Research Council, 2007).

Focusing on agricultural sector and related innovation process, some Authors (Hall, 2007) underline that innovation in agriculture is rarely triggered by research. Opportunities offered by the market represent stronger innovation drivers for farmers. European Agricultural Policy post 2020 seems to adopt the framework of innovation ecosystem. Among the general objectives of new CAP programming period post 2020 "modernisation of the sector by fostering knowledge, innovation and digitalisation of agriculture and rural areas" is a cross-cutting aim. A more modern CAP is described in the European Commission's legislative proposals for the CAP post 2020 to foster as a desired outcome to make advisors, researchers, rural networks, consumers and citizens work together. Innovation in agricultural sector has to be implemented by the interactions among innovation adopters and knowledge organizations (Smits et al., 2010). In this process providers of extension services are important to inform potential adopters about the benefits and disbenefits of the innovation and about the instructions to use it (Rogers, 2003). A more complex interaction among the different dimensions of the knowledge triangle (research, education and extension) and potential adopters of innovation in agriculture (Esposti, 2012) represents an Agricultural Knowledge and Information System (AKIS) (Edquist, 2005, World Bank, 2006).

In this study, an analysis of a first implementation of knowledge network in Campania Region is carried out. This Region has implemented, using Measure 1, Measure 2 and Measure 16 of Rural Development Plan 2014-2020, an experimental model of AKIS. The empirical research is divided in two parts.

The first one is devoted to the description of model proposed by Campania Region. Public and private involved actors will be described and their roles in the AKIS will be defined.

In the second part of the study, primary data collection will be carried out using face-to-face semistructured interviews to analyse connections between seekers and suppliers of knowledge and level and process of knowledge co-creation.

The Policy intervention model: Agricultural Knowledge and Innovation Model (AKIS)

AKIS is 'a set of agricultural organizations and/or persons, and the links and interactions between them, engaged in the generation, transformation, transmission, sto-

rage, retrieval, integration, diffusion and utilization of knowledge and information, with the purpose of working synergistically to support decision making, problem solving and innovation in agriculture' (EU-SCAR, 2012). Although it is a relatively modern concept, the AKIS has its roots already in the 1960s, when the agricultural policy aim was to establish a system of actors, the AKS (Agricultural Knowledge System), which would create and transfer knowledge in order to improve innovation and modernization in agricultural sector. The AKIS thus defined was intended to overcome the purely institutional vision of the AKS, to represent rather the set of interaction networks between the actors involved in the creation, transformation, dissemination and use knowledge and information to support policy makers and innovation in agriculture (EU SCAR, 2012; Röling, Engel, 1991). More recently (Klerkx, Leeuwis, 2009), AKIS has evolved by acquiring the concept of "innovation" (Agricultural Knowledge and Innovation System). This new AKIS's dimension derives from the decentralization as well as privatization process of knowledge system and public extension services.

Services privatization is producing the development of new advisory services through involvement of NGOs (non-governmental organizations), producer organizations, private companies with the progressive differentiation of roles.

This new approach related to Knowledge and innovation has been translated by EU policies thanks to European funds for rural development with specific measures to support the different AKIS components.

A major question remains about farmers' participation in the AKIS and about the implementation of connections among research, education and extension. Weaknesses and lack of some strategic links in the Agricultural Knowledge and Innovation System (AKIS), such as missing stakeholders, missing links between relevant stakeholders or ineffective knowledge transfer, causes a lack of farmers' ability to build their knowledge-base (EU SCAR, 2015). This is especially true for Italian agricultural sector characterized by small farms and rural areas with a high level of multifunctionality. Moreover, the framework developed in the next programming period 2021-2027, stresses the relevance of interactions between different operators working in systems of agricultural knowledge (van Oost, 2017). In fact, modernization of the agricultural sector by fostering knowledge, innovation and digitalisation of agriculture and rural areas is a cross-cutting objective of the next CAP (Council of the European Union, 2019). The strategy to support modernization is based on setting-up the AKIS to foster advisory services, research actors and CAP networks to cooperate and provide knowledge flows and innovation services.

In the next programming period, the approach is articulated and well defined in the Proposal for a Regulation of the European Parliament and of the Council Com(2018) 392 Final.

During the last planning period, several measures under the Rural Development Regulation 2014- 2020 have been implemented to stimulate innovation and the AKIS creation. The intervention was articulated by complementary and interrelated actions: information and training (art. 14 – Measure 1), advisory services (art. 15 – Measure 2), partnerships for the innovation (art. 35 – Measure 16) (Vagnozzi, 2015). However, these actions, although complementary, need a clear instruction of Regional Authority to act effectively with joined approach. AKIS are very different among regional areas and agricultural sectors. Due to this diversity, there is no guarantee that AKIS network is able to answer the challenges posed by the need to increase productivity and sustainability in agriculture and food production (EU SCAR, 2012). In this scenario, the current planning period must be considered by analysts and policy makers as an opportunity to test new strategies and policy tools.

Agricultural Knowledge and Innovation System (AKIS) in Campania Region: an experimental model

Campania is among the few regions of Italy where this Public Authority is managing to implement an AKIS using measures of Rural Development Plan 2014-2020. AKIS activities will focus on regional livestock sector and fishing industry characterized by small firms and farms distributed in rural and marginal areas. In Campania Region, livestock sector and fishing industry are strategic because their impacts on the environment, on biodiversity, on resilience of hilly, mountain and costal areas and on various regional typical food products. This network is called “AKIS Zootecnia Campania” and is based on a living-lab approach where involved actors have an active role as co-innovators. This model has to be a public and private partnership because the Italian framework is more complex due to the coexistence of several institutional levels which are responsible for the different AKIS components. Akis Zootecnia Campania will focus on specific geographical area characterized by socio-economic, productive and environmental peculiarities and will merge innovation and research processes. The applied framework is the so-called Quadruple Helix model (government – science/university – business/industry – civil society). This is a development of the Triple Helix concept. In the more recent approach, the dominance of industry government dyad in the Industrial Society is limited by a new relationship between university-industry-government in the Knowledge Society (Kolehmainen et al., 2016). In our approach, civil society, government, farms and research-training-advisory services are considered as four ‘spheres’ (Fig. 1).

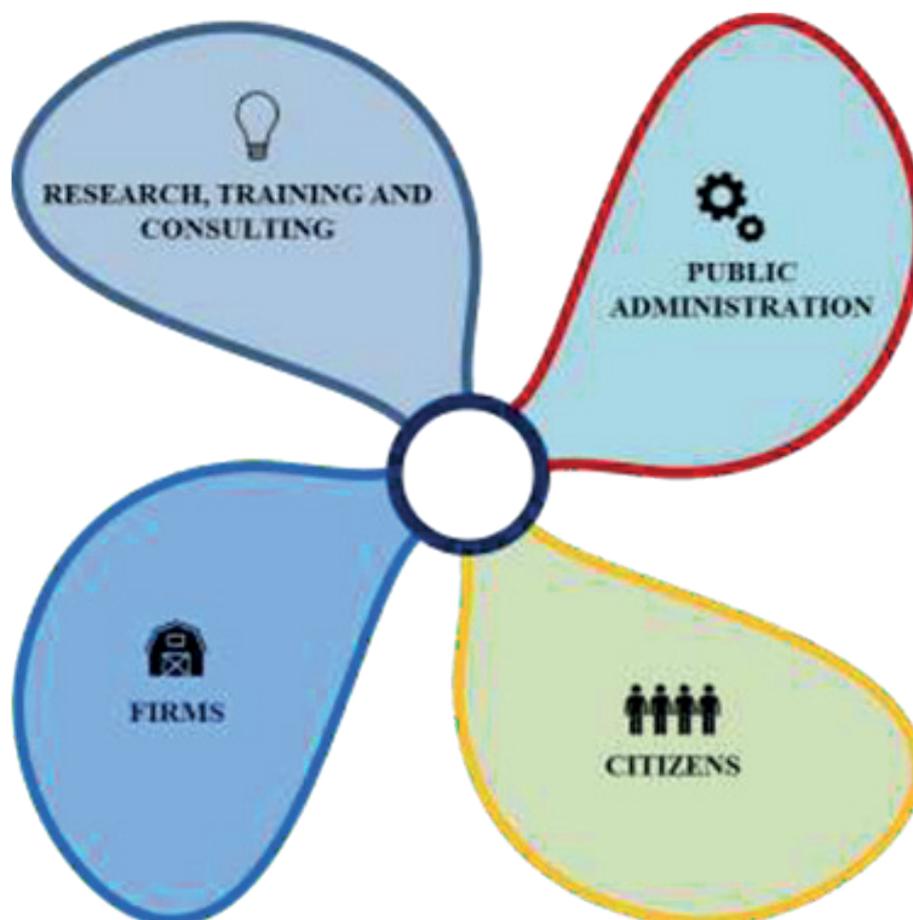


Figure. 1 – Quadruple Helix model for AKIS “Zootecnia Campania”

Source: own elaboration

In this way the helix represents the perspective of the complex system for knowledge production and innovation through processes of co-design or co-construction and collaboration with society.

The Campanian AKIS involves a huge number of actors operating at different levels. The model implemented by Campania Public Authority tries to answer the question how to implement a more dynamic and relational environment to stimulate creativity and learning.

The model proposed is implemented through the EAFRD funds (Measure 2 sub-measure 2.3 of the RDP 2014/20) and EMFF (Measure 2.49 PO FEAMP 2014/20). The activities funded by Measure

2 sub-measure 2.3 of the RDP 2014/20 - Continuous Professional Development (CPD) for Agricultural Advisors. and Measure 2.49 PO FEAMP 2014/20 - Replacement management and advisory services for aquaculture firms - are related to the organization of the network. Using described Measures as starting point to implement more complex system, the challenge will be founded other AKIS activities using Measure 1 and Measure 16 of RDP 2014-2020.

The Southern Experimental Zooprophyllactic Institute (IZSM) is the leader of the project. IZSM is a Public Law Health Service Body, which operates in the National Health Service as a technical scientific instrument of Public Authorities, guaranteeing the Veterinary Services activities and collaboration regarding animal health, healthiness and quality control for foods of animal origin, breeding hygiene and correct relation between human and animal settlements and the environment. Together with the other Experimental Zooprophyllactic Institutes, IZSM is in a network, which covers the whole national territory.

In the project, the Southern Experimental Zooprophyllactic Institute (IZSM) is responsible for the creation of relationships among different partners of the AKIS, for information and dissemination activities addressed to beneficiaries of Measure 1.2 of the RDP 2014/20 – Demonstration activities and information actions, to certified advisory bodies and advisory bodies founded by public calls of RDP 2014-2020. These activities are based on direct needs of entrepreneurs. Needs are elicited by an implemented information desk point and by analysis of the expressions of interest showed by entrepreneurs in the calls for Measure 2.1 - Support to help benefiting from the use of advisory services, 1.1.1 - Support for professional training activity and skills acquisition and 16.1.2 - Support for pilot projects and for the development of new products, practices, processes and technologies.

Using this continuous and dynamic monitoring approach for entrepreneurs' needs, it will be possible to derive insights for "tailor made" public and private research activities. The information desk point will be the link between the available innovations and the involved companies and / or consultants / trainers.

The system will be a reference point for companies, for consultants and trainers and will act to identify needs of innovation and the corresponding answers in terms of technology, knowledge, financing and policy, to facilitate the connections among AKIS actors, to strengthen the collaboration within heterogeneous networks of actors operating in different institutional systems and contexts.

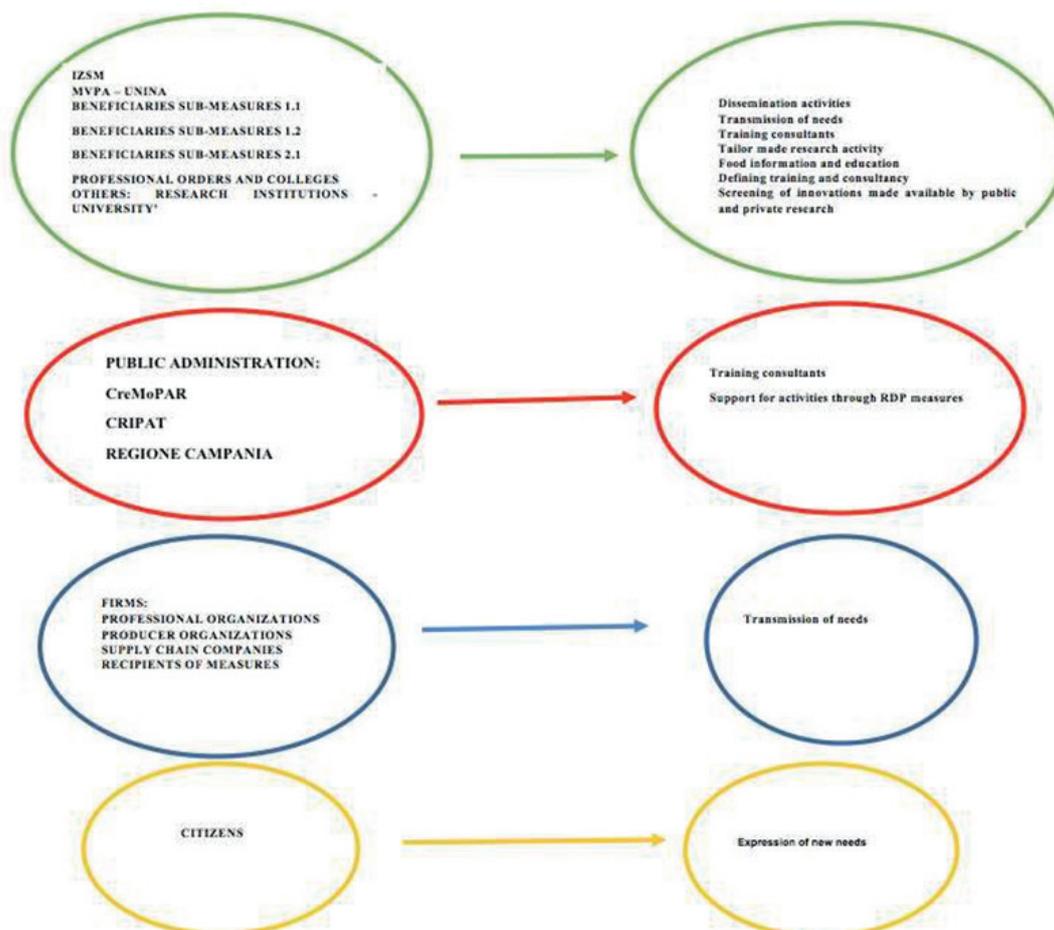
AKIS by Campania Region looks at five main actors with a focus on agricultural/rural development innovation (Fig.2):

- Research
- Extension services
- Education and training
- Support systems (all the organizations providing credit, inputs and producers' associations, etc.)
- Civil society

The challenge of this potential network is to become a system.

However as (the right-hand side of) Figure 2 shows, different actors are responsible for different activities to act upon the knowledge of farmers and rural actors and generate innovations in to solve problems and to catch opportunities.

To assess the internal validity and to identify relationships and information/knowledge flows, multi- actor dialogues will be also developed, based on reliable information and a transparent sequence of interactions and result-monitoring. AKIS stakeholders will work together during the whole process to implement AKIS structure in order to better align both the process and its outcomes with the values, needs and expectations of society' (European Commission 2018).



Source: own elaboration

Figure 2 – AKIS actors and activities

In this early stage, 7 semi-structured interviews were conducted with strategic AKIS partners. Results showed the need of diverse components to be well connected to bridge the gap among them. Different operative approaches and different technical languages characterized agricultural researchers and extension services, moving them from the real needs of the farmers.

The stakeholders interviewed also emphasized that the tools, implemented in AKIS model could be successful thanks to the presence of capillary IZSM structures and staff and also well trained and motivated consultants. The complexity of the AKIS implemented in Campania Region requires particularly effective governance instruments and a continuous monitoring and evaluation processes. Interviewed stakeholders underlined the desirable requirements to obtain a useful system:

results could give hints to implement, in the last period of the Cap 2014-2020, others experimental AKIS using the possibilities offered by Rural Developments Plans.

An AKIS is nothing more than a concept. It is the attempt to provide knowledge and innovation in agriculture through an articulate system composed by farmers, agricultural educators, researchers, non-academic experts, public and independent private advisors, supply chain actors and civil society. Yet many of the variables of these systems are unknown in terms of relationships, governance, strength and weakness. The study, thanks to the first results of a more articulated multi actor analysis, provides an overview of a potential AKIS founded by Measures of RDP 2014-2020. The challenge faced by Campania region is to integrate different Measures of RDP 2014-2020 (Measure 1, 2 and 16) following an innovative interventions path. In the project, the Southern Experimental Zooprophyllactic Institute (IZSM) is responsible for the creation of relationships among different partners of the AKIS, for information and dissemination activities. Strength is the presence of capillary IZSM structures and staff.

However, the complexity of the AKIS implemented in Campania Region requires particularly effective governance instruments and a continuous monitoring and evaluation processes to elicit innovation needs. This issue needs of a testing time useful to better plan policy intervention for the next CAP.

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Fostering complementarities between traditional and scientific knowledge: Agricultural researchers' perceptions

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Keywords

Traditional & scientific knowledge, information, dissemination, innovation.

Abstract

Scientific and traditional knowledge have followed their own paths and there is a need to combine both knowledge resources. It implies strong dialogue between researchers and farmers, which requires good insights about perceptions and activities performed by both groups. In this research, the focus is on agricultural researchers' perceptions about their own and farmers' activities in order to find strategies to strengthen communication between both groups. A survey carried out among 156 agricultural researchers has provided insights about their perceptions with respect to farmers' knowledge and information sources, their motivations toward dissemination activities and perceptions about dissemination activities. Results show great distance between researchers and farmers but also willingness to bridge the gap. Strategies indicate that indirect approaches could be more useful than direct communication. Researchers should be evaluated in accordance with social needs, because their actual activities are far away from farmers' interests, and farmers need to improve their training to have easier access to knowledge resources, as professional experiences are yet their main knowledge source. Innovation requires joint activities that could be performed in many different ways. This research provides new references about researchers' perceptions related to the Spanish agricultural sector.

Background

The Innovation Union is one of the initiatives of the Europe 2020 strategy for smart, sustainable and inclusive growth. European Innovation Partnership (EIP) is a key point in this initiative. EIPs support the cooperation between research and innovation partners so that they are able to achieve better and faster results compared to existing approaches. This new approach requires better understanding of different partners. The European Commission launched EIP-AGRI in 2012, for more productive and sustainable agriculture and forestry. It brings together innovation actors (farmers, advisors, researchers, business, NGOs, etc.) and helps to build bridges between research and practice, through a dynamic approach. This approach is coherent with Agricultural Knowledge and Innovation Systems (AKIS)

proposals: social innovation for agricultural innovation. In this way, AKIS emphasizes two ideas: on one side the integration of traditional and scientific knowledge and, on the other side, a horizontal approach.

Both ideas are based on knowledge communication among stakeholders. AKIS tries to reduce the distance between actors in order to work on a common and specific problem. Traditional agricultural knowledge systems were vertical structures. Firstly, knowledge was generated by scientists, and then, it was transferred to the agricultural sector. Farmers' background and experience were not considered. Nowadays, this approach hinders the innovation from being more effective. It is necessary a change in the agricultural scientists' way of work. In order to do it is important to know their perceptions.

The innovation is not a lineal process from scientists to farmers. Current approaches raise models where innovation works in a systemic context. Regulations, policies, infrastructure or funding are key drivers in the innovation process (Klerkx, 2008). Thus, innovation involves a creative and networking process between different subsystems. In this approach, collaboration among stakeholders is essential.

The current dominant agrarian model in developed countries stems from the necessity of feeding a population, that after having suffered two great wars during the first half of 20th century, it has been growing and demanding new quality products. It is an agricultural model marked by the objective of knowledge dominance, first off giving raise to the industrial revolution and then to the green revolution. The expert knowledge superseded the local knowledge (Morgan and Murdoch, 2000). This model fulfilled the goals it pursued, however, it has had economic, social and environmental impacts, and thus, it is necessary to rethink the whole model to ensure sustainability and survival.

A sustainable agricultural model cannot be achieved without a change in the agricultural paradigm knowledge. This sustainable agriculture implies highly adapted practices to local and traditional context. In addition, these practices have to be suitable regarding the ecosystem where they are carried out (Curry & Kirwan, 2014; Ingram, 2008; Ingram & Morris, 2007). This implies the necessity of taking into account different epistemologies and ways of knowledge, hence, the involvement of various social actors in an interactive and creative discussion. It is a model that not only highlights a combination of different sources of knowledge, but also the way this knowledge is produced, combined, distributed and shared.

Lundval y Johnson (1994) mentioned four ways of knowledge:

- know-what, refers to the knowledge about facts.
- know-why, refers to scientific laws in relation to nature and society.
- know-how, refers to how to use tools and concepts.
- know-who, refers to know who knows what and who knows to do what.

Morgan and Murdoch (2000) reduce these to two categories; the first one clusters know & what and, the second one merges know & why. The former would be the knowledge codified, explicit and standardized. The latter refers to the knowledge tacit, implicit, local, dependant of the context and the experience. Sutherland et al. (2017) also mentions the two types of knowledge as tacit and codified. This paper mentions that some authors focus on remarking the differences (Morgan and Murdoch, 2000), others emphasize the complementary nature of both knowledge (Molnar et al., 1992; Nonaka and Takeuchi, 1995; Pretty, 1995; Black, 2000).

The tacit knowledge is linked to direct experiences and practices. It includes intangible elements, such as, beliefs, insights, value system, etc. (Isoe, 2011). Farmers' knowledge is intuitive, derived from their daily work. This kind of knowledge enables them to give meaning to their spatial and temporal context. Ingram (2010) applies these concepts to the case of soil management practices, drawing contrasts between farmers' knowledge and researchers' knowledge.

In accordance with the green revolution's mantras, the relationship between both knowledge was based on a one-way linear model, mainly relying on technology supply, poor feedback, the public sector as the main stakeholder, focusing on the most purely agronomic issues, etc.

Nevertheless, the change of framework, the free trade agreements and the globalization have increased the competition. The knowledge, the information and the technology are not anymore constrained to the scope of universities and public research centres. The communication technologies shape the knowledge dissemination processes, the civil society participates in the decision-making and the decentralization raises the responsibilities and resources at local level. To all of this, we have to add the adjustments on the public accounts, which have direct impacts on the research budgets and agricultural extension services.

The increase of social dynamism, along with the multiple knowledge sources, have speeded up the knowledge and innovation generation processes, to an extent where in many cases knowledge and innovation are almost simultaneously produced. The main drivers of this change have been the shift in food consumption, the emerging technologies, the climate change and the redefinition of public-private relationships.

Agricultural knowledge communication

The step from knowledge to innovation requires communication. Communication refers to sharing information, making somebody aware of something. Knowledge communication is a bridge that links individual experience with their group experience and, when necessary, with individuals from other groups. In fact, it is the way cultures build in and transform.

Traditionally, knowledge communication has been defined as "the exchange of feelings, opinions or any other type of information through speech, writing or another kind of signals". According to Leagans (1961), knowledge communication is the process by which, two or more people exchange ideas, facts, feelings or insights, in a manner that a shared understanding of meaning, intentions and use of messages is generated.

It is a conscious attempt to share information, ideas, preferences or attitudes with other people. The setting of a shared meaning is a common element in all definitions and the way to verify the proper knowledge communication implies a feedback or reaction of message receptor. It is important to distinguish knowledge communication from simple information, because to achieve knowledge communication it is necessary a response from the interlocutor. On the other hand, the information only provides some data, new or fact.

Everett Rogers developed the foundation of the diffusion theory. He received a Bachelor of Science (1952) and a Master's degree in Agriculture. However, his approach came from the social sciences point of view. He was interested on the resistance of farmers to use innovative techniques in agriculture. Therefore, in 1962 Everett Rogers published one of the most influence work about innovation "Diffusion of Innovations". In fact, innovation and agriculture are in the origin of current theories about innovation.

Purpose of the study

This research aims at providing insights about agricultural researchers' perceptions and motivations towards their own activities as well as farmers' activities, in order to generate knowledge for sound strategies to foster dialogue between both groups and enhance innovation.

There are three sub-objectives, such as:

1) To analyse agricultural researchers' perceptions about farmers' knowledge and information sources

- 2) To explore researchers' motivations toward the dissemination activities
- 3) To analyse researchers' perception about farmers and innovation.

Methodology

A link to an online survey was sent (June - September 2018) by email to researchers included in the database of the Spanish National Institute for Agricultural and Food Research and Technology (INIA). This institution is responsible for the management and coordination of Agrifood R&D Spanish programs. It was complemented by other regional sources.

The survey includes three blocks of questions. The first one is about researchers' perception with regard farmers' knowledge and information sources. The second one is about researchers' attitudes with respect dissemination activities. And finally some questions about researchers' profile were included in the third block.

Survey includes ninety-five questions, most of them with values included in a scale between 0 and 9, to quantify the opinion of researchers about the considered statements.

Finally, 156 researchers answered the survey; 86.5% is focused on commodities, and 8,3% on processing industry. The 19% works in the University and 81% in agricultural research centres, most of them in public centres (92%).

Analysis, with IBM SPSS Statistics, includes three steps. First step is a descriptive analysis in order to offer a general researchers' perception about farmers' knowledge and information sources. Second step is a classification of researchers' motivations toward the dissemination activities. Finally, last step is an analysis focusing on researchers' perception about farmers and innovation. This last analysis identifies different strategies of researchers according to different types of farmers. Principal Component Analysis (PCA) has been used in the second and third steps.

PCA is a multivariate technique used to simplify the numerous and complex relations that can be found in a set of quantitative observed variables. This technique seeks to find common dimensions or factors that group highly correlated variables and explain a great part of the common variability. As opposed to what occurs with other techniques, such as regression variance analysis, in factor analysis all the variables are independent, given that there is no a priori conceptual dependence of some variables on others. Factor analysis consisted of four representative steps: 1) the calculation of a matrix capable of expressing the joint variability of all the variables; 2) the extraction of initial factors; 3) the rotation of the solution to facilitate its interpretation; and 4) the denomination of the initial factors.

In the extraction method by principal components, the factors found are the autovectors of the matrix of rescaled correlations. The criterion used to extract these factors was when autovalues were greater than unity, i.e. factors that explain more variance than any original variable. The Varimax method with Kaiser executes an orthogonal rotation that minimizes the number of variables that have high saturation in each factor, simplifying the interpretation of the results. Once the final factorial solution is reached, the factors are named, and this is subjective, requiring a combination of intuition and knowledge of the variables.

The statistical contrasts used to evaluate the goodness of the fit of the factorial models formulated are: the mean of the KMO (Kaiser-Meyer-Olkin) measure and Bartlett's test of sphericity. In this study, a factorial principal components factor analyses was carried out by a Varimax rotation with Kaiser normalization.

Findings

Agricultural researchers' perceptions about farmers' knowledge and information sources

One of the suggestions provided by the AKIS approach in order to rebuild the agricultural innovation systems is to create a more horizontal model. A model where scientists and farmers are able to establish a dialogue. A previous step is that researchers should recognise farmers' knowledge and, at the same time, farmers should be confident about scientific knowledge improving their farms. In order to establish such a dialogue it is important to know researchers' perceptions about farmers as well as the opposite. Thus, based on data survey, the "know how" gets low recognition (5.9/9) by agricultural researchers as a knowledge source to solve problems, although, they value it correctly because is well adapted to specific local areas (78%). From the researchers' point of view, farmers do not demand general knowledge but solutions for specific problems and advice (7.0/9). On the other hand, farmers consider poorly research centres as information and advice references (6.2/9). It seems that each collective believes on their own knowledge resources.

Researchers consider that farmers' knowledge is mainly based on experience (7.9/9), above of formal training, tradition, non-formal training and intuition (Table 1). According to national farm records, just 5% of farmers (head of the holdings) have formal training and, experience is the knowledge source for 85% of farmers, which is in accordance with findings in this research.

Table 1 Farmers' knowledge sources

| | <i>Mean</i> |
|---------------------|-------------|
| Experience | 7.9 |
| Formal training | 6.5 |
| Tradition | 6.3 |
| Non-formal training | 6.1 |
| Intuition | 5.6 |

Furthermore, researchers also consider that technicians of cooperatives are the main farmers' source of information (7.3/9) for farmers, which provides an idea of the coverage that cooperatives have in the Spanish agricultural system, followed by peer learning, research centres and agricultural commercials (Table 2). Internet and university rank very low. Scientific journals become irrelevant. It is a clear recognition by researchers that they have little direct impact on farmers

Table 2 Farmers' information sources

| | <i>Mean</i> |
|---------------------------------|-------------|
| Technicians of the cooperatives | 7.3 |
| Peer learning | 6.8 |
| Research Centres | 6.5 |
| Agricultural commercials | 6.4 |
| Technicians of the Government | 6.4 |
| Sectorial journal | 6.2 |
| Extension office | 6.1 |
| Internet | 5.6 |
| University | 5.5 |
| Scientific journals | 3.9 |

The PCA, in this case, associates knowledge and information sources and it explains the 49% of variance. Kaiser-Meyer-Olkin (KMO) test is 0.8 and significance level of Bartlett's test of sphericity is .000, so data are suited for this analysis. It identifies two principal components (Tables 3, 4, 5 and 6). The first one explains 33% of variance and the second 16%. The first one includes University, research centres and sectorial journals as the main drivers, all of them with correlation values >0.8. Intuition and traditional knowledge get information from peer learning and agricultural commercials. They have very limited relationship with any other kind of information source. On the other side, farmers with formal training focus their attention on university, research centres, sectorial journals and scientific journals.

Table 3 Principal component analysis. Extraction method. Communalities

| | <i>Initial</i> | <i>Extraction</i> |
|---------------------------------|----------------|-------------------|
| Experience | 1,000 | ,035 |
| Formal training | 1,000 | ,473 |
| Non-formal training | 1,000 | ,301 |
| Intuition | 1,000 | ,499 |
| Tradition | 1,000 | ,505 |
| Agricultural commercials | 1,000 | ,444 |
| Peer learning | 1,000 | ,540 |
| Internet | 1,000 | ,324 |
| Extension offices | 1,000 | ,494 |
| Technicians of the Government | 1,000 | ,603 |
| Technicians of the cooperatives | 1,000 | ,458 |
| University | 1,000 | ,711 |
| Research centres | 1,000 | ,712 |
| Sectorial journals | 1,000 | ,672 |
| Scientific journals | 1,000 | ,629 |

Table 4 Total variance explained

| <i>Component</i> | <i>Eigenvalues</i> | | | <i>Extraction sums of squared loadings</i> | | |
|------------------|--------------------|----------------------|---------------------|--|----------------------|---------------------|
| | <i>Total</i> | <i>% of variance</i> | <i>Cumulative %</i> | <i>Total</i> | <i>% of variance</i> | <i>Cumulative %</i> |
| 1 | 5,078 | 33,852 | 33,852 | 5,013 | 33,423 | 33,423 |
| 2 | 2,324 | 15,495 | 49,347 | 2,389 | 15,923 | 49,347 |
| 3 | 1,462 | 9,746 | 59,093 | | | |
| 4 | 1,119 | 7,461 | 66,554 | | | |
| 5 | ,927 | 6,178 | 72,732 | | | |
| 6 | ,712 | 4,747 | 77,479 | | | |
| 7 | ,670 | 4,470 | 81,948 | | | |
| 8 | ,501 | 3,342 | 85,290 | | | |
| 9 | ,465 | 3,102 | 88,392 | | | |
| 10 | ,395 | 2,630 | 91,023 | | | |
| 11 | ,354 | 2,361 | 93,384 | | | |
| 12 | ,313 | 2,088 | 95,472 | | | |
| 13 | ,285 | 1,898 | 97,370 | | | |
| 14 | ,241 | 1,609 | 98,979 | | | |
| 15 | ,153 | 1,021 | 100,000 | | | |

Table 5 Component matrix^a.

| | <i>Component</i> | |
|---------------------------------|------------------|----------|
| | <i>1</i> | <i>2</i> |
| Experience | | |
| Formal training | ,683 | |
| Non formal training | | |
| Intuition | | ,700 |
| Tradition | | ,659 |
| Agricultural commercials | | ,612 |
| Peer learning | | ,719 |
| Internet | | |
| Extension offices | ,647 | |
| Technicians of the Government | ,772 | |
| Technicians of the cooperatives | ,586 | |
| University | ,843 | |
| Research centres | ,836 | |
| Sectorial journals | ,820 | |
| Scientific journals | ,789 | |

Extraction method. Principal component analysis

Researchers' perceptions and drivers for carrying out dissemination activities

Researchers devote 23% of their time on dissemination activities. They consider that informative workshops (7.6 mean/9) and designing multiactor research and innovation projects (7.5/9) are the best interaction and communication channels, which are valued with similar levels (Table 7). It is important to emphasize that communication through mobiles is not considered better than personal communications.

The two most important researchers' drivers to participate in dissemination activities are to offer solutions for agricultural problems (8.3/9) and to do something useful (7.7/9), both of them based on practical matters (Table 8).

Principal component analysis let identify two type of researchers according to their motivation to disseminate their findings (Tables 9, 10, 11 and 12). Two components explain the 57,2% of variance. Kaiser-Meyer-Olkin (KMO) test is 0.856 and significance level of Barlett's test of sphericity is .000so data are suited for this analysis.

The first component (41%) is highly correlated (>0.7) with variables defining scientific career focused researchers, such as, focus on getting complementary funding, professional recognition, prestige, getting research data or scientific specialization. On the other side, the second component (15.7%) defines functional or sector focused researchers including variables such us offering solutions to concrete problems or doing something useful (correlation >0.7). It should be underlined that in line with our findings the Standing Committee on Agricultural Research (SCAR) also draws up two profiles in this way. It advocates a "distinction between science-driven research" and "innovation-driven research in the motivation of research" (Table 13) (SCAR, 2012).

Researchers' perception about farmers and innovation

Almost 34% of the researchers recognise that results are not transferred to the sector. In order to foster innovation, researches demand opportunities and spaces to meet with the agricultural sector and, from a global point of view, to improve communication

a. 2 extracted components.

between researchers and farmers. In addition, they recommend defining common research objectives. All of them get the same value (8.0/9) and a more applied research to resolve real and specific farmers' problems (7.5/9) (Table 14).

Table 6 Rotated component matrix^a.

| | <i>Component</i> | |
|---------------------------------|------------------|----------|
| | <i>1</i> | <i>2</i> |
| Experience | | |
| Formal training | ,662 | |
| Non formal training | ,511 | |
| Intuition | | ,707 |
| Tradition | | ,692 |
| Agricultural commercials | | ,645 |
| Peer learning | | ,734 |
| Internet | | |
| Extension offices | ,682 | |
| Technicians of the Government | ,776 | |
| Technicians of the cooperatives | ,631 | |
| University | ,831 | |
| Research centres | ,808 | |
| Sectorial journal | ,812 | |
| Scientific journal | ,767 | |

*Extraction method. Principal component analysis. Rotation method: Varimax with Kaiser normalization
a. Rotation have converged in 3 iterations*

Table 7 Best communication channels between researchers and farmers

| | <i>Mean</i> |
|---|-------------|
| Informative workshops | 7.6 |
| Designing multiactor research and innovation projects | 7.5 |
| Agricultural journals | 7.1 |
| Direct communication with farmers | 6.6 |
| Mobile application | 6.6 |

Table 8 Researchers' drivers to carry out dissemination activities

| | <i>Mean</i> |
|---|-------------|
| To offer solutions to concrete problems | 8.3 |
| To do something useful | 7.7 |
| To improve the image of the research centre | 6.8 |
| To consolidate the research group | 6.4 |
| To rethink research topics | 6.4 |
| To access to knowledge networks | 6.2 |
| To get to research data | 6.2 |
| To get complementary funding | 6.0 |
| Professional recognition | 5.6 |
| Scientific specialization | 5.3 |
| Prestige | 4.5 |
| Economic profit | 3.0 |

Table 9 Principal component analysis. Extraction method. Communalities

| | <i>Initial</i> | <i>Extraction</i> |
|---|----------------|-------------------|
| Prestige | 1,000 | ,628 |
| Scientific specialization | 1,000 | ,613 |
| To do something useful | 1,000 | ,544 |
| To offer solutions to concrete problems | 1,000 | ,639 |
| To get complementary funding | 1,000 | ,637 |
| To consolidate the research group | 1,000 | ,624 |
| To access to knowledge networks | 1,000 | ,613 |
| To rethink research topics | 1,000 | ,536 |
| Professional recognition | 1,000 | ,639 |
| To get to research data | 1,000 | ,597 |
| To improve the image of the research centre | 1,000 | ,345 |
| Economic profit | 1,000 | ,448 |

Table 10 Total variance explained

| <i>Component</i> | <i>Initial eigenvalues</i> | | | <i>Extraction sums of squared loadings</i> | | |
|------------------|----------------------------|----------------------|---------------------|--|----------------------|---------------------|
| | <i>Total</i> | <i>% of variance</i> | <i>Cumulative %</i> | <i>Total</i> | <i>% of variance</i> | <i>Cumulative %</i> |
| 1 | 5,337 | 44,477 | 44,477 | 4,975 | 41,455 | 41,455 |
| 2 | 1,525 | 12,712 | 57,188 | 1,888 | 15,734 | 57,188 |
| 3 | 1,144 | 9,534 | 66,723 | | | |
| 4 | ,709 | 5,910 | 72,633 | | | |
| 5 | ,666 | 5,551 | 78,184 | | | |
| 6 | ,591 | 4,929 | 83,113 | | | |
| 7 | ,541 | 4,505 | 87,619 | | | |
| 8 | ,433 | 3,612 | 91,230 | | | |
| 9 | ,350 | 2,913 | 94,143 | | | |
| 10 | ,267 | 2,225 | 96,368 | | | |
| 11 | ,231 | 1,927 | 98,295 | | | |
| 12 | ,205 | 1,705 | 100,000 | | | |

Extraction method. Principal component analysis.

Table 11 Principal component analysis. Extraction method

| | Component | |
|--|------------------|----------|
| | 1 | 2 |
| Prestige | ,723 | |
| Scientific specialization | ,782 | |
| To do something useful | | ,700 |
| To offer solutions to concrete problems | | ,765 |
| To get complementary funding | ,778 | |
| To consolidate the research group | ,776 | |
| To access to knowledge networks | ,779 | |
| To rethink research topics | ,716 | |
| Professional recognition | ,786 | |
| To get to research data | ,765 | |
| To improve the image of the research centre. | ,463 | |
| Economic profit | ,592 | |

a. 2 extracted components. Table 5. Component matrix^a

Table 12. Matrix of rotated components^a.

| | Component | |
|---|------------------|----------|
| | 1 | 2 |
| Prestige | ,788 | |
| Scientific specialization | ,759 | |
| To do something useful | | ,737 |
| To offer solutions to concrete problems | | ,799 |
| To get complementary funding | ,795 | |
| To consolidate the research group | ,692 | |
| To access to knowledge networks | ,719 | |
| To rethink research topics | ,633 | |
| Professional recognition | ,793 | |
| To get to research data | ,760 | |
| To improve the image of the research centre | | ,486 |
| Economic profit | ,659 | |

Extraction method. Principal component analysis. Rotation method: Varimax with Kaiser normalization. a. Rotation have converged in 3 iterations.

Table 13. Resume of researchers' profile. Adapted from SCAR, 2012

| <i>Aspect</i> | <i>Science drive research</i> | <i>Innovation-driven research</i> |
|------------------------------|---|---|
| Incentive to program a topic | Emerging science that can contribute to solving a societal issue (or a scientific question) | An issue/ problem in society that can be solved by new research, or a new idea to solve an existing issue |
| Participation of users | In demonstration phase/ via research dissemination | In agenda setting, defining the problem and during the research process |
| Quality criteria | Scientific quality | Relevance (for the sector or a region) |
| Focus | Research organizations | Networks of producers and users of knowledge |
| Diffusion model | Linear model | System (network) approach |
| Type of government policy | Science/ research policy | Innovation policy |
| Economic line of thinking | Macro- economics | Systems of innovation |
| Finance | To a large extent public money; more speculative and large spills over effects | Public private partnerships very possible / advantageous |
| Type of research | Interdisciplinary with absorption capacity in AKIS | Transdisciplinary and translational with close interactions |

Table 14. Key points in order to foster innovation

| | <i>Mean</i> |
|---|-------------|
| Spaces to meet with agricultural sector | 8.0 |
| Improve communication between researchers and farmers | 8.0 |
| Common definition of research objectives | 8.0 |
| More applied research | 7.5 |

Practical/Theoretical/Political Implications,

These findings offer interesting thoughts about the complementarity between, traditional and scientific knowledge. Currently, researchers' direct dialogue is difficult with traditional farmers because their information sources are peer learning and agricultural commercials. If researchers want to share knowledge with these profiles, they must focus on leader farmers and agricultural inputs companies. If researchers focus on formal trained farmers, the dialogue will be easier. Unfortunately, those farmers are not the main profile in the Spanish agricultural sector. Therefore, one of the challenges is to propose methods where scientific and experiential knowledge can be a complement. According to those findings, another important challenge is to support researchers' motivations. Researchers focused on scientific careers and researchers focused mainly on sectorial problems must be both professionally recognised. Scientific publications and extension activities or spreading information and knowledge should be considered when evaluating researchers' professional activities.

Agricultural researchers state that they spend a considerable time, almost one quarter of their time, on dissemination activities. It is striking that they spend so much time because it has very little recognition on their professional scientific careers that most agricultural researchers are concerned. Spite those difficulties they value highly multiactor involvement on research and innovation projects. It means that they believe that the best dissemination is when the different agrofood chain agents get to work together since the beginning and not only at dissemination stages. This approach is hardly put in practice nowadays in Spain. In any case, they believe that their dissemination activities should be useful and prepared to solve problems.

In real terms, there is a contrast between those beliefs and the significance of the majority of agricultural researchers preoccupied for the usual standards to promote their professional careers, like funding, prestige and recognition. It means that researchers move in between their beliefs and the official evaluation parameters. In order to promote innovations they propose to work more closely with farmers and other agents along the agrofood chain.

Communication is a key element for further developments but strategies could be different depending on the farmers' level of training because they acquire knowledge and get information from different sources. Accordingly, if the strategy is not adequate could be useless. Unfortunately, a great majority do not have formal training but many of them belong to cooperatives where technicians could play an important role on transmitting information and knowledge. Researchers should carefully pursue their communication strategies.

These data offer an interesting picture about the agricultural researchers' position in the new AKIS proposals. We can appreciate a large distance between scientific and traditional knowledge, but also there is a very good opportunity and willingness in order to change the researchers' way of work.

Originality/Value

This communication offers an interesting approach to the innovation systems from the researchers' point of view. It opens several interesting action lines in order to get a more dynamic and innovative relationship between farmers and researchers, between traditional and scientific knowledge. Furthermore, it targets how to foster these processes, supporting to researchers to change towards a new model of agricultural knowledge and innovation systems.

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Building extension capacity in privatised extension systems: Insights from delivery of on-line professional development modules in Australia

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Keywords

Extension capability, education, pluralism, commercialisation, practice, micro-credentialing

Abstract

In developing capability in agricultural advisory and extension services, the reare calls for emphasis on 'softcapabilities' and innovative learning modes. In this paper we aim to contribute to knowledge about how this can be achieved in tailoring capability development to meet the professional needs and demands on advisors in pluralistic extension systems. We report on the development, delivery and evaluation of on-line professional development (PD) modules in agricultural extension in Australia. We applied a capacity development framework to analyse data from a professional development needs analysis of advisors across Australia (n=655) and from pre and post-involvement questionnaires completed by module participants about their experience (n=62). We found the diversity of advisors presented challenges for design and delivery of professional development. The diversity related to: the work context (e.g. commercial or industry body); the level of knowledge and experience in extension theories and methods; the framing of professional development as individual learning; and, the level of work-load support for advisors from their organisation in completing PD 'outside the firm'. This diversity, along with the short format, on-line learning mode also placed limitations on the emergence of a community of practice. Our findings define the areas needing to be managed in tailoring PD whilst balancing the demand for flexibility in delivery and cohort - specific content and processes. As one of few studies of the real constraints for advisors in participating in PD in a pluralistic context, unique insights to the capability challenge and implications for advisory system governance and research have emerged.

Translating the transformative learning approach into practice: the case of a training of trainers' pilot in client-centred extension approach

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Keywords

Experiential learning, training, extension service, adviser competences

Abstract

To analyse the potentials and limitations of using an experiential learning approach to induce attitudinal change in the Ethiopian Extension System to transform extension services from a teaching (topdown) to a participatory and interactive way.

Design/Methodology/approach:

Reconstruction of the experience implementing a training of trainers event in a regional Ethiopian Extension System, considering the theoretical foundations, the training concept, the process and the learning outcomes from trainers and learners points of view.

Findings:

the article presents how theories are related to the concept development and the application of an innovative training of trainers' event using an experiential, transformative learning approach. Experiential based training has the potential to be a starting point that enables transformative changes in the extension system. However, in order to increase that potential, its design should consider not only the theoretical foundations but a number of prerequisites inside the extension system and its agents.

Practical/Theoretical/Political Implications/Originality/Value:

The article presents main leanings of a practical experience with a specific case of a system of extension. Exploring the chain of theories, concepts, application and outcomes, the main findings can be used by practitioners in the design of training methods in similar contexts. The findings might also be used in order to design research methods to assess effectiveness of innovative training methods oriented to change towards more participatory extension systems.

Increasing the Competence of Agricultural Advisors in Uganda

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Abstract

Like most African countries, Uganda is predominantly an agricultural country, with more than 60% of the population working in agriculture. The agricultural situation goes beyond the narrower professional position, as it is the dominant sector of economic and social status. Agriculture and the related agricultural services sector occupy 90% of the population, while agriculture accounts for 24.5% of GDP, and agricultural services produce 54.5% of GDP

The main challenges of the agricultural sector in Uganda are the climate change, poor farming techniques, limited market access, lack of effective implementation of laws and policies and regional conflicts.

As a program of aid from the Hungarian Government two, nine weeks training courses were organized by the Ministry of Agriculture of Hungary in partnership with Szent Istvan University, the leading university of applied sciences, African Hungarian Union (AHU) and hosted by Kyambogo University. The training program was under a theme increasing the competencies of extension service specialists in Uganda and it focused mainly on enhancing their methodological and professional knowledge.

The primary goal of the project was to establish a complex training regime that -based on the complex knowledge expansion of local professional advisors- simultaneously helps to sustain agro-biodiversity, and make family farms viable and to enhance the effectiveness of knowledge and technology transfer from Hungary to Uganda.

During the pilot program in 2017 the Kyambogo University recommended participants, who had just graduated from university. Unlike the 2017 program, 2018 training program included practicing agricultural extension workers from local governments, agricultural organizations and other trainees from academia like teachers particularly in agriculture. It started on 26th September covering four days a week from Wednesday to Saturday and ended on 23rd November 2018 with a closing ceremony and issuance of certificates.

Several modules were taught during the course including: Methodology of extension, Business solutions for small scale producers, Project management, marketing methods, Household economics and nutrition, Main aspects of agricultural projects in African countries, and Presentation technics.

The length of the training was 9 weeks with a final exam on the last week closing with the ceremonial handing over of certificates.

Experiences were shared from all over Uganda since the trainees came from different regions of the country and also comparisons were drawn between how agriculture is done in the developed nations and how it is done in the less developed countries in Africa.

Although the students possessed very heterogenic professional background knowledge, they still participated diligently and with great attention in the training. Their efforts were highly appreciated as some of them had to come from remote areas and branches to get to the training.

All training modules were justified, and the students have creatively and innovatively utilized all the knowledge gained there. The students have indicated their ability to use the lessons learned in a skillful and routine manner by creating excellent individual presentations. Some of the students have also made individual calculations and statistical survey work during the creation of their final exam paper. Through these essays participants have received an overarching picture about the situation of certain regions and their problems. Solution suggestions have also arisen that could serve as a good basis for some entrepreneurships.

As a summary it can be ascertained that the project was a success: 33 students have been trained and the Hungarian partners have gained valuable experience in the preparation and implementation of similar African projects.

Innovative training for advisers and farmers on creating added value at farm level. Case study from Poland

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Keywords

Added value, supply chain, direct selling, innovative training

Abstract

Supporting competitive supply chains is included in the European Union's Rural Development Programme, mainly in its priority 3 – "Food Chain Organization and Risk Management". In recent years, many publications and a large scope of consulting work have concerned the promotion of creation of producer groups, added value and shortening of supply chains. Agreeing with the thesis that supply chains should be short, one should also take into account that there are different ways of organizing them in business practice. Adding values can take place along the entire supply chain or at individual stages of production and marketing. The key is to add elements for which customers are willing to pay (more) and which in their diversity may include a new product, higher quality, local origin or a refined brand. In our opinion, the main focus is always on the customer, and the concept of added value will become real only if consumers are interested in purchasing such products. However, attention should be paid to the specificity of the food market, which significantly affects its shaping in the aspect of the entire supply chain. Among many features of this market the most important are: the seasonality of supply and sales, large fluctuations on the side of the supply of agricultural raw materials, low durability and natural susceptibility of small-scale production for brokering.

In the traditional approach to creating added value in agriculture, the focus was on generating additional income through the participation of farmers in the supply chain beyond the basic production of raw materials (change of sales, sales date, product characteristics), thus changing the role of the farmer, from the producer of raw materials for an agro-businessman. The new approach, extremely important for countries with fragmented agrarian structure (including Poland), focuses on generating income through the production of goods with favorable identity and quality features on the market and capturing the price premium. They can be local, regional, ecological and special products. These two types of approaches to creating added value are not mutually exclusive and farmers can combine good practices from both paths.

The main aim of the thesis is to illustrate ways and methods of organizing trainings for advisers and farmers in the newly established Practical Training Center in the scope of a new approach to creating added value at the farm level and direct sales marketing. For 8 years the Center has had four small model processing plants and complete technological lines, i.e. milk, meat, cereals as well as vegetables and fruits, adapted to the

financial possibilities of small farms or groups of agricultural producers. They enable practical training for farmers and advisers in the field of food processing and building marketing strategies.

Other objectives of the thesis are to assess the effects of training and to show the best examples of the use of acquired knowledge in business practice. The training assessment was carried out in following areas: small processing of agricultural raw materials at farm level, diversification of agricultural income sources, direct marketing and methods of improving the smoking of processed animal products.

GPS Cows: an interactive digital technology knowledge exchange with high school teachers

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Keywords

Digital literacy, e-learning module, high school teachers, professional learning, livestock tracking data

Abstract

FAgriculture is a significant contributor to the Australian economy, however there is currently a shortage in suitably qualified people to enter the workforce. The GPS Cows program (www.gpscows.com) consists of an e-learning resource and aims to increase the digital literacy skills and knowledge of food and fibre production of Year 7 & 8 students studying Technology Mandatory as part of their schooling in New South Wales, Australia. It is hoped that GPS Cows will showcase the technology utilised in the agricultural industry and attract the next generation workforce. To ensure the GPS Cows program is successfully implemented in schools, a series of one-day professional learning workshops were conducted across rural and urban areas, with over 120 teachers participating. This paper evaluates their experience, with feedback to be utilised as part of the action research cycle to improve the program. The survey results (response rate of 90%) for the GPS Cows workshop was positive with 99% of participants stating that they enjoyed the day.

Background

Australia is a highly developed country with 90% of the population living in urban areas (Trading Economics, 2018). It is therefore unsurprising that an increasing disconnect between the general community and the agricultural sector is being observed. There is currently a skills shortage in the agricultural industry with an estimated four jobs available for each person who graduates from university with a degree in this discipline (Pratley and Botwright-Acuna, 2015). Agriculture now requires a workforce with higher degree skills in digital literacy, science, technology, and mathematics (STEM) to facilitate the transformation of the sector (Australian Government Parliamentary Committee 2016). Closely linked to this issue is a low level of digital literacy amongst young people, with the number of students in Grade 6 and Year 10 achieving a proficient standard in national testing declining in 2017 when compared to 2011 levels (ACARA, 2018).

One way in which both of these issues is being addressed is through the implementation of a new Technology Mandatory curriculum in the State of New South Wales. This subject requires students to achieve learning outcomes related to food and fibre production (Logan, 2018). This compulsory curriculum for 13-14 year old students also

includes content on digital and design technologies. However, for this curriculum to be successfully implemented in the classroom, teachers require the knowledge and skills to confidently teach content on these concepts. A lack of qualified teachers in technology related areas, but especially agriculture (Victorian Farmers Federation, 2011) has led to the demand for extra resources to be developed and professional learning opportunities offered. It is vitally important that in conjunction with the development of a resource, that teachers are supported in implementing it in the classroom. Professional learning workshops are critical to a program's success to ensure teachers have the knowledge and confidence to teach these resources in the classroom (Tytler, 2007). In collaboration with researchers, industry professionals and the NSW Department of Education, the 'GPS Cows' e-learning module was developed to build the capacity and confidence of teachers to implement this new curriculum (Cosby et al., 2019).

Purpose

The GPS Cows e-learning module aims to provide an understanding of agricultural production in Australia and an appreciation for the technology used in industry. Specifically, it addresses the need for students to have increased knowledge and skills in digital technologies using GPS livestock tracking data, an emerging technology, as a case study. Research into tracking livestock using GPS devices has been the subject of animal behavioural scientists for over 20 years (Bailey et al., 2018) for a wide range of applications within the agricultural industry. Therefore, students who develop skills in analysing this data are likely to be sought after by employers.

Previous research, as part of a pilot program, identified the opportunities and barriers to implementing the GPS Cows program in schools. Results from the pilot program highlighted that teachers believed the resource would increase engagement of their students with their learning and they would enjoy participating (Cosby et al., 2019). This highlighted the potential of GPS Cows to assist with students achieving learning outcomes in an innovative manner. Areas identified by teachers where the research team could support the GPS Cows program being taught in schools included ongoing support, the development of resources and professional learning workshops (Cosby et al., 2019). This feedback was considered when designing the GPS Cows e-resources and professional learning workshop which are the focus of this paper. This paper will report on the effectiveness of the GPS Cows workshop to facilitate knowledge exchange with teachers and allow them to use the e-learning module in their classrooms.

Methodology, data collection and analysis

An assessment of the GPS Cows workshop and resources was conducted following the Kirkpatrick Four Levels of Training Evaluation model (Kirkpatrick and Kirkpatrick 2006). During, and at the conclusion of the workshop data from attendees were collected using a participant response system and online survey to evaluate the 'reaction' and 'learning' components of the framework. This paper reports on the results of the online survey (using SurveyMonkey™) completed at the conclusion of the workshop. Future publications will report the results from the participant response systems. Eight workshops were conducted during October and November of 2018 across urban and regional NSW, with 108 of 120 teachers attending completing the evaluation survey (90% response rate). The data has been analysed to identify the strengths of the GPS Cows program workshop and areas which require improvement as part of the action learning research cycle. The 'behaviour' and 'results' component of the Kirkpatrick model (Kirkpatrick and Kirkpatrick 2006) will be considered in future publications. This will be completed through follow-up surveys which will be sent to teachers who have attended the GPS Cows workshop to determine how they have utilised the program in their school.

Results and Implications.

A total of 108 teachers (66% female and 34% male) completed the survey at the conclusion of the GPS Cows workshop (90% response rate; Table 1). Of the participants, 62% of teachers had been teaching for greater than 10 years, with only 2% of the participants teaching for less than 1 year. Most teachers spent their own childhoods in towns rather than cities, with 74% reporting they grew up in townships of less than 50,000 people. Of the total respondents, more than a third grew up in rural towns of less than 5,000 people. Interestingly, more participants had shifts away from major and capital cities and towards townships in their careers, with a total of 26% growing up in cities but only 19% currently teaching in them (Table 1).

Table 1 Demographics of teachers completing the GPS Cows for Technology Mandatory workshop.

| Gender (n=107) | |
|---|------------|
| | Percentage |
| Female | 66% |
| Male | 34% |
| Years teaching (n=107) | |
| | Percentage |
| <1 Year | 2% |
| 1-3 Years | 12% |
| 4-7 Years | 14% |
| 8-10 Years | 10% |
| 10-15 Years | 20% |
| 16+ Years | 42% |
| Location the majority of childhood spent (n=108) | |
| | Percentage |
| Rural Town – less than 5,000 people | 34% |
| Town – 5,000-18,000 people | 17% |
| Large Town – 19,000 – 49,000 people | 23% |
| Major City – 50,000-250,000 people | 12% |
| Capital City – 250,000+ people | 14% |
| Location of current school n=108) | |
| | Percentage |
| Rural Town – less than 5,000 people | 29% |
| Town – 5,000-18,000 people | 22% |
| Large Town – 19,000 – 49,000 people | 30% |
| Major City – 50,000-250,000 people | 11% |
| Capital City – 250,000+ people | 8% |

Table 2 demonstrates that 99% of participants who responded enjoyed the workshop with 97% reporting that they considered the workshop relevant to their own teaching. No participants reported that they disagreed that the workshop was either relevant to

their teaching or a good use of their time, reflecting that the content and resources covered within the workshop is well aligned to the Stage 4 Technology Mandatory curriculum. In line with this, 89% of participants responded that they were confident they could implement the GPS Cows module into their Stage 4 Technology Mandatory teaching program. Encouragingly, 97% of respondents reported that they would recommend GPS Cows to their colleagues (Table 2).

Table 2 Participant's perception of GPS Cows workshops (n= 108)

| | <i>Strongly Agree</i> | <i>Agree</i> | <i>Neutral</i> | <i>Disagree</i> | <i>Strongly Disagree</i> |
|--|-----------------------|--------------|----------------|-----------------|--------------------------|
| <i>I enjoyed the workshop</i> | 50% | 49% | 0% | 1% | 0% |
| The workshop is relevant to my teaching | 54% | 43% | 3% | 0% | 0% |
| Attending the workshop was a good use of my time | 56% | 41% | 3% | 0% | 0% |
| I am confident I will be able to use the GPS Cows module as part of my Stage 4 Technology Mandatory teaching program | 28% | 61% | 9% | 2% | 0% |
| I would recommend the GPS Cows workshop to my colleagues | 47% | 50% | 3% | 0% | 0% |

Respondents were asked to answer an open-ended, non-compulsory question to identify what they thought was the best part of the workshop. As a result of the thematic analysis, four key themes were identified (Table 3). Participants reported that the best aspects of the workshop included the quality of the resources and presenters, the format and content of the workshop, and the real-world contexts provided by the program. The largest theme reported by participants was in response to the hands on and practical nature of the workshop which allowed the teachers to get an understanding of the content themselves, including any challenges their students may face. One participant responded, "Consolidating learning as we progressed through the day to ensure we understood before moving on. Great presenters very helpful and patient with me! Thank you" and another, "The workshop was comprehensive and the ideas are great. Provided sufficient training and time I do believe that this program could be successful". It is important to ensure any training that is aimed at increasing digital literacy skills is practical and involves teachers using their own computers to become

familiar with the content. It has been reported that teachers who are not comfortable or experience using computers themselves may not integrate their use in the classroom (Mueller et al., 2008).

Table 3 Themes identified as the best thing about the GPS Cows Workshop (n=78)

| <i>Thematic Response</i> | <i>Number of Responses</i> |
|---|----------------------------|
| Hands on & Practicality of the Workshop | 27 |
| Workshop Format and Content | 20 |
| “Real World Contexts” Provided | 16 |
| Resources & Quality of the Presenter | 15 |

When asked for aspects of the workshop that could be improved four key themes emerged. The greatest of these was that participants felt like they would benefit from more time, with some suggesting this would improve their ability to complete activities. One person said:

Probably needs to be longer, as much as I hate to say this, however I didn't feel that I had enough time to really understand every step. I did find some of the instructions hard to follow, which I believe would become easier if you practiced more.

For the majority of teachers, a one-day workshop will not provide enough time to master the skills required to teach all the activities to their class that form the GPS Cows resource. Research as stated that it can take 5-6 years for a teacher to develop the skills to integrate technology successfully in the classroom, and they require support and time to obtain this confidence (Hadley and Sheingold, 1993). It is therefore important that teachers revisit the GPS Cows workshop and e-learning materials after their participation in the professional learning opportunity to continue to develop their skills and knowledge.

Other themes that emerged including updating and extending the resources, more explicit teaching and curriculum links, and teaching how to overcome technological troubleshooting and venue issues. One participant explained that while there were other teachers and facilitators there it did not pose an issue, but that it may become an issue in the future:

It was a bit challenging when I fell behind or made an error and could not fix the problem, however, the facilitators and other attendees helped...bound to be an issue when people have different levels of technology skills.

Table 4 Themes identified as where the GPS Cows Workshop can be improved (n=45)

| <i>Thematic Response</i> | <i>Number of Responses Number</i> |
|---|---------------------------------------|
| Longer / More Time | 18 |
| Updated / More Resources | 11 |
| Technology / Venue Issues | 9 |
| More Explicit Teaching / Curriculum Links | 7 |

Conclusion

As part of the action research cycle, the feedback received were utilised to improve workshop content and e-resources. Amongst the changes was the development of a comprehensive teaching program aligning each of the lessons in GPS Cows to the Stage 4 Technology Mandatory curriculum has to assist teachers to see the strong links this program has to the syllabus. Additionally, the way parts of the workshop are delivered to participants and the instructions around the use of Excel have been updated to try and alleviate some of the difficulties faced. These changes will be evaluated in the second round of the GPS Cows workshops, with 9 events undertaken in March and April of 2019. Future research will also focus on evaluating the 'behaviour' and 'results' components of the Kirkpatrick Four Levels of Training Evaluation model with workshop participants.

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Enhancing student engagement through course redesign to incorporate student centred learning

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Keywords

Student engagement, course design, problem based learn

Abstract

An action research project was conducted to investigate the effects of a course redesign on student engagement in classroom settings in a Teagasc agricultural college in Ireland. In the first phase of the research, student 'engagement' in a traditional lecture form was observed 66 times in three different types of modules. One type of module had 0/16 classes rated as 'high engagement'. These conditions phase of the research involved redesigning a module of this type using a problem based learning (PBL) approach to examine if this would enhance student engagement in the classroom. Observations were carried out on 24 classes of the redesigned module and 16/24 had 'high engagement'. This indicates that a course redesign based on student centred learning can enhance student engagement in modules where students traditionally find it difficult to engage and can enhance their academic achievement. Course design should be the first consideration when planning how to enhance student engagement. Course design refers to the collection of modules that make up an education programme, how they are structured, organized (timetables etc.), the module specifications (learning outcomes, assessment strategies) and mode of delivery. Three of these were influential in this action research project: the course structure, module specifications and organizational aspects of the course. This paper outlines and discusses why course design plays such a key role in student engagement.

the number of students in Grade 6 and Year 10 achieving a proficient standard in national testing declining in 2017 when compared to 2011 levels (ACARA, 2018).

Farm advisory services and knowledge growth in Italy: comparison among three regional intervention models

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Keywords

Knowledge, Innovation, European knowledge policy

Introduction

Innovation in the agricultural sector is considered the main strategy to improve food production, multifunctionality and agricultural sustainability. In this scenario, policy makers worldwide and especially in the European Union (EU) are structuring a new toolbox to implement more efficient public policy to foster knowledge and innovation in rural areas. Among the most important tools, agricultural advisory services have regained importance (Knierim et al., 2017). Moreover, the framework developed in the next programming period 2021-2027, stressed the relevance of interactions among different operators working in agricultural knowledge, through the establishment of new networks and new subjects, like operational groups (van Oost, 2017).

In the proposal COM (2018)392 for Cap 2021-2027 - Rules on support for strategic plans to be drawn up by Member States under the Common agricultural policy (CAP Strategic Plans) and financed by the EAGF and by the EAFRD, EU priority is to promote a knowledge-based rural economy with stronger interventions for knowledge-transfer and advisory measures.

Several studies had, as an objective, investigate the dimensions of agricultural consultancy as forerunning innovation adoption (Cristiano et al. 2015, Cristiano 2012, Vagnozzi 2010, Ascione 2010, Vagnozzi 2008).

The need for knowledge in this domain is getting wider also due to agricultural sector deep transformations and new economic, environmental and social challenges that it is facing. New features have been assigned to agriculture, in terms of strategies, policies and meaning to better support genesis processes of shared and coproduced knowledge (Cristiano et al. 2015). In this scenario, the role of the consultant as a bridge among farms, professional training and innovation is pivotal to create mutualistic

learning and open innovation construction and diffusion, in an environment of mutual trust and encouragement (Koutsouris, 2012). This process fosters also connections and interaction among actors within the innovation process (Klerkx et al., 2012).

The deep transformation of the European knowledge policy and extension services needs a period of experimentation and results observation before the new CAP 2021-2027.

Several factors working together could create the conditions to reach all types of potential beneficiaries, even small and marginal ones, of agricultural services (Eastwood et al., 2017) and to avoid “result paradox” (Benvenuti, 2000; Bartoli et al, 2017)

This paper focuses on the description of case studies in three Italian regions: Campania, Emilia Romagna and Veneto. These Regions have implemented, using Measure 2 of Rural Development Plan 2014-2020, three different public intervention models to develop the supply of extension at farm level, to stimulate higher rates of farmer participation in agricultural services and to empower human capital and farmers’ attitudes towards innovation (EU SCAR 2012).

Materials and Methods

The analysis of different Measure 2 models is implemented through a qualitative approach. After a description of the policy models based on the available public documents, the regional approaches have been compared using three main dimensions: the explication of advisor activities derived by farmers needs analysis, the characteristics required for consultants, the choice of tenders or calls to select beneficiaries.

The empirical research is divided in two parts.

The first one is devoted to the description of the three intervention models proposed by Campania, Veneto and Emilia Romagna Regions.

In the second part of the study, available data related to the farms’ requests, consultants characteristics and budget and expenditure progress will be analyzed. In Campania, Veneto and Emilia Romagna, Measures 2 are in an early stage of implementation so there are few data. However, the available information provides insights for interesting reflections.

Regional policy model

Emilia Romagna Region

Emilia Romagna Region has implemented Measure 2 – sub measure 2.1 model based on three prevalent needs: F01 - Fostering innovation, cooperation and the development of the knowledge base in rural areas, F02 - Strengthening the links between agriculture, food production and forestry and research and innovation, F03 - Fostering lifelong learning and vocational training in the agricultural and forestry sectors. Public calls are published for Measure 2 interventions. Amount of advisory activities are estimated used standard costs.

Beneficiaries of public calls are consultants with documented experiences in the field covered by the call for tenders. To apply consultants and their advisory bodies have to be approved by Regional Authority. The selection of proposals is based on three criteria: 1) compliance with the needs and objectives of the Focus areas set in the calls 2) requested budget 3) ability to pursue the objectives. On the hand of target group, farmers age and intervention area falling into zone C “intermediate rural areas”, zone D “areas with development problems”, into parks and natural reserves and into vulnerable zones identified under the nitrates directive are higher valued are evaluated characteristics. Advisory topics proposed by Emilia Romagna region are 13 (table 1).

The Emilia-Romagna model is structured in two steps and it is based on a list of con-

Table 1 Lists for advisory activities

| <i>Topics</i> | <i>Main FA</i> |
|---|----------------|
| Precision farming and HW and SW applications of precision agriculture | 2A |
| Antibiotic resistance control techniques | 2A |
| Biosecurity and animal welfare | 2A |
| Biodiversity and defend crops from wildlife invasive | 4A |
| Conservative agriculture and reduction of footprint | 4B |
| Waste water and livestock effluent treatment techniques | 4B |
| Biological agriculture | 4B |
| Methods to reduce nitrates in aquifers | 4B |
| Low-impact defense for control of adversity in agriculture | 4B |
| Adaptation to climate change due to changes in water regimes | 5A |
| Qualitative optimization of water resources | 5A |
| Innovative technologies for irrigation and water saving | 5A |
| Techniques for reducing GHG and ammonia emissions in farms | 5D |

Source: own elaboration

sulting projects approved by the Region. Farmers can make their choice among the different possibilities included in the catalogue.

The two phases are:

- 1- to evaluate and to publish consultancy project on the “green catalogue” and contextual recognition / accreditation of advisory body;
- 2- to identify the interested farmer and to fix the economic support.

The two phases can be implemented in different time even weeks or months, rarely one or two years. The main peculiarity of the Emilia-Romagna model, which differentiates it from all Italian regions and from almost all European ones, is the high financial support provided by farmers. Farmers pay 40% of the consultancy costs, plus 22% VAT and 4% for consultants’ social security fund, while the Region only reimburses 60% of the cost. In practice, this structure leads to a subdivision amounts practically equal between public and private. The funds can be booked at the moment of the application and that the granted funds follow a monthly ranking. To guarantee a continuous availability until 2020, the total dedicated amount (€ 3,000,000.00) was divided into nine parts, each one activated every 4 months. To date six of the 36 rankings scheduled have already been concluded.

Veneto Region

Beneficiaries of Measure 2 are public or private advisory bodies or advisory networks (as describe by special regulation on network aggregation forms) with documented experiences in the field covered by the calls and with requirements foreseen by the Interministerial Decree 3 February 2016 concerning “Establishment of the farm advisory system in agriculture”.

Advisory services consist of a set of interventions carried out by the advisory bodies to support the agricultural farms for technological / managerial / market changes necessary to improve their competitiveness and a sustainable use of production factors. Therefore, extension services aim to increase the economic and environmental performance of farms. To improve consultants’ specific skills, each tender has specific requests to identify beneficiaries.

The selection of proposals is based on a set of criteria that can be summarized in these six: 1) adequate skills to conduct consulting activities, 2) characteristics of advisory approach and project, 3) compliance with the needs and objectives of the Focus areas

set in the calls, 4) compliance with the horizontal objectives, 5) farmers targeting, 6) coherence of intervention area. Public calls are published for Measure 2 interventions. The financial support provided by Veneto Region is equal to 100% of the intervention. Advisory topics proposed by Veneto region are 18 (table 2).

Amount of advisory activities are estimated used standard costs. For each advisory service, the related protocols have been prepared. This guide briefly describes the aims and objectives, the specific technical aspects for the service implementation, in particular the minimum number of visits to the farms, the intermediate and final outputs and the cost. With regard to this aspect, for each protocol a specific analysis was carried out to identify specific working hours amount (Consultant Work Hours - CWH), requested from the consultant generally required to perform those services. The unit cost of the advisory service was determined by multiplying the CWHs for the standard cost (42 euros / hour). The agricultural advisory activities are divided into two types:

- basic consultancy;
- specialized consultancy.

Table 2 Lists for advisory activities

| <i>Advisory activities</i> | <i>Main FA</i> | <i>Hours of work</i> | <i>Unit cost advisory activities (euro)</i> |
|--|----------------|----------------------|---|
| Management consulting aimed at the economic optimization of production factors, at overcoming critical points, at developing opportunities, also through the use of RDP measures | 2A | 15 | 630 |
| Advice on safety in the company aimed at improving the organization and working conditions | 2A | 12 | 504 |
| Advice aimed at assessing credit access opportunities. | 2A | 25 | 1050 |
| Consultancy aimed at starting farm activities | 2A | 25 | 1050 |
| Consultancy aimed at introducing innovative, medicinal or non-food crops into the company | 2A | 25 | 1050 |
| Consulting aimed at the start of direct sales. | 2A | 25 | 1050 |
| Advice aimed at preparing a marketing and communication plan | 2B | 20 | 840 |
| Consulting for management digitalization | 2B | 20 | 840 |
| Consultancy aimed at mapping and managing risks for the agricultural company | 2B | 15 | 630 |
| Animal welfare-oriented advice (dairy cattle) | 3A | 35 | 1470 |
| Animal welfare-oriented advice (beef cattle) | 3A | 25 | 1050 |
| Advice aimed at guiding the entrepreneur on the subject of conditionality (vegetable) | P4 | 12 | 504 |
| Advice aimed at guiding the entrepreneur on the subject of conditionality (animal) | P4 | 12 | 504 |
| Consultancy aimed at guiding the entrepreneur towards the sustainable management of specialized crops: viticulture | P4 | 30 | 1260 |
| Advice aimed at guiding the entrepreneur towards the sustainable management of specialized crops: fruit growing | P4 | 30 | 1260 |
| Advice aimed at guiding the entrepreneur towards the sustainable management of specialized crops: horticulture | P4 | 30 | 1260 |
| Consultancy aimed at guiding the entrepreneur towards the sustainable management of specialized crops: floriculture and | P4 | 30 | 1260 |
| Consultancy aimed at guiding the entrepreneur to conversion to organic | P4 | 30 | 1260 |

Source: own elaboration

Campania Region

Beneficiaries of Measure 2 - sub measure 2.1 Aid for obtaining advisory services - are advisory bodies with requirements foreseen by the Interministerial Decree 3 February 2016 concerning "Establishment of the farm advisory system in agriculture". Members of advisory bodies have to be:

- enrolled in professional orders and boards for the respective advisory areas;
- subjects with qualification required for enrolment in orders or professional colleges;
- at least 3 years work experience as consultant in the field of technical assistance or consultancy in the field or in the areas for which the consultant intends to provide the service.

Tenders with multiple lots are published for Measure 2 interventions. Each tender is composed by different The aims of this approach are to divide the service being auctioned into parts in order to increase attraction for small and medium size advisory bodies, to reduce the number of bureaucratic procedures.

Regional Authority has implemented an inventory of advisory activities, this list contains a set of activities analytically described and provides Advisory bodies also useful information to formulate the project (amount, focus area etc).

For the identification of the best methodology for applying Measure 2, a "Regional Catalogue of Advisory Activities" (77 activities) has been discussed by Committee of Professions and Professional Orders / Colleges (table 3). To better define farmers needs and research activities and connections among these actors and advisory bodies, to facilitate the innovations dissemination and to define the priorities on which to direct the activities of the advisory bodies regional authority has set up the Orientation Committee of the Agriculture Advisory System (D.G.R. n. 112 - 07.03.2017). The Committee approved on 6 September 2017:

- "Regional catalogue of Advisory Activities";
- "Context Analysis" – to identify object and territorial distribution of the lots.

Table 3 Lists for advisory activities

| <i>Topics</i> | <i>Main FA</i> | <i>Advisory activities</i> |
|--|----------------|-----------------------------|
| Innovative agricultural production | 2A | 1 - 45 - 61 - 64 |
| Biomarketing | 2A | 2 |
| Biological | 3A/2A | 3 - 4 - 5 - 6 - 7 - 8 |
| Biodiversity | P4 | 9 |
| Landscape | P4 | 10 |
| Harmonization of agrosilvopastoral activities in protected areas | P4 | 11 |
| Energy efficiency and biogas | 6A/5C | 12 - 55 |
| Management of the organic fraction of waste and zootechnical and oil waste | 6A/5D/P4 | 13 - 24 - 60 |
| Improvement of farm' s performance and structures | 2A | 14 - 15 - 17 - 18 |
| Actions to safeguard the integrity of livestock and to combat zoonoses | 3A | 16 |
| Processing of livestock products - food safety | 3A | 19 - 21 |
| Development of associative and cooperation forms | 3A | 20 - 27 - 69 |
| Animal welfare and optional animal welfare certification systems | 3A | 22 - 23 |
| Informatic and digital technologies | 3A | 25 - 43 - 56 - 73 |
| Job safety in the enterprise farm / forestry | 2A | 26 - 48 |
| Estimate and evaluation of damages | P4 | 29 - 57 - 58 |
| Damage prevention | P4 | 30 - 31 - 59 |
| Sustainable forest management and activities related to mushrooms and truffles | P4/5E/6A | 32 - 38 - 39 - 41 |
| Collection and management of forest reproductive material | P4 | 33 - 40 |
| Prevention of natural disasters (fires and hydrogeological instability) | P4 | 34 - 35 - 36 - 37 |
| Management control and development of the agricultural enterprise | 2A | 44 - 46 - 47 |
| Develop a business plan for access to credit | 2A | 49 |
| Income integration and multi-functionality | 6A/3A | 50 - 51 - 52 |
| Introduction and ex ante evaluation of investment activities in the field of direct sales activities | 3A/2B | 53 - 54 |
| Processing of plant products - food safety | 3A | 62 |
| Phytopathological emergencies | 2A | 63 |
| Viticulture | 2A | 65 - 66 |
| olive cultivation | 2A | 67 - 68 |
| Irrigation and fertigation | 5A | 70 |
| Quality systems | 3A | 28 - 42 - 74 - 75 - 76 - 77 |
| Forage farming and pasture management | P4 | 71 - 72 |

Source: own elaboration

A highly qualified technical staff is awarded with reference to the subject areas of the contract. Furthermore, on the hand of target group, farmers and rural entrepreneurs involved in agritourism, traditional catering, hotel reception, extra-hotel reception, tourist services (guide, organization of incoming, management of sites of interest, museums, etc.), artistic crafts (woodworking; stone working; artistic and traditional ceramics and terracotta, etc.) could be recipients of advisory services. Each farm could receive advisory services for an amount equal to 1,500.00 euros per year. To date, three tender procedures have been activated with a total amount of € 9,600,000.00

Results

The results show three different intervention models to implement sub Measure 2.1 - Aid for obtaining advisory services. Emilia Romagna, Veneto e Campania have the same objective: to foster extension services for different and more modern farm dimensions. As public procedure to activate intervention, Emilia Romagna and Veneto have chosen calls, Campania has chosen tender. The intervention design in all regions is focused on providing tailored extension services for specific problems. The challenge is to match farmers demand and needs. Member States are obliged to provide a Farm Advisory System for all farmers but they could not use M2 to implement this. Public documents seem to show that Campania Region is implementing this strategy. In fact, advisory bodies that present proposal for M2 funds have to demonstrate requirements foreseen by the Interministerial Decree 3 February 2016 concerning “Establishment of the farm advisory system in agriculture”. However, it is important to highlight that in Campania Veneto e Emilia Romagna M2.1 is intended to support activities that go beyond the obligatory provision of advice under the farm advisory system. The support rate for measure interventions ranges from 50% (Emilia Romagna) to 100% (Campania e Veneto).

Regional lists for advisory activities are rich and focus on traditional and innovative farmers needs.

The catalogue produced by Emilia Romagna contains 13 topics (table 4). To date, involved farms are 628. The most preferred topics are related with nitrate reduction and integrated pest management. Animal welfare and organic agriculture follow the first two topics by number of farms. More modern topics as precision farming, carbon footprint reduction, adaptation to climate change and optimization of water resources don't go up to 30 farms involved. To date involved advisory bodies are 19 composed by 76 consultants. All consultants are into professional area of agronomists and veterinarians. From the analysis of the approved projects it emerges that the average cost of an advisor service consultancy is equal to 1,036 euros with a minimum of 380 and a maximum of 1,480 euros. It should be noted that the average cost of the services characterized by qualitative evaluation equal to “very high” was 998 euros, therefore a little more contained than the average of all the proposals (€ 1,036).

The catalogue produced by Veneto region contains 18 topics (table 5). To date, involved farms are 7,851. The most preferred topics are related with cross compliance and improvement of work organization. Sustainable viticulture and inputs optimization follow the first two topics with about 500 farms involved. More modern topics are innovative production, marketing, risk management, sustainable horticulture. These extension areas don't go up to 50/60 farms involved. It is important to underline that no farm has chosen the topic related to digitalization. To date involved consultants are 259 among these 202 are into professional area of agronomists and veterinarians.

Table 5. Lists for advisory activities and involved farms related to calls until May 2019 in Veneto Region

Table 4 LiLists for advisory activities and involved farms related to calls until May 2019 in Emilia Romagna Region

| Topics | Main FA | Farms (n.) |
|---|----------------|-------------------|
| Precision farming and HW and SW applications of precision agriculture | 2A | 15 |
| Antibiotic resistance control techniques | 2A | 23 |
| Biosecurity and animal welfare | 2A | 77 |
| Biodiversity and defend crops from wildlife invasive | 4A | 37 |
| Conservative agriculture and reduction of footprint | 4B | 1 |
| Waste water and livestock effluent treatment techniques | 4B | 46 |
| Biological agriculture | 4B | 65 |
| Methods to reduce nitrates in aquifers | 4B | 147 |
| Low-impact defense for control of adversity in agriculture | 4B | 127 |
| Adaptation to climate change due to changes in water regimes | 5A | 1 |
| Qualitative optimization of water resources | 5A | 8 |
| Innovative technologies for irrigation and water saving | 5A | 24 |
| Techniques for reducing GHG and ammonia emissions in farms | 5D | 57 |

Source: own elaboration

Table 5 Lists for advisory activities and involved farms related to calls until May 2019 in Veneto Region

| <i>Topics</i> | <i>Main FA</i> | <i>Farms (n.)</i> |
|--|----------------|-------------------|
| Management consulting aimed at the economic optimization of production factors, at overcoming critical points, at developing opportunities, also through the use of RDP measures | 2A | 544 |
| Advice on safety in the company aimed at improving the organization and working conditions | 2A | 1472 |
| Advice aimed at assessing credit access opportunities. | 2A | 384 |
| Consultancy aimed at starting farm activities | 2A | 100 |
| Consultancy aimed at introducing innovative, medicinal or non-food crops into the company | 2A | 24 |
| Consulting aimed at the start of direct sales. | 2A | 161 |
| Advice aimed at preparing a marketing and communication plan | 2B | 56 |
| Consulting for management digitalization | 2B | 0 |
| Consultancy aimed at mapping and managing risks for the agricultural company | 2B | 48 |
| Animal welfare-oriented advice (dairy cattle) | 3A | 474 |
| Animal welfare-oriented advice (beef cattle) | 3A | 249 |
| Advice aimed at guiding the entrepreneur on the subject of conditionality (vegetable) | P4 | 3166 |
| Advice aimed at guiding the entrepreneur on the subject of conditionality (animal) | P4 | 332 |
| Consultancy aimed at guiding the entrepreneur towards the sustainable management of specialized crops: viticulture | P4 | 191 |
| Advice aimed at guiding the entrepreneur towards the sustainable management of specialized crops: fruit growing | P4 | 551 |
| Advice aimed at guiding the entrepreneur towards the sustainable management of specialized crops: horticulture | P4 | 62 |
| Consultancy aimed at guiding the entrepreneur towards the sustainable management of specialized crops: floriculture and nursery | P4 | 35 |
| Consultancy aimed at guiding the entrepreneur to conversion to organic | P4 | 2 |
| Total | | 7851 |

The catalogue produced by Campania region contains 31 topics derived from 77 activities of Regional catalogue (table 6). To date, involved farms are 8,059. The most preferred topics are related with assessment and development of short supply chain, management control, water management and sustainable bioenergy, fertigation strategy, biogas production, diversification and multifunctionality. Food and job safety topics follow the most preferred. Topics like marketing or activities related with forests and biodiversity conservation don't go up to 100 farms involved. To date involved advisory bodies are 67

composed by 386 consultants. 45% of consultants is into professional area of agronomists and veterinarians, the rest comes from other disciplines (architect, engineer, lawyer, business consultant etc.)

Table 5 Lists for advisory activities and involved farms related to calls until May 2019 in Veneto Region

| Topics | Main FA | Farms (n.) |
|---|----------------|-------------------|
| Innovative agricultural production | 2A | 282 |
| Biomarketing | 2A | 61 |
| Biological | 3A/2A | 292 |
| Biodiversity | P4 | 157 |
| Landscape | P4 | 139 |
| Harmonization of agrosilvopastoral activities in protected areas | P4 | 11 |
| Energy efficiency and biogas | 6A/5C | 484 |
| Management of the organic fraction of waste and zootechnical and oil waste | 6A/5D/P4 | 302 |
| Improvement of farm' s performance and structures | 2A | 363 |
| Actions to safeguard the integrity of livestock and to combat zoonoses | 3A | 10 |
| Processing of livestock products - food safety | 3A | 216 |
| Development of associative and cooperation forms | 3A | 217 |
| Animal welfare and optional animal welfare certification systems | 3A | 109 |
| Informatic and digital technologies | 3A | 255 |
| Job safety in the enterprise farm / forestry | 2A | 444 |
| Estimate and evaluation of damages | P4 | 157 |
| Damage prevention | P4 | 483 |
| Sustainable forest management and activities related to mushrooms and truffles | P4/5E/6A | 151 |
| Collection and management of forest reproductive material | P4 | 0 |
| Prevention of natural disasters (fires and hydrogeological instability) | P4 | 53 |
| Management control and development of the agricultural enterprise | 2A | 613 |
| Develop a business plan for access to credit | 2A | 171 |
| Income integration and multi-functionality | 6A/3A | 427 |
| Introduction and ex ante evaluation of investment activities in the field of direct sales | 3A/2B | 684 |
| Processing of plant products - food safety | 3A | 406 |
| Phytopathological emergencies | 2A | 177 |
| Viticulture | 2A | 24 |
| olive cultivation | 2A | 222 |
| Irrigation and fertigation | 5A | 679 |
| Quality systems | 3A | 224 |
| Forage farming and pasture management | P4 | 246 |
| Total | | 8059 |

Source: own elaboration

Conclusions

The role of agricultural advisory services is changing thanks to innovation adoption and current European Agricultural Policy approach. Regional Authorities are advancing financial and managerial reforms to improve new policy design. Given the need for modernization of the rural and agricultural sector, the present emphasis on participation of stakeholders in programmes and community demand-driven projects seems correct. The aim of Measure 2 sub Measure 2.1 - Aid for obtaining advisory services is well specified in the regional models. To foster advisory services for different and more modern

farm dimensions with public intervention is a complex process characterized by many subjects with different needs and behaviours. Advisory services should represent the link among these different subjects. In particular, consultants should connect agricultural sector and research sector. Modern advisory services have to elicit farmers needs and have to translate them into tailor made innovations. To implement this process is necessary to follow an innovative approach to create governance structure and local networks among different actors.

In Campania, Veneto and Emilia Romagna, Measures 2 sub Measures 2.1 are in an early stage of implementation so there are few data. However, the available information provides insights for interesting reflections. The first one is related to the modern monitoring mechanism that is able to capture and follow the relevant changes and the policy output. This programming period represents the first attempt of new platform, implemented by regional authorities, to collect and analyze digitized and dematerialized proposals and involved subjects characteristics. The second one is represented by target groups of Measure 2. Data show that farmers number involved in the extension activities isn't high. This aspect is more relevant for the most innovative issues (digital, robotics,

precision farming, international marketing) and to the more complex or not very immediate environmental ones (biodiversity, water management, forest issue). This weakness could be mitigate by more efficient communication strategies targeted on farmers and by innovative role and a higher interaction among different Measure (1-2- 16).

The last one is related to consultants characteristics. Advisory services have to respond more effectively to the needs of farmers and other rural actors. Modern consultants need to be able to give holistic and related to specific problems advice to farmers. It is necessary to realize a reorientation of advisors to integrate a broad spectrum of specific issues in order to give farm tailored advice.

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ATTITUDE OF AGRICULTURAL EXTENSION AGENTS ABOUT ELECTRONIC AGRICULTURAL EXTENSION IN AL-GHARBIA GOVERNORATE, EGYPT

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Keywords

Electronic agricultural extension application, ICT, VERCON, RADCON, Al- Gharbia governorate, Egypt.

Abstract

The main objective of the study was to identify the attitude of agricultural extension workers towards the applications of e-agriculture extension in Gharbia governorate. The size of the sample was determined by using the krejcie & Morgan table to determine the size of the sample. The sample was 196 randomly selected according to the percentage of each category of agricultural extension workers in the overall. A questionnaire was distributed to the respondents during monthly meetings. Data were collected, and 192 cases were retrieved by 97.96%. Frequencies, percentages and T test were used for statistical analysis.

The most important results were: Percentage of agricultural extension specialists 50.5% of sample size. About 80.7% of the respondents did not receive training courses in the field of e- agricultural extension. Only 39.6% of the respondents have computers connected to the Internet. 54.2% of respondents have a mobile phone with internet access. Half of the respondents had a low attitude towards e-agricultural extension. The most important problems of electronic agricultural extension were: lack of training of agricultural extension workers on e-agricultural extension, lack of Internet services in the work place, and lack of financial allocations to provide e-agricultural extension services.

Introduction

The world now witnesses many economic, social and technological changes that have created a new reality of communication through ICT applications. Now, the world is living the age of knowledge or ICT revolution. Information has become the power that can be used to increase the level of knowledge and a tool to influence the behavior of individuals in society (El-Baaly, 2011).

Agricultural extension is essential for achieving agricultural and rural development by exploiting all available resources and providing information and knowledge in all activities of rural life and changing rural knowledge, skills and attitudes, using various and different methods and means of guidance(Qamar;2005).

Traditional agricultural extension suffers from shortcomings in its methods and means of transferring agricultural knowledge, do not respond to the needs of the target audience, and lack effective mechanisms for interaction (Saleh, 2001; El-Baaly and El-Gohary, 2012, 2013).

Therefore, it was necessary to take advantage of the rapid developments in the field of information and communication technology based on the application and employment of computers and the Internet in the service of the agricultural extension sector and development through the provision of channels of communication wide and diverse as well as activating the role of information and communication technology, which provides the most appropriate communication environment for rural and agricultural development. The initiatives that employ ICT in agricultural extension should be seen as complementary to and not substitute for traditional extension services (Abdel Wahed, 2007, 2015).

The Agricultural Extension Service has recently introduced and applied ICT to overcome the difficulties faced by the agricultural extension system and the traditional extension methods and to increase their effectiveness. They are very powerful tools for learning rural people and providing them with the knowledge and skills they need to improve their living conditions. Development services, particularly in agricultural extension education, where ICTs constitute a fundamental change in the educational process (Qeshta, 2012).

Electronic extension is one of the forms of e-learning, so electronic extension can be defined as a new ICT-based extension system represented in computer technology and the Internet and made available to all users everywhere, all time, flexibly and easily (Qeshta, 2012; Abdel Wahed, 2015).

E-agricultural extension applications are a development in the communication channels in response to the ICT revolution. The Egyptian agricultural extension system has recently applied E-agricultural extension applications to overcome the difficulties faced by traditional extension methods and increase their efficiency. E-agricultural extension applications include: Agricultural Expert Systems, Virtual Extension and Research Communication Network (VERCON) <http://www.vercon.sci.eg>, Rural and Agricultural Development Communication

Network (RADCON) <http://www.radcon.sci.eg>, Mobile Phone: M. Learning - M.

Farming, and Social Media: Facebook <https://www.facebook.com/Farmersuv-501445726675105/?fref=ts> (El-Baaly, 2018).

Although, e-agricultural extension applications improved agricultural extension service as an intelligent service, but diffusion of e-agricultural extension had not continued as expected. Therefore, the present study is intended to investigate the attitudes of agricultural extension workers towards E-agricultural extension applications.

Objectives

The main objective of the study was to identify the attitudes of agricultural extension workers towards electronic extension in Gharbia Governorate, Egypt by achieving the following sub-objectives:

- 1 To identify the level of the attitudes of respondents towards E-agricultural extension applications.
- 2 To identify the differences between the attitudes of the respondents towards electronic agricultural extension when categorizing them on the basis of qualitative variables namely: job title, training in e-agricultural extension applications, availability of computer connected to the internet, availability of laptop connected to the Internet.
- 3 To identify the most important problems of e-agricultural extension applications from the point of view of the respondents and their proposals to solve them.

Research hypothesis

To achieve the second research objective, the following research hypothesis was formulated: There are differences in the average scores of the attitude towards e- agriculture among respondents when classified according to: job title, training in e- agricultural extension applications, availability of a computer connected to the Internet, and availability of a laptop connected to the Internet.

To test this hypothesis was formulated in its null hypothesis.

Material and Methods

The population was all agricultural extension workers in Al-Gharbia Governorate, Egypt which reached to 402 agricultural extension workers. To determine the size of the sample used of schedule krejcie and Morgan (krejcie & Morgan, 1970), which was 196 respondents were randomly selected. Data collected from the respondents during the monthly meetings, and 192 cases were retrieved by 97.96% of all sample.

Research variables:

A study of variables measured as follows:

- Job title: It was expressed as a question about the job title. The responses were: Agricultural Extension Specialist, Agricultural extension agent, Responses were given (2, 1) in order.
- Obtain training in e-agricultural extension applications: The question was asked whether the researcher received training courses in the field of e- agricultural extension applications or not, and the responses are: Yes or No and were given degrees (2,1), in order.
- The availability of a computer connected to the Internet: It was expressed by the question of the availability of a computer connected to the Internet and whether or not the responses were: Yes or No and were given degrees (2,1), in order.
- The availability of a mobile phone connected to the Internet: It was expressed by asking the question of the availability of a mobile phone connected to the Internet and the responses are: Yes or No and were given degrees (2, 1), in order.
- The attitude of the respondents towards electronic agricultural extension: it is the main variable in the study. It has been measured through a tool containing 17 items. Participants have been asked about their response to each item was disagree, Partly agree, and agree, were given degrees 1, 2, 3 for positive items, and 3, 2, 1 were given for negative items, and the collection of degrees to express the researcher's attitudes towards electronic agricultural extension.
- Problems of e-agricultural Extension: Each respondent was asked to identify the problems of e-agriculture in his view.
- Proposals to solve the problems of e-agricultural extension: Requested each respondent to identify appropriate solutions to overcome the problems of electronic agricultural extension.

Several statistical methods such as percentage, frequency and T- test were used to analyze the data.

Results

First: A description of the study variables:

Job title:

Table 1 shows that 50.5% of the respondents are agricultural extension specialists and 49.5% of them are agricultural extension agent.

Table 1 Number and percentage distribution of respondents according to job title

| <i>Job title</i> | <i>Number</i> | <i>Percentage</i> |
|------------------------------------|---------------|-------------------|
| agricultural extension specialists | 97 | 50.5 |
| agricultural extension agent | 95 | 49.5 |
| Total | 192 | 100 |

Source: Data collected and calculated from questionnaires.

Obtain training in e- agricultural extension applications:

Table 2 shows that 80.7% of the respondents did not receive training courses e-agricultural extension applications. This may have negatively affected their knowledge about e-agricultural extension applications, and its ability to provide an e- agricultural extension service as a smart service.

This result indicates that, there is a need to prepare intensive training programs for agricultural extension workers in the field of e-agricultural extension applications to improve their knowledge and experience, develop their skills and improve their abilities to benefit from the applications of e-agriculture to intelligent agricultural extension service. The availability of a computer connected to the Internet:

Table 2 Number and percentage distribution of respondents according to obtain training in e- agricultural extension applications

| <i>Obtain training in e-agricultural extension applications</i> | <i>Number</i> | <i>Percentage</i> |
|---|---------------|-------------------|
| Obtained training | 37 | 19.3 |
| Did not obtain training | 155 | 80.7 |
| Total | 192 | 100 |

Source: Data collected and calculated from questionnaires.

Table 3 shows that only 55.2% of the respondents had computers. This percentage is not large in light of the call to activate the electronic agricultural extension.

Table 3 Number and percentage distribution of respondents according to computer availability

| <i>Availability of a computer</i> | <i>Number</i> | <i>Percentage</i> |
|-----------------------------------|---------------|-------------------|
| available | 106 | 55.2 |
| not available | 86 | 44.8 |
| Total | 192 | 100 |

Source: Data collected and calculated from questionnaires.

Table 4 shows that 39.6% of the respondents had an internet computer. This is a small percentage despite the spread of Internet service in Al- Gharbia Governorate, Egypt. This may adversely affect the attitude towards e-agricultural extension applications.

Table 4 Number and percentage distribution of respondents by availability of computer connected to internet

| <i>Computer connected to the Internet</i> | <i>Number</i> | <i>Percentage</i> | <i>Percentage of total sample</i> |
|---|---------------|-------------------|-----------------------------------|
| Available | 76 | 71.7 | 39.6 |
| Not available | 30 | 28.3 | 10.6 |
| The total number of respondents who have a computer | 106 | 100 | 55.2 |

Source: Data collected and calculated from questionnaires.

The availability of a mobile phone connected to the Internet:

Table 5 shows that 94.3% of the respondents have a mobile phone. This is indicative of the spread of such technology, and that there is ease in the acquisition of mobile; perhaps for the price, ease of carrying and necessary in the communication of life in general.

Table 5 Number and percentage distribution of respondents according to their Mobile Phone Availability

| <i>Availability of a mobile phone</i> | <i>Number</i> | <i>Percentage</i> |
|---------------------------------------|---------------|-------------------|
| Available | 181 | 94.3 |
| Not available | 11 | 5.7 |
| Total | 192 | 100 |

Table 6 shows that 54.2% of the respondents have a mobile phone connected to the Internet; In other words, just over half of the respondents have the opportunity to deal with e-agriculture extension applications on the mobile phone connected to the Internet to obtain the agricultural extension information they need in their agricultural extension tasks and provide smart agricultural extension service.

Table 6 Number and percentage distribution of respondents by availability of Internet in Mobile Phone

| <i>Mobile connected to the Internet</i> | <i>Number</i> | <i>Percentage</i> | <i>Percentage of total sample</i> |
|---|---------------|-------------------|-----------------------------------|
| Available | 104 | 57.5 | 54.2 |
| Not available | 77 | 42.5 | 40.1 |
| Total number of respondents who have a mobile | 181 | 100 | 94.3 |

Source: Data collected and calculated from questionnaires.

The attitude of respondents towards e-agricultural extension:

Table 7 shows responses of the respondents on the scale of the attitude towards e-agricultural extension, which indicated the weakness of attitudes towards e-agricultural extension, may be that because of weak awareness and training in e-agricultural extension field.

Table 7 Distribution of the responses of the respondents on the scale of attitude towards electronic agricultural extension

| Items | Disagree | | Partly agree | | Agree | |
|--|----------|------|--------------|------|-------|------|
| | N | % | N | % | N | % |
| E-agricultural extension applications are complex and difficult. | 57 | 29.7 | 31 | 16,1 | 104 | 54,2 |
| Information obtained of e-agricultural extension applications is inaccurate. | 41 | 21.4 | 50 | 16,2 | 101 | 52,6 |
| Information obtained of e-agricultural extension applications is special. | 118 | 61.5 | 39 | 20,3 | 35 | 18,2 |
| Information obtained of e-agricultural extension applications is biased. | 34 | 17.7 | 43 | 22,4 | 115 | 59,9 |
| E-agricultural Extension applications are not a good source of agricultural information. | 60 | 31.3 | 29 | 15,1 | 103 | 53,6 |
| Information obtained of e-agricultural extension applications is uncertain results. | 44 | 22.9 | 44 | 22,9 | 104 | 54,2 |
| Information obtained of e-agricultural Extension applications is conflicting. | 44 | 22.9 | 37 | 19,3 | 111 | 57,8 |
| Encouragement the use of e-agricultural extension applications. | 112 | 58.4 | 30 | 15,6 | 50 | 26 |
| Information obtained of e-agricultural extension applications is applicable. | 113 | 58.9 | 41 | 21,4 | 38 | 19,8 |
| Information obtained of e-agricultural extension is consistent with other sources of agricultural information. | 111 | 57.8 | 50 | 26 | 31 | 16,1 |
| Information obtained of e-agricultural extension is credible. | 110 | 57.3 | 49 | 25,5 | 33 | 17,2 |
| E-agricultural extension applications are a waste of effort. | 55 | 28.6 | 33 | 17,2 | 104 | 54,2 |
| E-agricultural Extension applications are an effective method of communication between specialists. | 105 | 54.7 | 37 | 19,3 | 50 | 26 |
| E- agricultural Extension applications have become the best source of agricultural information. | 112 | 58.4 | 51 | 26,6 | 29 | 15,1 |
| E-agricultural extension applications are a waste of time. | 58 | 30.2 | 27 | 14,1 | 107 | 55,7 |
| E-Agricultural extension applications enable new agricultural information to be captured. | 105 | 54.7 | 38 | 19,8 | 49 | 25,5 |
| E-Agricultural Extension Applications inexpensive. | 104 | 54.2 | 28 | 14,6 | 60 | 31,3 |

Source: Data collected and calculated from questionnaires.

In order to complete the view, the score of the items of the scale was collected to reflect the degree of attitude of each respondent. The actual range of the respondents was calculated. It was found to be 25 degrees; the lowest score was 17 and the highest score was 42. The actual range was divided into three sections as shown in Table 8; half of the respondents had a low positive attitude towards e- agricultural extension, while 5.2% of the respondents had an average positive response, and 44.8% of the respondents had a high positive attitude towards e- agricultural extension.

Table 8 Distribution of responses by respondents according to degree of attitude towards e-agricultural extension applications

| Level of attitude toward e-agricultural extension | Number | Percentage |
|---|--------|------------|
| Low positive attitude from 17 to 25 | 96 | 50 |
| Average positive attitude from 26 to 34 | 10 | 5.2 |
| Positive attitude is high from 35 to 42 | 86 | 44.8 |
| Total | 192 | 100 |

Source: Data collected and calculated from questionnaires.

Second: The results of T-tests between the mean scores of the respondents' attitudes towards e-agricultural extension when classified according to independent variables qualitative:

Table 9 presents that there are significant differences in the attitude towards electronic agricultural extension applications among the respondents when they are classified on the basis of each of the qualitative independent variables namely: job title, training on e-agricultural extension applications, availability of computer connected to the Internet, availability of mobile phone connected to the Internet, Calculated (T) are 6.93, 3.66, 17.17 and 13.99 respectively, which are significant values at a significant level of 0.01. This result supports the research hypothesis.

Third: Problems of e-agriculture extension applications and proposed Solutions:

Table 10 shows that respondents identified ten problems of e-agricultural extension problems. Lack of training in the e-agricultural extension applications was in the top of the problems by 83.2% of responses, followed by lack of Internet services in the workplace of agricultural extension workers by 79.2% of respondents' answers. Most of these problems appear to be related to the continued lack of funding for e-agricultural extension services after the initial pilot phases, which it are often funded by foreign projects or grants, and there are indicators confirming that success of e-agricultural extension applications as smart agricultural extension services in Egypt .

Proposals to solve the problems of e-agricultural extension from the point of view of respondents:

Table 11 that the respondents' suggestions solutions to problems of e-agricultural extension. The proposed solutions are arranged in descending order according to the answers of the respondents as follows: training agricultural extension workers on e-agricultural extension applications, connecting the internet service to the work place of the agricultural extension, providing periodic maintenance of electronic devices, updating information on e-agricultural extension applications, providing agricultural extension' workplaces with a sufficient number of computers, and other solutions.

Table 9 The results of T-tests of the differences between the mean scores of the respondents' attitudes towards e-agricultural extension when classified according to the independent variable categories

| <i>Independent variables</i> | <i>Mean scores of the respondents' attitudes towards e-agricultural extension</i> | | <i>T value</i> |
|---|---|-------|----------------|
| Job title | Agricultural Extension Specialist | 33.70 | 6.93 ** |
| | Agricultural extension agent | 23.03 | |
| Training in e-agricultural extension applications | had training | 34.65 | 3.66 ** |
| | had not training | 26.93 | |
| Availability a computer connected to the Internet | available | 39.85 | 17.17** |
| | unavailable | 20.93 | |
| Availability a mobile phone connected to the Internet | available | 37.61 | 13.99** |
| | unavailable | 20.64 | |

** Statistical significance at the level of 0.01

Conclusions

The extension service can be provided through e-agricultural extension applications and can be offered in partnership and coordination between traditional agricultural extension and e-agricultural extension applications, and can only be provided through conventional agricultural extension according to the requirements of each extension situation and the circumstances of each extension agent.

There are several mechanisms to ensure that continue funding, whether by providing

Table 10 Respondents' answers about problems of e-agricultural extension applications

| <i>Problems</i> | <i>Frequencies</i> | <i>Percentages</i> |
|--|--------------------|--------------------|
| Lack of training in e-agricultural extension applications. | 160 | 83.2 |
| Lack of Internet services in the work place of agricultural extension workers. | 152 | 79.2 |
| Lack of funding for electronic agricultural extension. | 148 | 77 |
| Continuous disruption of the Internet in the workplace of agricultural | 144 | 75 |
| Lack of maintenance of computers. | 138 | 71.8 |
| E-agricultural extension applications are not updated regularly. | 132 | 68.8 |
| Lack of computers in the workplaces of agricultural extension. | 128 | 66.6 |
| High costs of e-agricultural extension applications. | 108 | 56.2 |
| Lack of e-agricultural extension applications. | 100 | 52.1 |

Source: Data collected and calculated from questionnaires.

services entirely free of government funding or through various agricultural companies that invest in selling their products and marketing their services or paying the cost through the farmers' organizations that can be formed and Contractual farming with Agri-value chains, or directly pay farmers according to the number of their transactions specially when they use the most specialized services of high value, or adoption a combination of the previous methods.

Recommendations:

Based on findings of the study there are practical/theoretical/political implications and originality/value, so it is possible to recommend:

1. Preparation and implementation of training programs in the field of e- agricultural extension applications.
2. Provide adequate financial allocations to activate the e-agricultural extension and ensure its continuity.
3. Link agricultural extension services to an electronic database through smart cards for farmers.
4. Providing advanced computers connected to the Internet in agricultural extension workplaces.

Updating available agricultural information on e-agricultural extension applications.

Table 11 Respondents' suggestions solutions to problems of e-agricultural extension

| <i>Suggestions solutions</i> | <i>Frequencies</i> | <i>Percentages</i> |
|---|--------------------|--------------------|
| Training agricultural extension workers on e-agricultural extension applications. | 160 | 83.2 |
| Connecting the Internet service to the work place of agricultural extension. | 152 | 79.2 |
| Providing periodic maintenance of electronic devices. | 138 | 71.8 |
| Updating information on e-agricultural extension applications. | 132 | 68.8 |
| Providing agricultural extension' workplaces with a sufficient number of computers. | 128 | 66.6 |
| Linking agricultural extension work to Internet. | 77 | 40.1 |
| Provide an incentive to encourage the use of e-agricultural extension applications. | 74 | 38.5 |
| Providing agricultural extension system with information technology experts. | 74 | 38 |
| Recruitment of young cadres able to use ICT in agricultural extension. | 71 | 37 |
| Diffusion awareness of the culture of electronic agricultural extension. | 47 | 38.6 |

Source: Data collected and calculated from questionnaires.

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Enhancing student engagement through course redesign to incorporate student centred learning

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Keywords

Student engagement, course design, problem based learning

Abstract

An action research project was conducted to investigate the effects of a course redesign on student engagement in classroom settings in a Teagasc agricultural college in Ireland. In the first phase of the research, student 'engagement' in a traditional lecture format was observed 66 times in three different types of modules. One type of module had 0/16 classes rated as 'high engagement'. The second phase of the research involved redesigning a module of this type using a problem based learning (PBL) approach to examine if this would enhance student engagement in the classroom. Observations were carried out on 24 classes of the redesigned module and 16/24 had 'high engagement'. This indicates that a course redesign based on student centred learning can enhance student engagement in modules where students traditionally find it difficult to engage and can enhance their academic achievement. Course design should be the first consideration when planning how to enhance student engagement. Course design refers to the collection of modules that make up an education programme, how they are structured, organised (timetables etc.), the module specifications (learning outcomes, assessment strategies) and mode of delivery. Three of these were influential in this action research project: the course structure, module specifications and organisational aspects of the course. This paper outlines and discusses why course design plays such a key role in student engagement

Introduction

Teagasc is a semi state "national body providing integrated research, advisory and training services to the agriculture and food industry and rural communities" in Ireland (Teagasc, 2019). Teagasc is the main provider of further education in agriculture, food, horticulture, forestry and equine studies in seven colleges in Ireland for level 4 and 5 courses on the European Qualification Framework (EQF) and in partnership with third level colleges (Institute of Technologies and Universities) where they also run Level 6, 7 and 8 EQF courses (QQI, 2009). From 2013 to 2016 Irish Government's Department of Education and Skills (DES, 2019) carried out whole college evaluations on Teagasc colleges. These evaluations concluded that student engagement in classroom settings

was an area which needed improvement. This action research project was a response to this challenge.

What is Student Engagement and why does it matter?

Student engagement can be seen as a gateway to learning which can lead to higher academic achievement (Zyngier, 2008). It can be defined as the 'degree of attention, curiosity, interest, optimism, and passion that students show when they are learning or being taught in classroom situations, which extends to the level of motivation they have to learn and progress in their education' (Glossary of Education Reform, 2016). This definition describes engagement as having three distinct dimensions that are categorised from a psychology standpoint by Fredricks, Blumenfield and Paris, 2004; and Fredricks & McColskey, 2012 as;

1. Behavioural - physical actions which show a student is engaged i.e. participating in activities assigned by the teacher
2. Cognitive - the ability of a student to focus their attention on a task i.e. listening, thinking about and comprehending the material they are studying
3. Affective - the moods, feelings and attitudes which students may display or have towards a subject i.e. enjoyment, laughter, passion whilst participating in a task for the subject which they are studying

The benefit of engagement to a teacher is immense as they can formatively assess the students and subsequently take appropriate action on it in real time (Dixson & Worrell, 2016). A teacher can formatively assess students who are engaged whilst the student can begin to self-regulate their learning (Nicol & MacFarlane-Dick, 2006). The alternative of not having engagement in the classroom is that a teacher may only get to see how that student is doing through summative assessments but by this stage if they do poorly it is too late to do anything other than repeat the assessment (Dixson & Worrell, 2016).

As student engagement can enhance academic achievement (Zyngier, 2008), schools and colleges need to give attention to enhancing engagement. It can be achieved through several different methods, tools, assessments or a combination of these. The design of this needs to take into account the audience, the resources that are available and the limitations of the overall programme. Some common elements which require consideration and apply to any course are its; educational philosophy, structure, organisation, teaching, learning and assessment strategies (O'Neill, 2015). O'Neill (2015) outlines a design process which can be used to guide any curriculum team through this process. Failure to consider engagement in the design phase could lead to students who rebel, resent having to do a topic and resist knowledge i.e. become disengaged. Bryson & Hand (2007) agrees with Schlecty (2002) that student engagement is on a continuum which means there are levels of student engagement. Schlecty (2002) put these into five categories (See Figure 1 below - Rios, 2019). Furthermore as this is a continuum, a student can range in their level of engagement during their course depending on the type of activities which they have to carry out, the content, the time of day/year, the teacher for their module and their peers.



Figure 1 This infographic shows different levels of student engagement and was created by Dr. Roland Rios based on Schlechty's engagement continuum.

Another important aspect of student engagement is a student's own motivation. Externally motivated students want to achieve high grades, get qualified, and may be under pressure to achieve from parents, family, scholarships or rewards/ punishments. Intrinsically motivated students have an interest in the area or enjoy the tasks, take responsibility for a challenge and want to learn more about the subject. How a student is motivated can significantly impact on their engagement (Saeed & Zyngier, 2012). To enhance engagement, intrinsic motivation is necessary but it is important to note that a balance of extrinsic and intrinsic motivation can be used together (Zyngier, 2008).

A course which is delivered and assessed in a traditionally passive manner does not give a student the opportunity to take responsibility for their learning and doesn't add to intrinsic motivation. A student centred learning (SCL) approach can give the student the opportunity to take this responsibility. Schlechty and Newmann (1992) note that students who become involved in their own learning are engaged as it is a:

"... psychological investment in learning. They try hard to learn what the school offers. Students take pride not simply in learning the formal indicators of success (grades for example), but understanding the material and incorporating or internalizing it in their lives (p. 1)"

Engaged students associate the task with a result or product that has meaning and value for them which inspires the student to persist in the face of difficulty and they will learn at higher levels (Schlechty, 2001). The ability of a student to develop during these learning opportunities can test their skills to be creative, analyse, problem solve and work with peers.

If a course does not give students the opportunity to become an independent learner, low levels of engagement will persist. This will be due to the lack of value and meaning which students associate with the tasks they are set, it can become repetitive and this ultimately leads to lower levels of engagement (Schlechty, 2002). Students chase the marks and focus their attention on the elements that are assessed in order for them to meet their goals (Maher, 2004). This can be used to the advantage of the teacher provided they have the option to use SCL approaches and assessments. This is heavily influenced by the course design i.e. course, structure, learning outcomes, assessment types.

A Conceptual Framework for examining what affects student engagement in classroom settings - What is the literature saying?

Four main factors were considered in this research project to affect student engagement in classroom settings; 1) Course Design, 2) Teacher, 3) Environment, 4) Student (See Figure 2 below). A review of the literature (Maher, 2004; Fink, 2007; O'Neill, 2015) suggests that course design has the most influence on student engagement in classroom settings. While course design is seen as having the most influence the teacher, the student and the classroom environment also bring their own effects to student engagement in classroom settings but they can be influenced positively or negatively by the course design.

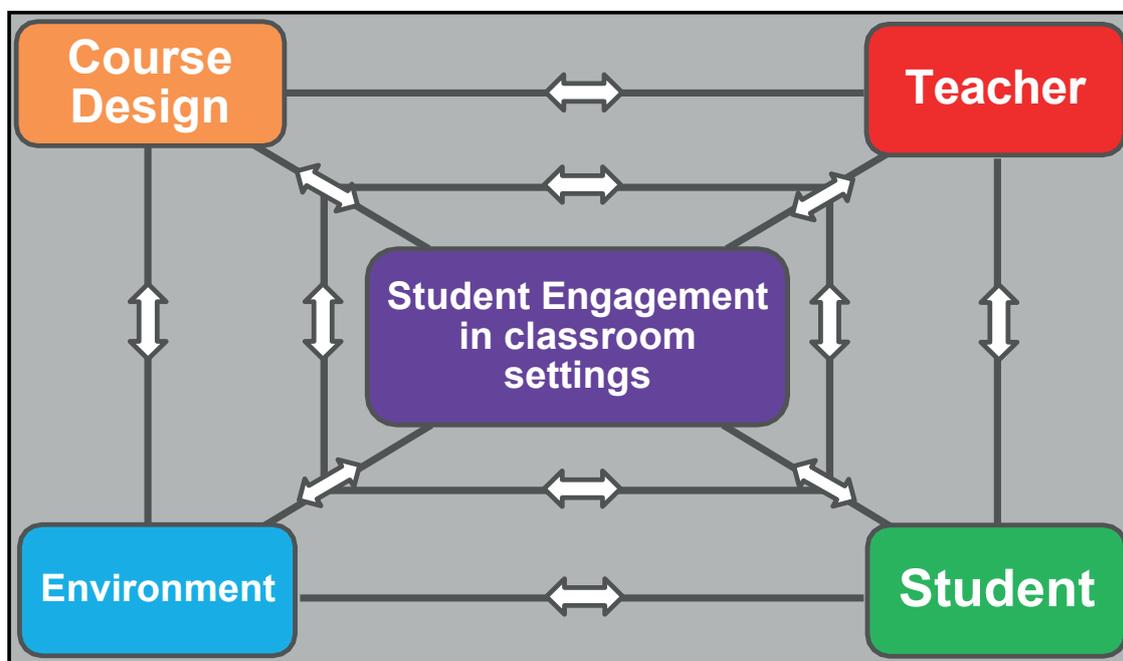


Figure 2 The conceptual framework of the four main factors which affect student engagement in classroom settings.

Research Design

This action research project had two phases. Phase 1 explored the factors that affected student engagement in classroom settings in a Teagasc agricultural college using a variety of research methods. Subsequently Phase 2 acted on these findings by designing and implementing a pilot module (a core module and transferable skills module - See Table 1) to incorporate an SCL approach into the current course structure. There were a number of ethical considerations when conducting this research with students and teachers, so full ethical approval was sought and received from University College Dublin (UCD).

Table 1. Description of all module types which were observed..

| <i>Descriptions of Core, Specialised, Supplementary training and transferable skills modules:</i> |
|---|
| - Core Modules are mandatory and cover the basic principles of agricultural science, financial management, health and safety, the structure of Irish agriculture, policy and legislation. |
| - Specialised modules focus on the basic principles, knowledge and skills necessary for animal and crop husbandry associated with different farm enterprises. |
| - Supplementary training modules are also provided which are technical in nature as they focus on knowledge and skills ranging from maintenance of farm buildings to safe application of pesticides. |
| - Transferable skills module is mandatory and covers the principles and practice of a variety of personal skills for students to develop; Interpersonal skills, communication skills in a variety of formats, team work, research skills and time management. |
| The purpose of this type of module is to focus on the competencies and skills which are transferable to a variety of scenarios which will be beneficial to students in their future careers. |

Research Methods - Phase 1

Research was carried out through interviews, focus groups and observations. Interviews with four educational specialists from national and international universities highlighted how much of an influence course design has on student engagement. A focus group with teachers in a Teagasc agricultural college also highlighted how much course design impacts them. Observations across 66 classes overwhelmingly showed a clear struggle for students to engage with core modules compared to any other type of module observed (See Table 2). Finally a student focus group concluded that students find core modules more difficult to engage with due to their content and how they are delivered.

Research Methods - Phase 2

Phase 2 involved the redesign of a core module which was combined with a transferable skills module to form the pilot module. This enabled the use of SCL in a quite restrictive course structure and assessment verification process. This combination allowed for the

incorporation of aspects of problem based learning (PBL), which is a SCL approach (Barrett, 2017; Barrett and Moore, 2010). PBL can be defined as (Barrows and Tamblyn, 1980):

'The learning that results from the process of working towards the understanding of a resolution of a problem. The problem is encountered first in the learning process.'

The stages in the redesign process included:

1. Identification of a core module which could be used for PBL and a transferable skills module on relevant skills. This allowed for smaller group sizes as well as rewarding students with marks for the transferable skills required in PBL (extrinsic motivation).
2. Design of real life problems that would address the learning outcomes in the curriculum. Students would be assessed on their transferable skills as they worked on the problem in small groups (Intrinsic motivation) culminating in a presentation. Students would have to complete a prescribed summative assessment (theory exam as part of the core module) at the end of each problem. Assessments strategies were designed to align with the problems within PBL. The problems were developed by the researcher through consultation with faculty in the college and with some further help from specific colleagues with specialist knowledge.
3. Plan the organisation and structure of the module so that students would work on two problems over the time period with a timeline for each problem and each assessment. Three teachers and three small classrooms were assigned to the pilot module.
4. Preparing guidelines on PBL for teachers so that they understood what PBL is and how it would work for the pilot module. This included explaining the teaching, learning and assessment strategies. Preparations were hampered as the researcher did not know what teachers would be on the module until two weeks before the beginning of the module. Meetings and communication with the teachers took place once they were assigned to explain the process and address/ clarify any issues or concerns.
5. Guidelines and an introductory phase were also planned for the students so that they would understand what was expected of them.
6. The final stage of the design process involved ensuring that the staff had all the required materials (Introduction to PBL for students, problems, marking schemes etc.) and were clear on what they would be doing. Teachers were also briefed on how and what research would be conducted and when.

Classroom observations

Semi-structured observations (Bryman, 2016) were used to observe in reality what affects student engagement in the classroom. An observation framework was developed and piloted to assess the level of student engagement in the classroom using indicators of mostly behavioural and affective engagement. Prior to commencing observations teachers were approached to acquire their consent. The teachers were told the purpose of the observations, how often they would be and how they would be used. The researcher sat as a non-participant at the back of the class for 66 classroom sessions in Phase 1 and 24 classes in Phase 2 (pilot module), noting the different indicators and how/if they changed over the course of the class.

In Phase 1, the 66 cases covered three different types of modules, six different teachers, small and large class sizes. The results from each observation were collated and categorised as having had low, medium or high levels of engagement. While there is a degree of recognised subjectivity in this categorisation, those that were categorised as 'low engagement' were ones where students showed little interest, were distracted or visibly bored. Those categorised as 'high engagement' were typified by students asking questions, answering questions, enjoying participating in questions, debates, role plays etc. These classes showed that students were interested and willing to participate in activities and tasks allocated to them.

In Phase 2 the same framework and categorisation was used and the pilot module was the only module observed. Observations were conducted with each teacher and each cohort of students several times in both phases to overcome the reactive effect of the researcher observing i.e. affecting the normal behaviour of teachers or students (Bryman, 2016).

Student Survey and Focus Group

A student survey was conducted with 108 of the students who took the pilot module. This gathered feedback in the form of ratings (quantitative data) of particular aspects of the module as well as some open ended questions about what they found engaging and not engaging about the module (qualitative data). While a survey is effective at collecting feedback from a large proportion of the population, it can lack in-depth feedback. Focus groups were conducted to follow up on the survey data to get more insight from students.

Two focus groups were conducted (12 and 8 participants). Students were asked to volunteer to participate in these by the researcher. A focus group is an ideal opportunity for a researcher to do this through questions, discussions, bouncing ideas off each other, probing answers given and gathering in depth feedback from the group (Acocella, 2012). Giving the student a voice to give feedback was imperative in the case of this pilot module (Brooman, Darwent & Pimor 2015; Campbell et.al. 2007).

Teacher Interviews

Interviews were conducted with all four teachers who taught on the pilot module to get feedback on their experience. It is important to note that mid-way through the module a teacher had to be replaced due to unforeseen circumstances. Three of the teachers who taught on the pilot module have completed a Level 5 (EQF) Certificate in Teacher Training. However, none of their courses had dealt specifically about PBL so they were given guidance as to what PBL is, how it is delivered and what way it would work with the pilot module.

Results

The results from Phase 2 (pilot module) of the research are presented and discussed in this section.

Classroom Observations

Observations were conducted in the pilot module (Phase 2) to compare engagement levels with Phase 1. Observations show that students were substantially more engaged

Table 2 Results from the classroom observations conducted in Phase 1

| <i>Type of Module</i> | <i>No. of classes observed</i> | <i>No. in Low Engagement Category</i> | <i>No. in Medium Category</i> | <i>No. in High Engagement Category</i> | <i>Classroom Type</i> |
|------------------------|--------------------------------|---------------------------------------|-------------------------------|--|------------------------|
| Core | 16 | 12 | 4 | 0 | Large (11) & Small (5) |
| Specialised No. 1 | 31 | 4 | 18 | 9 | Large (6) & Small (25) |
| Specialised No. 2 | 11 | 0 | 1 | 10 | Large (11) |
| Supplementary Training | 8 | 2 | 4 | 2 | Large (8) |

Table 3. Results from the classroom observations conducted in Phase 2

| <i>Core & Transferable skills module combined</i> | <i>No. of classes observed</i> | <i>No. in Low Engagement Category</i> | <i>No. in Medium Category</i> | <i>No. in High Engagement Category</i> | <i>Classroom Type</i> |
|---|--------------------------------|---------------------------------------|-------------------------------|--|-----------------------|
| Pilot Module | 24 | 1 | 7 | 16 | small |

in the core module in Phase 2 (16/24 with high engagement - Table 3) than they were in Phase 1 (0/16 with high engagement - Table 2). As enhanced engagement can lead to higher academic achievement (Zyngier, 2008), more attention is required on how to achieve this. Observation results indicate that the course design can be a catalyst to achieve enhanced engagement.

Student Survey - n = 108

Table 4. Student ratings on content, delivery and assessment of the pilot module (n=108)

| <i>Elements of pilot module</i> | <i>Rating Scales (5 Point Likert scale)</i> | <i>Average Rating out of 5</i> |
|---------------------------------|---|--------------------------------|
| Module content | Very irrelevant - Very Relevant | 2.74 |
| Delivery | Very ineffective - Very Effective | 3.01 |
| All assessment types | Very unfair - Very fair | 3.22 |

When all of the module assessments were completed in the core module, students were given a questionnaire and asked to rate several elements in the pilot module out of 5. Table 4 below summarises the ratings given:

Table 5 Aspects of the pilot module which students mentioned as engaging or not engaging (n = 108)

| <i>Aspects of Pilot Module</i> | <i>Mentioned as Engaging</i> | <i>Mentioned as Not Engaging</i> |
|--------------------------------|------------------------------|----------------------------------|
| Group work | 64 | 8 |
| Presentations | 40 | 42 |
| Content | 40 | 11 |
| Problem Base Learning approach | 18 | 3 |
| Working on problems | 10 | 3 |
| Assessments | 20 | 7 |
| Computers/ Researching | 11 | 12 |
| Too many classes per week | 0 | 24 |
| Teacher | 5 | 0 |
| Change of teacher | 0 | 3 |

Students were also asked to give qualitative answers about 2 aspects of the module that they found engaging and 2 aspects that they did not find engaging. Table 5 below summarises the number of times different aspects were mentioned as either engaging or not engaging.

This indicates that students found many aspects of the pilot module engaging. The delivery in a variety of forms, as well as the fairness of the assessments had the highest rating. Assessments were aligned to the tasks that they were given and students knew what was expected of them in the assessments. The elements that students found engaging were group work, content, PBL, working on problems and assessments. It is unsurprising that there were elements that didn't engage some students or that they found challenging. This does not mean that challenging tasks should not be done, but to balance tasks that are both engaging and challenging for the students.

Student Focus Group - Thematic analysis

Twenty students participated in the two focus groups. A key theme from the student focus group was that whilst it was an engaging module there were also elements of the pilot module which caused frustration. The collection of this type of information is vital and corresponds with the teacher's feedback and observation results.

Positive Engagement

A variety of factors contributed to positive engagement by students; the teacher, how they teach, working with groups, discussions and also the subject matter itself. Students discussed how the way in which the content is delivered influences how engaging it is. Ordinarily they find core modules less engaging as they can be in large classrooms where teachers predominantly rely on the traditional lecture format of delivery. The course redesign and the use of SCL enhanced engagement. A catalyst to this was a change to the structure of the course by combining two modules to have smaller class sizes and introducing PBL:

Students found PBL beneficial as working with groups on a problem got them engaged with their peers and opened their mind to other ideas. Students were engaged cognitively and behaviourally as a result of this. Two students commented that;

*P; "It is more relevant and brings it back to how you might do it at home and using real life examples makes it much more interesting. Other times when there are lecturers just literally talking off the slides, you don't really see any relevance of it"

*P; "You were getting other people's opinions so that you weren't working on your own all of the time"

Issues leading to low engagement;

Students highlighted issues in the pilot module such as having too many contact hours per week and too many presentations.

*P; "Well it was good doing two presentations but the third one was just too much"

In the focus groups, students also discussed challenges with their overall academic programme. They struggle with the amount of content they need to know for assessments. The current programme structure and organisation means students can take up to 11 modules at once. The majority of these have theory exams that focus heavily on recalling knowledge and facts and are taken during the same short period of time;

*P; "There is a lot of stuff that you need to know at the same time for exams"

One student's comment about this overload was:

*P; "I haven't a clue what is going on in most classes"

Teacher interviews - n=4 (*P = Participant)

Teachers were assigned to the pilot module less than two weeks before it began. This meant that teachers missed out on the design of the problems and planning how it would work. This caused confusion and anxiety before the module began as it was a not only a new approach but also planned differently to a traditional module. Teachers also highlighted the issues and benefits which they found:

Preparation, Structure and Organisational aspects from the teachers' perspective;

The pilot module was designed, developed and delivered under a number of organisational constraints. These included timetabling, teacher allocation, resourcing as well as concerns over the 'fit' with institutional assessment verification processes. This was a cause of uncertainty and anxiety for teachers and others within the agricultural college. The time allocated to the pilot module was in line with the recommended hours for each of the two modules combined. As a result of carrying out the pilot module, it was concluded that there had been too much time allocated. These concerns were expressed by teachers:

*P; "Students were saying why am I doing this again? We couldn't do anything because we were constrained by the modules having a certain number of hours, certain learning outcomes and certain assessments that we had to use"

Teacher perceptions of student's readiness for problem based learning;

Teachers had concerns about student readiness for PBL. They cited student (im)maturity, diversity and lack of experience with independent learning as challenges. When probed they elaborated that students have been conditioned through the secondary education system where passive learning predominates. They felt that more support and preparatory work is needed to help students transition towards being an independent learner as they progress towards a full PBL approach:

*P; "It was certainly a much friendlier way of learning ... at a more mature level I feel there is a greater potential for it ... the first year students are used to a system where they are being told what to do ... and suddenly they are being asked to think about it"

While the teachers did feel that the students were not quite ready for PBL, they believed that students should develop these competencies and skills by transitioning them towards SCL attributes. This could be achieved by spiralling competencies through the course (O'Neill, 2015; Ornstein & Hunkins, 2004).

Student engagement and group size

The teachers highlighted the benefit which the course redesign had on student engagement compared to traditional delivery;

*P; “We definitely did get much better engagement than in a lecture theatre, I don’t think anyone will argue against that”

Smaller group size allowed teachers to get to know their students better and they could react in real time to students misunderstanding;

*P; “I like it because in smaller groups I got to know the students very well and I enjoyed going into the class ... that benefited the class and how I taught them”

Discussion

In an attempt to make core modules more engaging, changing the course structure was the catalyst to creating a SCL experience. Combining a core module with a transferable skills module not only allowed smaller group sizes but marks for students (extrinsic motivation) to engage with the tasks. The use of problems which used either real life examples or scenarios engaged students as they became responsible for learning the module content (intrinsic motivation). The balance between these two types of motivation meant that students who engaged with the module achieved higher academic success than their peers.

Using problems and groups of 4-6 students per group allowed students to take responsibility for their learning. This was perhaps a shock to their system and was not something every student immediately took to. Over time they adapted and took on the challenge. Similarly the PBL module was a challenge for the teachers as it was not something they had done before and not something that they had any formal training on. This caused some doubt and anxiety as students took time to adapt to this approach. Teachers saw this and the diversity of the classes meant that some students adapted very well and became comfortable with the task whereas some students took longer to adapt. This shows the diverse nature of the student cohort in Teagasc agricultural colleges. This challenge can be addressed and aided by the design of the course through its; educational philosophy, structure, organisation and teaching, learning and assessment strategies (O’Neill, 2015). Formal training for teachers on the use of student centred pedagogical strategies is also needed to give teachers more knowledge, confidence and belief in these SCL approaches and assessment strategies. Without a course design which supports this, any formal training would be a waste as teachers would struggle to introduce SCL approaches.

The pilot module using PBL, outlined in this paper, was parachuted into a course design which had elements that constrained its effectiveness such as; the assessment verification process, the courses structure, organisation and coordination, all of which are necessary for success (Bouhuijs, 2011). Introducing PBL into an established college and course can be more challenging than in a new college (Bouhuijs, 2011). This pilot module aimed to analyse if a SCL approach could enhance student engagement, which it did. It recognises that limitations with the current course structure affected the PBL nature of the module negatively. An important recommendation to any college when introducing PBL is not to underestimate the changes required especially to the Programme/ Curriculum (Bouhuijs, 2011). Viewing PBL as a classroom technique is a mistake as it is a total educational approach which has four components (Bouhuijs, 2011; Barrett, 2006):

- 1 A PBL curriculum design
- 2 PBL tutorials
- 3 PBL compatible assessments
- 4 Philosophical principles underpinning PBL

Conclusion

In phase 1 of this study the traditional lecture style approach to delivery of classes was observed across three different types of modules, six different teachers and a total of 66 classes. This highlighted that the type of module had more influence than the teaching styles used between different modules. Core modules in particular had the lowest engagement out of all three types of modules observed. Students were visibly disengaged in these modules as they would frequently be distracted (on mobile phones, talking during class, visibly bored/ asleep during class). Therefore the concept and objective for phase 2 was to enhance student engagement in a core module. Analysis of the literature indicated that SCL and in particular a PBL approach would be appropriate.

Observations were conducted during phase 2 in which a core and transferable skill's module were combined to create an environment for a SCL approach. Observations showed a substantial increase in engagement compared to phase 1. Phase 2 observations showed students participating in group work, taking responsibilities for tasks, discussing ideas together to create a solution to their given problem, creating presentations of their solution and coordinating how they would present it as a group. Students were behaviourally, affectively and quite likely cognitively engaged in completing these tasks as they were responsible for their learning. They also had the opportunity to learn from their peers as students would bring various levels of knowledge and experience to their group. This allowed peer to peer learning to take place, all while being facilitated and guided by the teacher in the process.

It is clear from the two phases of research that the course redesign was the catalyst for this enhanced engagement as it enabled the use of a SCL approach. Course design should be the first consideration when trying to enhance student engagement in any setting. Four key issues of course design are its; educational philosophy, structure, organisation and module specifications (learning outcomes, syllabus content and assessments) which are transferable to any course.

Assessments have a very influential role in this process as delivery of content should align with the assessment type. Therefore incorporating SCL means assessments should shift from a complete reliance on the traditional MCQ, short answer and/ or structured questions to student centred assessments. Knowing that students chase the marks (Maher, 2004) can be used to the advantage of the teacher if the assessment can be aligned with SCL activities.

In order to shift towards SCL, the overall course design must be aligned to support SCL. Educational institutions need to analyse their current course design to assess opportunities for how to transition students towards SCL and opportunities to use SCL in order to enhance engagement and subsequently academic achievement (Zyngier, 2008). Transitioning may be achieved by spiralling (Ornstein & Hunkins, 2004) SCL competencies through the programme to build students up to an end goal i.e. a capstone style module. Coordination at programme level and how to communicate and implement required changes are key elements in the process. Key stakeholders in this process must include the head of department and curriculum team, college/department management, teaching staff and students to provide feedback to inform decisions in this process (Bouhuijs, 2011; Bovill, 2013; Brooman, Darwent & Pimor, 2015).

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3 Education and Extension: roles, functions and tools for boosting interactive approaches to innovation

Assessing agricultural innovation systems: a literature review and research agenda.

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Keywords

Innovation system, Assessment, Capacity to innovate

Abstract

Agri-food systems worldwide face unprecedented global challenges. Rapid changes and transitions of agri-food systems increasingly call for evidence-based and targeted policy responses. More effective and efficient agricultural innovation systems (AIS) are widely acknowledged as key drivers to unlock the potential of agriculture. In many low or lower-middle-income countries, however, the characteristics and performances of national and sub-national AIS are largely unknown and clear strategy to support innovation is lacking. There is a need to assist countries in the development of AIS strategies through comprehensive assessment involving a diversity of relevant stakeholders. Such an assessment may generate quantitative and qualitative information on the state and the performances of AIS to inform decision-making processes and guide investments towards strengthening AIS performance. The objective of the communication is to present a literature review aiming at supporting AIS assessments oriented to policy design. The literature review has been conducted in 2018 based on a collaboration between FAO and CIRAD.

This literature review shows the diversity of points of view in characterizing AIS (structural, functional, process-based or capacity-based views). These different views of AIS are based on different hypotheses and encompass different methods of AIS analysis. However, scholars do mention that these views appear to be complementary and useful for an operational AIS assessment. Because of this multiplicity of analytical views, a large number of methods have been proposed by scholars. These methods combine the use of qualitative and quantitative tools. The use of indicators in order to assess the structure and performance of AIS at national scale is unequal: they are useful for certain purposes (e.g. cross-country comparisons) but less for others (e.g. identifying key actions to strengthen bridging organisations).

Several assessment models have been designed and used by international community, combining different methods and tools, in order to carry out operational AIS assessments. We distinguish AIS diagnosis methodologies according to the entry points, the ultimate objective, the steps carried-out, the nature of data used and the degree of stakeholders' involvement in carrying-out the diagnosis. Four main entry points can be distinguished: enabling environment, R&D performance, effectiveness of farm advisory services, capacity to innovate. AIS assessment models and tools are linked to the nature of the ultimate objectives of the diagnosis. The ultimate objectives of existing AIS diagnosis methodologies are of three kinds: i) To make cross-country comparisons at the global level for informing international development agencies; ii) To provide recommendations to policymakers on how to improve governance and performance

of the national AIS; iii) To engage collective action for transformational change. The willingness to operate changes determine the degree of combination between external assessment made by evaluators and internal assessments made by stakeholders and actors themselves. The more stakeholders are engaged in the diagnosis, the more the assessment model relies on dynamic view of AIS providing methods and frameworks for collaborative analysis of complex innovation challenges.

The literature review clearly identifies the need to adapt innovation policies to the national context by taking into account not only the characteristics and history of the country but also the characteristics of the AIS. The assessment should effectively help policymakers to improve their innovation policies and propose actions regarding policy instruments. However, the existing methods to assess AIS are not sufficiently oriented to help policymakers make decision. The literature review suggests that the process to carry out of the assessment is as important as the methods. There is a need to involve AIS stakeholders in the assessment. Several reasons can justify the use of a participatory approach to design policies: pragmatic reasons (increase the chances of success of the assessment process and of the use of results), political reasons (promote democracy and strengthen actor participation and empowerment), and epistemological reasons (there is no single reality, multiple points of view are essential to construct an argument). Furthermore, providing support to the process of policy decision-making means addressing various challenges such as identifying champions to support reforms, looking for windows of opportunity for reform, and building capacities of policymakers so that they can participate in AIS assessment and can design innovation policies. Such a literature review paves the way for further research.

Governance's effects on innovation processes: the experience of EIP AGRI in Italy

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Keywords

Innovation, governance, multiactor-approach, innovation supply-chain

Abstract

The Europe 2020 strategy emphasizes smart, sustainable and inclusive growth to overcome the structural weaknesses in Europe's economy, improve its competitiveness and productivity and underpin a sustainable social market economy. The European initiative EIP-AGRI works to foster competitive and sustainable farming and forestry that "achieves more and better from less" with collaborative and problem-solving innovations. It supports the projects of the so-called Operational Groups that work on innovation pilot projects involving different actors.

The success of this strategy depends on people who share information in their own networks, relevance of singled out problems and innovative solutions, diffusion and communication pathway (Sewell et al., 2017).

An important instrument of this approach is the cooperation among all the actors of the innovation supply chain involved to solve problems or get opportunities. Moreover, since the co-construction of innovative solutions and their diffusion is complex and not linear, it's important the partnership of projects includes figures with specific relationship capacities (Klerkx L. et al 2012).

The paper presents the results of a comparative analysis aimed to understand how regional governance strategies can facilitate/hinder Operational Groups results (Zezza et al. 2017). The RDPs of four Italian Regions was analyzed to verify how the innovation for the competitiveness, productivity and sustainability were translated into the sub-Measures 16.1 and 16.2 and to understand if chosen rules and criteria relate to European strategy.

The study points out the different regional approaches to innovation strategy with the consequent different results in terms of coherence with the development regional objectives, farmers needs and innovation solutions.

Identification of key challenges and information needs of those enabling and implementing interactive innovation projects within the EIP-Agri

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Keywords

EIP-Agri, Common Agricultural Policy, interactive innovation, rural innovation, farming, forestry

Abstract

The European Innovation Partnership for Agricultural Productivity and Sustainability (EIP-Agri) is a relatively new policy concept that aims to speed up innovation in agriculture and forestry. Our paper presents key challenges and information needs of (potential) beneficiaries, advisors, support services, educators, policy makers and administrators. Since the EIP-Agri aims to address the needs of various stakeholders and to foster projects on the regional, national and European level, its implementation is complex. Our analysis is based on data obtained at workshops that took place in Northern, South-Eastern, Southern and North-Western Europe in November 2018. Each workshop followed a common script and reporting guideline leaving space to account for the diverse macro-regional contexts. While the heterogeneity within each macro-region was high, the results show that i) the particular institutional settings impact on the enhancement of farmer-led networks/projects, ii) economic incentives either drive or hamper the involvement, iii) fore-runners in the field of interactive innovation exist in both policy/administration and in practice, iv) the maturity of administrative systems is of great relevance and impacts significantly on the cooperation and co-creation of stakeholders. This paper contributes to the knowledge exchange and co-learning between practitioners, advisors, scientists, and representatives from policy and administration in Europe who are aiming for interactive innovation in agricultural, forestry and rural value chains. The comments and recommendations collected at the ESEE2019 conference will feed into the further work of the LIAISON project.

“Cultivate the network”: a key factor for an innovation ecosystem. The case of the Italian Rural Network

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Keywords

Networks, AKIS, rural development.

Abstract

When we talk about innovation, we often focus on individuals. There is less focus on the kinds of structures that promote a culture of innovation.

The National Rural Network (NRN) is a tool widely used by the EU and its Member States to improve decision shaping and policy execution, as it provides the flexibility required to deal with wide diversity of issues and for supporting the proper delivery of public policy and greater impacts of rural development programmes.

The role of National Rural Network further extended in EU Reg. 1305/2013 (art.54) to foster innovation in agriculture, food production, forestry and rural areas during 2014-2020 programming period. Activities by NRNs regarding provision of networking for advisors and innovation support services are constituting an important factor in many EU Member States, including support to EIP- AGRI Operational Groups and RDP Managing Authorities.

Aim of the study is to analyze NRN potential to promote mutual learning and to generate, share, and use agriculture-related knowledge and policy information. A great diversity of people is involved in creating agricultural knowledge: farmers, advisors, researchers, education and training providers, input suppliers, retailers, media services, ministries and regional authorities.

Making better use of Rural Networks for knowledge exchange and stronger AKIS is crucial in connecting all relevant actors, allowing continuous access to reliable knowledge and innovation, successfully solving problems and responding to new challenges.

“Cultivate the network” is a key factor for creating a proper innovation ecosystem. The paper will also focus on which activities / tools are the most effective in achieving this goal by NRN.

The study will consider the case of the Italian National Rural Network and its role in the context of a fragmented national AKIS, scattered in regional knowledge systems and in which different private and public stakeholders come into play. The methodology used will review the intervention promoted by the Italian Network to support innovation in a context such as the Italian one, highly competitive in agricultural sector but in need of improved knowledge transfer and coordination.

The paper will not only cover the current Network but will also provide some recommendations on how to strengthen an integrated national AKIS, able to successfully interconnect the national, regional and local level.

Re-orientating extension and research to inclusive innovation: The case of hybridisation of a New Zealand agricultural research organisation

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Keywords

Impact culture, inclusive innovation, hybrid organisations, institutional logics, organisational change

Abstract

The last two decades has seen an increasing call for public-funded research and extension to deliver impact beyond traditional measures of extension quantity (e.g., number of extension events) and research quality (e.g., excellence of academic outputs), to the benefits these produce for society. This “impact agenda” has stimulated agricultural research organisations to explore transitioning from science-driven research and extension to inclusive innovation. An inclusive innovation approach potentially delivers increased impact by focusing on stakeholder needs, and co-development of fit-for-purpose practices implemented in partnership with stakeholders. Concurrently, a shift from linear to inclusive innovation has created uncertainty around organisational cultures and the respective roles of research, extension and industry in innovation. As more organisations embark on this transition, studies are needed to provide examples of how to navigate this organisational change. We contribute to this literature by studying the topic from the perspective of hybrid organisations, which are organisations defined by practices, products and services that reflect dichotomous institutional logics. For example, public research institutes cooperating closely with next- and end-users operate with both public and private research logics.

Purpose

To understand how hybrid organisations navigate emergent institutional logics as they transition from science-driven to inclusive innovation, in response to the impact agenda for public-funded agricultural research in New Zealand.

Methodology

An in-depth case study analysis, using the concepts of hybrid organisations and institutional logics as an analytical framework, was used to address this purpose. The

hybrid organisation perspective helps to reveal how research organisations, along with aligned actors in the agricultural innovation system, navigate emergent dichotomies in the transition from science-driven to inclusive innovation. We draw on the institutional logics literature to describe the values, beliefs, assumptions and practices that make up the dichotomous cultures (logics) in hybrid research organisations, e.g. science/non-science, knowledge provider/knowledge broker, independent advisor/impact champion. The case study was the research organisation, AgResearch, which in 2012 began an organisational change programme, BeyondResults, to transition from science-driven to inclusive innovation. Face-to-face interviews were conducted with 39 individuals from the research organisation, including senior management and researchers, as well as Government, extension and industry actors. Secondary data was gathered from BeyondResults documentation, including monitoring and evaluation data. After a preliminary analysis, a sense-making workshop with participants in BeyondResults tested the validity of emerging themes. A detailed thematic analysis was used to develop these themes in more depth.

Results

The change programme within AgResearch enabled a hybridisation of organisational roles by creating a space to experiment with inclusive innovation logics, while maintaining science-driven logics elsewhere in the organisation. There is evidence of the start of a cultural change towards inclusive innovation within AgResearch. Strong championing of the inclusive innovation logic by the organisational leadership was critical to legitimacy.

BeyondResults provided a “proof of concept”, both internally and externally, of new organisational roles and practices. Within the research organisation it helped scientists to recognise and confront critical questions about the organisational culture and roles in inclusive innovation, i.e., points of conflict between existing and emerging institutional logics. Externally, BeyondResults has begun to provide thought leadership and a space to convene strategic conversations about the respective roles of extension, industry, Government and research in inclusive innovation.

Implications

The case study demonstrates how resourcing and legitimising a space to experiment with inclusive innovation enabled a research organisation to learn and adapt inclusive innovation practices, clarify organisational roles in inclusive innovation alongside extension, industry and Government actors, and how these new roles and practices fit (or not) with institutional logics within the organisation. This has potential for agricultural research and extension to develop and deliver greater economic, social and environmental benefits for society.

Starting from scratch: Building knowledge and innovation systems for ecosystem services in Sweden

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Keywords

Knowledge and innovation systems Socially robust knowledge Ecosystem services Beekeeping

Abstract

To manage rural and environmental challenges we need to rethink existing practices: Develop social and institutional innovations, adapt the regulatory frameworks, build new products and markets, as well as technologies and managerial approaches. Identified needs and emerging potentials, for instance the role of rural areas to support mitigation of climate change and halt the environmental degradation, are discussed on societal level, but from a policy perspective the question is whether or not existing knowledge and innovation systems, KIS, are well suited to meet such challenges. New areas for rural development, such as the provision of ecosystem services, are challenging. The question is how these challenges can be overcome by the development of adapted and flexible KIS?

In Sweden one sector which experience an increased attention is beekeeping that through its businesses also contribute to pollination in specific areas. It involves many individual beekeepers but is, from a KIS perspective, nevertheless highly informal, underfunded and unstructured. The challenges facing apiculture are many today. One of the most important is related to honeybee health issues, having consequences for rural economy and long-term sustainability. Increased competence and collaboration are seen as central to reach sustainable production systems. But in this respect today's KIS is not functional. Thus, beekeeping illustrates an area that demand social and institutional innovation to be able to deliver public goods. We need to better understand the key functions enabling environments for responsive multi-actor co-innovation in new areas. The beekeeping sector has good preconditions and might function as a role model for the development of other ecosystem services benefitting the rural economy. If one succeed in creating a functional and socially robust KIS in apiculture it might be instrumental for the development of KIS for ecosystem services in general.

Purpose, questions

The aim of this study is to contribute to a better basis for policy decisions when developing KIS in new areas. We do this mainly by a critical discussion on experiences made when developing a socially robust KIS for apiculture in Sweden. The research questions address how traditions and existing structures interact with new societal needs and competencies. We investigate the consequences for organizing for change and how

the key functions of KIS might be translated into new areas.

Design, methodology

This study is based on a participatory research project using a case-study methodology. The approach included a range of methods used in multi-stakeholder collaborative work. The case used to deepen the understanding on how to go about developing a KIS from scratch is beekeeping in Sweden.

Data collection, analysis

Relevant stakeholders are identified and participating in workshops as well as interviews. A qualitative analysis is made based on collected data as well as earlier research on KIS. The qualitative analysis is guided by triangulation of the different data input, including a Delphi-inspired methodology.

Results and implications

The results include a) recommendations on how a socially robust KIS for the Swedish beekeeping sector might be organised and function, b) a critical analysis of the main challenges when building a KIS from scratch, and c) consequences for other, contemporary areas such as the development of new KIS for existing ecosystem services. The implications are that policies need to be not only developed, but also fine-tuned to support 1) the unique characteristics of networks and platforms for learning and co-innovation in new areas of development, 2) systems for vertical integration of actors in the policy chain, and 3) action evaluation for continuously improving pre-conditions and methods when scaling up and out social and institutional innovations.

The Effect of Meta-cognitive and Self-directed Skills on Academic Achievement among Agricultural Students, Iran

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Keywords

Academic Achievement, Self-directedness skills, Meta-cognitive skills, Social conditions, Agricultural students, Iran

Abstract

The last two decades has seen an increasing call for public-funded research and extension to deliver impact beyond traditional measures of extension quantity (e.g., number of extension events) and research quality (e.g., excellence of academic outputs), to the benefits these produce for society. This “impact agenda” has stimulated agricultural research organisations to explore transitioning from science-driven research and extension to inclusive innovation. An inclusive innovation approach potentially delivers increased impact by focusing on stakeholder needs, and co-development of fit-for-purpose practices implemented in partnership with stakeholders. Concurrently, a shift from linear to inclusive innovation has created uncertainty around organisational cultures and the respective roles of research, extension and industry in innovation. As more organisations embark on this transition, studies are needed to provide examples of how to navigate this organisational change. We contribute to this literature by studying the topic from the perspective of hybrid organisations, which are organisations defined by practices, products and services that reflect dichotomous institutional logics. For example, public research institutes cooperating closely with next- and end-users operate with both public and private research logics.

Achievement among these students. In total, they could predict a significant percentage (68.1%) of variance for the variables academic achievement.

Introduction

Since the students' academic achievement is considered as one of the important criteria in determining the quality of the educational system, it is of particular importance to have a close examination of this effective factor. Therefore, the theoretical and research efforts of many theorists have increasingly contributed to the analysis and explanation of factors associated with the academic achievement (Tamanaifar &

MansouriNik, 2014). Students' academic achievement is one of the main indicators to assess higher education and predict the future status of the students in terms of obtaining academic qualifications along with practical and academic skills (Soares et al., 2009). There are many methods to assess this factor, some of which include the assessment of achievements in each training course, the annual grade point average, the grade point average obtained for a specific course, and specialized tests (Pitt et al., 2012). The identification of factors affecting the students' academic achievement provides an appropriate approach to planning and developing educational programs, thus providing the best possible results for both the educational institution and students (Halpenny et al., 2010). Undoubtedly, agricultural higher education is no exception.

Having a close look at the factors influencing academic achievement at universities, one can find that a large number of factors affect academic achievement (Ghomi et al., 2016), the most important of which is self-directed learning strategies (Bahar, 2010). Self-directedness in learning is a process throughout which the learners take the responsibility of identifying their own learning requirements as well as planning, implementing, and evaluating their learning outcomes (Fisher & King, 2010).

Self-directed learners are active and self-motivated individuals who, instead of passively waiting for reactive learning, take initiatives in their own learning. Self-directedness is a psychological mode in which one assumes being personally responsible for oneself and one's learning (Long, 2000). This type of learning is underpinned by a principle clarifying how the learner organizes his learning behaviors according to his meta-cognitive and motivational beliefs (Linnenbrink & Pintrich, 2002). Self-directed learners are purposeful and meaningful and, given their high motivational level, their learning is sustainable and consistent (Saif, 2012). This type of learning consists of three components: Self-management (management of or by oneself; taking the responsibility of one's own behavior and well-being), Self-control (the ability to control oneself, in particular one's emotions and desires, especially in difficult situations), and Willingness to learn (defined as a desire, wish or readiness to acquire new knowledge and develop) (Williamson, 2007).

Relevant studies show that Iranian students are not well-ranked in terms of self-directedness skills (Amini & Fazli-nejad, 2010). A review of studies conducted during 1995-2007 also indicates that Iranian students are at a low level in terms of self-management, self-control, and willingness to learn, which are in fact the main components of self-directedness in learning (Heidari-Damani, 2010). Furthermore, given the effectiveness of self-directedness development programs in different parts of the world, Iran's higher education system has also recently focused on the development of similar programs (Taqipour et al., 2016). Due to the rapid and growing changes in the agricultural sciences, the Higher Education Centers need to grow their students in such a way that they are equipped with lifelong learning abilities (Abbasi & Zamani-Miandashti, 2013). Educating such students in the higher agricultural education system requires empowering learners with self-directed learning skills (Abbasi & Hedjazi, 2013). Acquiring such an ability not only leads to academic achievement during the course of study at higher agricultural education centers but also makes them more responsive to the widespread changes in future knowledge and agricultural skills (Zamani & Azizi -Khalkheil, 2006). With regard to the practical nature of agricultural sciences, the need to concern and invest on training self-directed learners is more highlighted (Taqipour et al., 2016). Indeed, many of today's postgraduates in agriculture have practically no special skills; therefore, they after graduation are struggling with unemployment problems or engaging in unrelated fields of study. (Zamani & Azizi-Khalkheili, 2006). Although a part of the problems stems from shortcomings in our educational system and weaknesses in social, economic, and political structures, it is partly because they are lacking self-directedness and knowledge updating skills.

In the agriculture sector and its sub-sectors, the one's ability to direct one's learning process and experiences is considered as an important factor in achieving success. Hence, improving self-directed learning skills is assumed to be one of the main tasks of any responsible agricultural educator in higher agricultural education centers, given the fact that many agricultural students' knowledge becomes obsolete after graduation. Here, self-directed learning enables current graduates (previous students) to update their knowledge (Taqipour et al., 2016).

Meta-cognitive skills are another factor affecting the academic achievement and self-directedness skills (Ghomi et al., 2016). In other words, meta-cognition is an engine stimulating students' academic achievement and self-directedness (Reeve et al., 2003). To put in simpler words, meta-cognition is "recognition of cognition" or "knowing about knowing". In other words, metacognition refers to an individual's knowledge of his own learning method (Saif, 2012). Meta-cognition allows learners to select and invent explicit learning strategies through understanding available cognitive resources and gaining experience from solving similar problems. It also plays a critical role in effective and profound learning since it empowers individuals to plan, monitor and control their cognitive function (Pennequin et al., 2010). Meta-cognition is known as a method that can be used to develop studying and learning skills and strategies (Veenman et al., 2006; Saif, 2012). The comparison between cognition and meta-cognition reveals that the former is engaged with act and action; however, the latter is associated with the selection and development of what one wants to do and the control of what is being done (Ghomi et al., 2016). Improving his meta-cognition skills, one can enhance his focus on a particular learning unit, recognize the necessity of information, and, if necessary, use meta-cognitive strategies to keep information in short-term memory or to store them in long-term memory and retrieve them (Altindag & Senemoglu, 2013).

Similarly, meta-cognition consists of three components as follows: Meta-cognitive knowledge, Meta-cognitive control, and Meta-cognitive strategy. The first component (i.e., meta-cognitive knowledge) refers to the general required strategies to carry out different tasks, the situations in which these strategies can be adopted, and the learning units in which these strategies can play an effective role (Altindag & Senemoglu, 2013). In this study, meta-cognitive knowledge includes the sub-components of personal knowledge (an individual's general knowledge about how to learn and process information), knowledge of task (i.e., knowledge about the nature, type, quality, and procedure of a task in which a person is supposed to be involved), and strategic knowledge (i.e., an individual's knowledge about when and where which strategy should be used). Another component (i.e., metacognitive strategies) refers to the tactics that individuals use to monitor and control their progress (Saif, 2012). The component of metacognitive strategies includes the following subcomponents: Regulation: (the fact of something like an organization regulating itself without interventions from external bodies), planning (the process of thinking about the activities required to achieve a desired goal) and monitoring (the regular observation and recording of activities taking place in a program).

Finally, the metacognitive control component includes follow-up and attention while reading, self-questioning about topics, and monitoring the speed and time needed to read a lesson (Salarifar & Pakdaman, 2012). Its meta-cognitive control also contains self-control, evaluation, and ordering. McClelland's Achievement Motivation Theory is one of the most important theories in curriculum development. McClelland assumes the social conditions of the community to be effective in encompassing achievement motivation, some of which are listed below:

1. Education in the families: According to McClelland, the most significant education in the family is the one nurturing features such as autonomy, self-control, specific

ambitions, and trust in Childhood.

2. Social class: The social class influences the achievement motivation, and such motivation is higher in the middle class than in other classes.
3. Social mobility: The achievement motivation is mostly notices in individuals and groups that have a tendency for social mobility.
4. Ideology: From the perspective of McClelland, the change of ideology is another factor having some impacts on the achievement motivation.

Additionally, the family environment is another factor contributing to the academic achievement of children. In his studies on the process of family socialization, Anderson (1971) concluded that the more number of variables are related to the family environment and thus, have more impacts on children's educational achievement. Some of these factors are family's insistence on achievements for children, educational guidance, family's endeavors, family's intellectual interests and their work habits as well as the parents' levels of education and family problems (Sharifian, 2001). In general, this variable included three components of education in family, family environment and organization of the educational and social environment.

A review of studies on the effects of meta-cognitive and self-directedness skills on student's achievements shows that a majority of these studies have been conducted among students in medical, educational, and human sciences, even though, few studies have been carried out investigating such an effect among agriculture students. One of the few studies on the field of agriculture was conducted by Taqipour et al. in 2016. The study aimed to examine self-directedness learning skills among Iranian agriculture students, and the results indicated that the agriculture students' self-directedness skills are generally at a medium level.

In a research study aimed at investigating the applications of meta-cognitive strategies in the experiences of students at Department of Education and Psychology of Shiraz University and revealing its relationship with their academic achievement level, Safari & Mohammadjani (2011) claimed that 26% of these students properly used meta-cognitive skills in their studies and learning. Regarding meta-cognitive components, 35 percent of students used self-regulation skills. In general, a significant positive correlation was observed between students' meta-cognitive skills and their mean scores. In addition, there was a positive and significant correlation between meta-cognitive components and students' mean scores. Further, significant correlations existed between the study strategies and methods and a variety of meta-cognitive knowledge.

Baradaran et al. (2014) examined the relationship between meta-cognitive knowledge about study strategies and academic achievement among the students of Iran University of Medical Sciences, and the findings showed that their mean score obtained for the knowledge about the study strategies was favorable, and that there was a significant correlation between the medical students' knowledge about the study strategies (and its three components) and their academic achievements. Based on the findings of this research, knowledge about planning and goal-setting strategies, in comparison with other meta-cognitive strategies, can better explain the academic achievements among medical students.

Long (2007) also concluded that self-directed learning is a continuous process that is required by the individuals throughout their lives, and that each individual matures with the challenges he faces in the environment. At the State University of New York (SUNY) at Oswego, Corey (2007) assessed the undergraduate students' perceptions of involvement in online fields of study and possible facilities for self-directedness in students' learning. The findings showed that the students were able to self-select and self-direct some assignments, headline presentations and readings. Also, considering different comments, engaging students in the Socratic method, devoting much time to

homework, self-reflecting, and creating pleasant assignments have also been useful in this regard.

In summary, it can be mentioned that since academic achievement is one of the most important factors for the development and progress of each country, the identification of the factors affecting the students' academic achievement is one of the most important approaches by which we can educate creative students having high compatibility with environmental and technological changes. Students trained in such a system would be able to move the development wheels in their own countries. In this context, self-directedness skills, meta-cognitive skills, and social conditions are important factors affecting academic achievement and preventing academic failure. It also seems that these factors are important tools to prepare individuals for the job market and entrepreneurship. Hence, the main objective of the present study was to examine the effect of cognitive and self-directedness skills on the academic achievement of agriculture students. Considering that meta-cognitive skills, in addition to affecting academic achievement, are also one of the facilitators of self-directedness skills, the meta-cognitive skills in the present study are both directly and indirectly (as self-directedness skills directly affect academic achievement) correlated with academic achievement. Moreover, given that various researchers have emphasized on the role of social factors in achieving academic achievement and improving self-directedness and meta-cognitive skills, the effect of this variable on academic achievement, self-directedness skills, and meta-cognitive skills was both indirectly and indirectly examined (Figure 1).

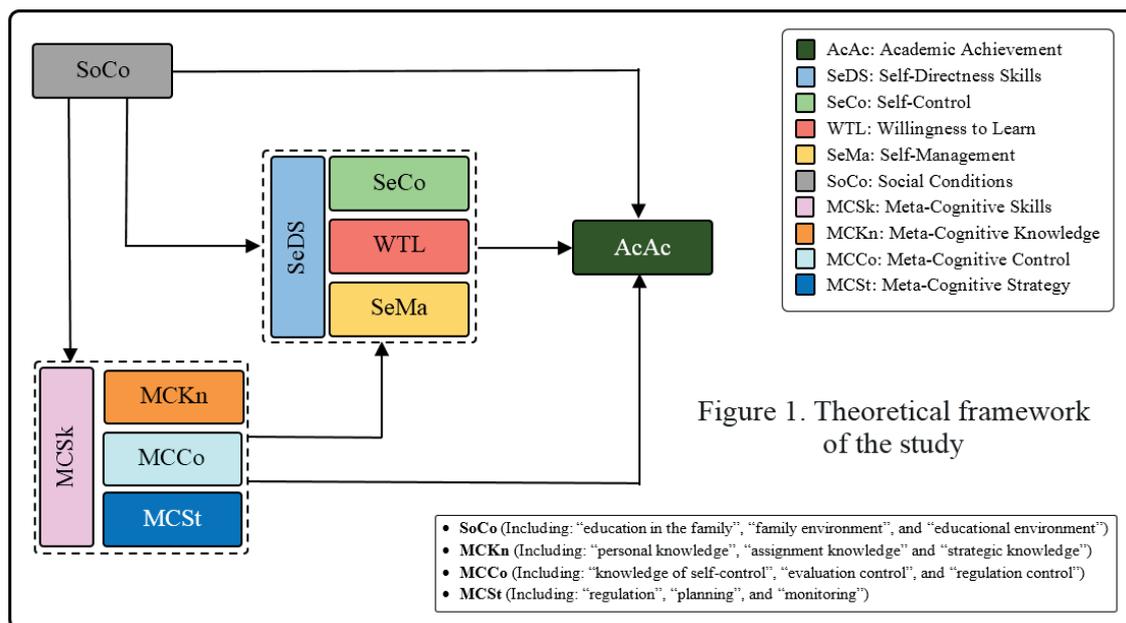


Figure 1 Theoretical framework of the study

Materials and Methods

This research was quantitative in terms of the research nature and applied in terms of purpose since the findings would be used by planners and curriculum developers in higher agricultural education. With regard to the data collection method, the study was a survey. Regarding the type of data-processing, it was also descriptive-correlational. This research was conducted in Agriculture Department of Iran's Universities. Due to the limited spatial and temporal scope and according to the statistics reported by the Ministry of Science, Research, and Technology (MSRT), Iran was divided into five poles

(MSRT-Deputy of Research, 2014) and one department was randomly selected from each pole. From the first, second, third, fourth, and fifth poles, the Colleges of Agriculture at Tarbiat Modares University (TMU), Sistan and Baluchestan University, Razi University of Kermanshah, Yazd University, and Shiraz University were selected respectively

Table 1. Stratification system developed by the MSRT

| Scientific center | Province |
|-------------------|---|
| First pole | Tehran, Alborz, Golestan, Semnan, Mazandaran, Qom, Qazvin, Guilan, and Zanjan |
| Second pole | North Khorasan, Razavi Khorasan, South Khorasan, Kerman, and Sistan and Baluchestan |
| Third pole | West Azarbaijan, East Azarbaijan, Ardabil, Kurdistan, Kermanshah, and Hamadan |
| Fourth pole | Isfahan, Yazd, Chaharmahal and Bakhtiari, Lorestan, Khuzestan, and Ilam |
| Fifth pole | Kohgiluyeh and Boyer-Ahmad, Bushehr, Fars, and Hormozgan |

(Table 1).

The statistical population consisted of all Iranian agriculture students (N=236973), and the sample size was estimated to be 150 persons according to Cochran statistics and two-stage sampling method (cluster sampling in the first stage (Table 1) and proportional stratified random sampling in the second stage). In the second stage, the strata included different fields of agriculture. Using Cochran statistics, the probable desired precision (d) was calculated to be 0.43; however, it was set at 0.19 compared with some previous works in order to increase the sample size and make the findings of the research more reliable.

$$d = t \cdot \frac{s}{\sqrt{n}} \implies d = 1.96 * \frac{1.22}{\sqrt{30}} \implies d = .43$$

$$n = \frac{N \cdot (t \cdot s)^2}{Nd^2 + (t \cdot s)^2} \implies n = \frac{236973 * (1.96 * 1.22)^2}{236973 * (0.19)^2 + (1.96 * 1.22)^2} \implies n = 150$$

In the present study, the “documentary” and “field study” methods were used to collect information. The documentary method includes a study of reliable sources, books, the Internet, journals, articles, reports, dissertations and theses, though, the instrument used in the field study method is a questionnaire. In this study, the developed questionnaire- in both electronic and written versions, contained closed and open responses. To confirm its face and content validity, the questionnaire was submitted to a group of curriculum and educational planning specialists in the higher agricultural education system. Considering the comments provided by these specialists and making the required revisions, the validity of the questionnaire was confirmed. In this research, Cronbach’s Alpha was used to assess the reliability of the questionnaire. To conduct a pilot study, 30 questionnaires were completed at one of the agriculture departments (i.e., University of Tehran) not included in the population. Based on the obtained results, the questionnaire consists of three sections: The first section was devoted to the title and explanations on purpose of the research, and the second section contained the demographic information of the respondents. Finally, the third section consisted of the main variables included in the theoretical framework and the relevant items to be measured. The operational definitions and procedures for each variable are presented below.

Academic achievement: This term refers to the extent in which the students achieve predetermined educational goals that are expected to be achieved in their learning efforts. In order to measure this variable, the students’ grade point average was used

(Saif, 2012).

Meta-cognition: Meta-cognition refers to each individual's knowledge of his or her own cognitive processes or anything related to these process, such as the information or data learning features. In other words, meta-cognition is an individual's knowledge of his own learning (Flavell, 1979). Meta-cognition consists of three components: Meta-cognitive knowledge (Altindag & Senemoglu, 2013), Meta-cognitive control (Salarifar & Pakdaman, 2012), and Meta-cognitive strategy (Saif, 2012). The conceptual definitions of each component and sub-component are presented in the Introduction Section. Meta-cognitive skills were measured in the form of 68 items ($\alpha = 0.87$) using a five-point Likert scale (Extremely Low: 1, Low: 2, Medium: 3, High: 4, and Extremely High: 5).

Self-directedness: Self-directed learning is a process in which learners are responsible for planning, implementing, and assessing their own learning and are expected to work independently from others in order to achieve their predetermined learning goals (Saif, 2012). The variable was measured in the form of 36 items ($\alpha = 0.89$) using a five-point Likert scale (Extremely Low: 1, Low: 2, Medium: 3, High: 4, and Extremely High: 5).

Social conditions: This variable includes three components of education in family, family environment, and organization of the educational and social environment. The variable was measured in the form of 13 items ($\alpha = 0.86$) using a five-point Likert scale (Extremely Low: 1, Low: 2, Medium: 3, High: 4, and Extremely High: 5).

The research data were collected using an electronic and a written questionnaire. The electronic questionnaire was submitted to the students by email, as well as the social networks, such as WhatsApp and Telegram. The written questionnaire was submitted directly. The respondents were interviewed and their information was recorded. Finally, 150 questionnaires were returned back and analyzed. The SPSS24 was used to analyze the data.

Results and Discussion

Descriptive analysis of the data showed that the mean age of the participants was 25.18, with a minimum of 20 and a maximum of 38 years ($SD = 2.73$). There were 106 (70.7%) male and 44 (29.3%) female respondents. Regarding their residence, 23 (15.3%) participants were rural and 127 (84.7%) participants were urban. The participants' mean monthly family income was 18631400.86 Rials (about US \$ 450) [$SD = 1084981$, $Min = 2000000$ Rials (about US \$ 48), and $Max = 80000000$ Rials (about US \$ 1900)]. The average number of the respondents' family members was about 5 persons ($SD = 1.42$, $Min = 2$, and $Max = 10$). In terms of level of education, there were 29 (19.3%) undergraduates, 96 (60%) MA students and 25 (16.7%) PhD students. The mean of the participants' grade point averages was 15.72 (out of 20) ($Min = 12$ and $Max = 19.87$) ($SD = 1.85$).

Relationships between variables

Pearson correlation coefficient was used to determine the correlation between the variables (Table 2). Considering the theoretical framework of the study, there was a direct relationship between academic achievement and meta-cognitive skills, self-directedness skills, and social conditions (Figure 1). The correlation test revealed that there is a direct and significant correlation between meta-cognitive skills and academic achievement ($r = 0.774$, $p < 0.01$). This is in line with the findings in other studies (Kumin & Rahman, 2010; Safari & Mohammadjani, 2011; Baradaran et al. 2014; Abdellah, 2015). It can also indicate that the more the students' meta-cognitive skills are, the more the student's academic failure can be prevented. On the other hand, the correlational findings suggested a direct and significant relationship between the self-directedness skills and the academic achievement ($r = 0.746$, $p < 0.01$). This finding is in a similar vein with the findings of other researchers (Anderson & Bourke, 2000; Shokar

et al., 2002; Avdal, 2013). That is, the higher the students' self-directedness skills are, the higher their academic achievement will be in the long run. Also, the correlation test showed that there is a positive and significant correlation between social conditions and academic achievement ($r = 0.668$; $p < 0.01$). This result is consistent with the results in some other research (Duran-Narucki, 2008; Barrett et al. 2013; Maxwell, 2016). The correlation between meta-cognitive and self-directedness skills was also positive and significant ($r = 0.766$, $p < 0.01$). Furthermore, the correlations between social conditions with self-directedness skills ($r = 0.590$, $p < 0.01$) and metacognitive skills ($r = 0.648$, $p < 0.01$) were positive and significant (Table 2).

Table 2 Correlations among study variables

| | <i>Academic achievement (AcAc)</i> | <i>Meta-cognitive skills</i> | | |
|---------------------------------|------------------------------------|------------------------------|---------|---|
| (MCSk) | Self-directedness skills (SeDS) | Social conditions | | |
| Academic achievement (AcAc) | 1 | | | |
| Meta-cognitive skills (MCSk) | 0.774** | 1 | | |
| Self-directedness skills (SeDS) | 0.746** | 0.766** | 1 | |
| Social conditions (SoCo) | 0.668** | 0.648** | 0.590** | 1 |

The analysis of causal relationships among variables

In this study, the path analysis was used to examine the relationship among the variables affecting the agriculture students' academic achievement. To this end, the direct effect of each variable on the dependent variable (academic achievement) was assessed. According to the findings, meta-cognitive skills and social conditions had the highest and lowest direct impacts, respectively. The results of the causal analysis were summarized in three steps, as discussed below.

In the first step, the academic achievement as the dependent variable and other variables as independent variables were included in the analysis. The results showed that self-directedness skills ($\beta = 0.317$, $p < 0.000$), meta-cognitive skills ($\beta = 0.379$, $p < 0.000$), and social conditions ($\beta = 0.235$, $p < 0.000$) could explain 68.1% of variance in academic achievement. These results imply that the higher and the better the students' levels of metacognitive skills, self-directedness skills, and social conditions are, the netter their academic achievement will be.

In the second step, self-directedness skills as a dependent variable and meta-cognitive skills and social conditions as independent variables were also introduced into the analysis. The findings in this step showed that metacognitive skills ($\beta = 0.661$, $p < 0.000$) and social conditions ($\beta = 0.161$, $p < 0.000$) could explain 59% of the variance in student's self-directedness skills.

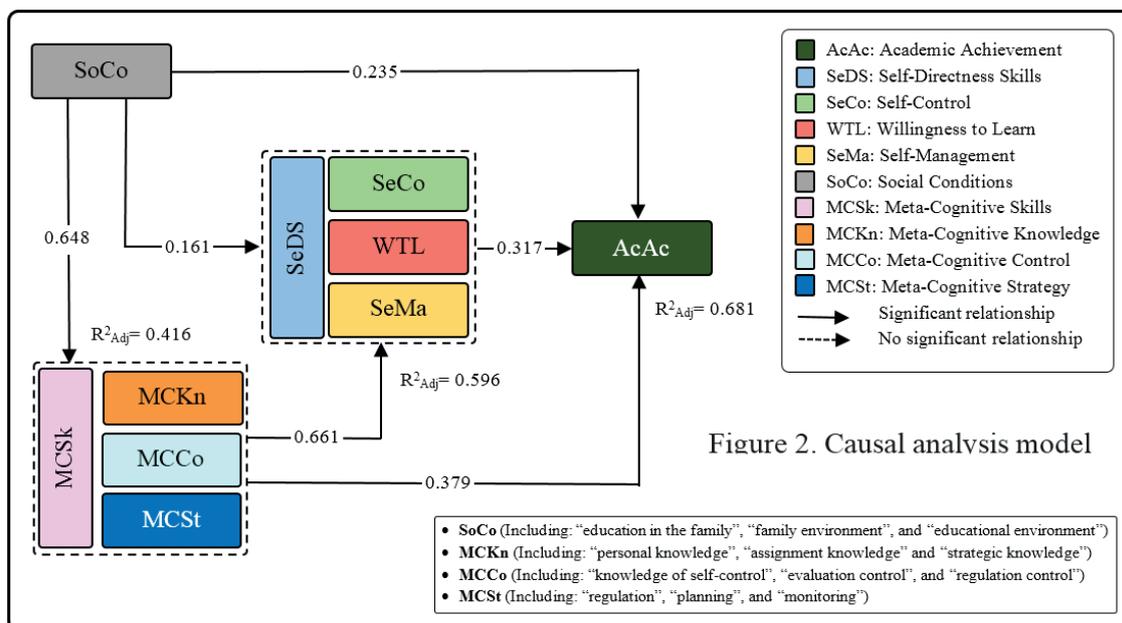
In the third step, the variable meta-cognitive skills as the dependent variable was included in the analysis, and the effect of the social conditions on this variable was assessed. The findings showed that the variable social conditions ($\beta = 0.648$, $p < 0.000$) could predict and explain 41.6% of variance in meta-cognitive skills; that is, the better students' social conditions is, the more their meta-cognitive skills will be (Table 3 and Figure 2).

Correlation decomposition among research variables

In order to improve our understanding of the causal relationships and mechanisms among the main variables of the research, the correlation values (r) and the standardized effect coefficients (β) were used (Table 4). Thus it should be noted that meta-cognitive skills, self-directedness skills, and social conditions were the factors having a direct effect on academic achievement. Besides direct effects, the variables social

Table 3. Direct effects on academic achievement (AcAc), self-directedness skills (SeDS), and meta-cognitive skills (MCSk)

| | Independent variables | B | Beta (β) | t | Sig. t |
|----------------------------|-----------------------|------------|------------------|------------|----------|
| Direct effects on the AcAc | Constant | 6.450 | --- | 12.17 | 0.000 |
| | SeDS | 0.025 | 0.317 | 3.79 | 0.000 |
| | MCSk | 0.016 | 0.379 | 4.87 | 0.000 |
| | SoCo | 0.048 | 0.235 | 6.02 | 0.000 |
| | Sig. F = 0.000 | F= 116.819 | R2Adj = 0.681 | R2 = 0.678 | R= 0.829 |
| Direct effects on the SeDS | Constant | 33.720 | --- | 4.78 | 0.000 |
| | MCSk | 0.361 | 0.661 | 9.66 | 0.000 |
| | SoCo | 0.416 | 0.161 | 2.35 | 0.000 |
| | Sig. F = 0.000 | F= 110.837 | R2Adj = 0.596 | R2 = 0.601 | R= 0.775 |
| Direct effects on the MCSk | Constant | 98.883 | --- | 7.49 | 0.000 |
| | SoCo | 3.062 | 0.648 | 10.35 | 0.000 |
| | Sig. F = 0.000 | F= 107.240 | R2Adj = 0.416 | R2 = 0.420 | R= 0.648 |



conditions ($0.648 \times 0.379 + 0.648 \times 0.661 \times 0.317 + 0.161 \times 0.317 = 0.431$) and meta-cognitive skills ($0.661 \times 0.317 = 0.209$) had indirect effect on academic achievement as well; however, no indirect effect was observed for the variable self-directedness skills. An investigation of the direct causal effects also indicated that the meta-cognitive skills ($\beta = 0.379$), self-directedness skills ($\beta = 0.317$), and social conditions ($\beta = 0.235$) had the greatest direct impact on the academic achievement, respectively. This suggests that the focus should be on enhancing meta-cognitive skills in order to achieve academic achievement among the agriculture students.

Also, the study of causal effects indicated that the variables social conditions (0.666), meta-cognitive skills (0.588), and self-directedness skills (0.317) had a significant causal effect on the academic achievement. Thus it can be claimed that although the improvements in social conditions have a great effect on the enhancement and promotion of academic achievement, this effect becomes much more pronounced with increasing students' meta-cognitive and self-directedness skills.

Conclusion

The main objective of this study was to assess the effects of meta-cognitive and self-directedness skills on the academic achievement of Iranian agriculture students. The results of the research confirm that the reinforcement of the students' meta-cognitive and self-directedness skills has a great impact on their academic achievement, and these two variables, together with the variable social conditions, could predict a significant percent of variance in students' academic achievement. According to the

Table 2 Correlations among study variables

| No. | Variables | Direct effects | Indirect effects | Total effects | Correlation coefficient | Non-causal effects | Model compliance with the theoretical framework |
|-----|-----------|----------------|------------------|---------------|-------------------------|--------------------|---|
| 1 | MCSk | 0.379 | 0.209 | 0.588 | 0.774 | 0.186 | √ |
| 2 | SoCo | 0.235 | 0.431 | 0.666 | 0.668 | 0.002 | √ |
| 3 | SeDS | 0.317 | ----- | 0.317 | 0.746 | 0.429 | √ |

√ Compliance with the theoretical framework

× Non-compliance with the theoretical framework

findings, it seems that a paradigm shift is of essence in Iran's higher agricultural education system and its teaching and learning processes since no attention is being paid to the meta-cognitive and self-directedness skills in Iran's current higher agricultural education system. In other words, instead of banking education, parrot learning, and information bombardment, this system should move towards the use of meaningful teaching and learning processes and nurturing self-reflective and self-directed students. In this way, the agriculture students become aware of their own learning processes and know how and when learn what. This process would lead to the students' academic progress during studies and prepare them for self-directing and updating knowledge after graduation from the university.

A deeper look at the findings on the indirect and total effects of independent variables on the dependent variable academic achievement reveals that social conditions (consisting of education in family, family environment and the organization of educational and social environment) has the greatest indirect and total effect on this dependent variable. Some components of the social environment (i.e., education in family and family environment) cannot be controlled by the higher agricultural education institutions, despite their impact on the academic achievement of students, or if they are to be controlled, they require widespread and long-term coordination and planning among different organizations. Accordingly, it is suggested that the higher education institutions mostly focus on organizing the educational and social environment in agriculture departments in order to achieve faster results in terms of students' academic achievement. For example, agricultural educators can use collaborative methods in classroom environments to strengthen autonomy, achievement motivation, self-regulation, and other-regulation. Moreover, in order to improve the trainings and family environments in line with the students' academic achievement, the Ministry of Science, Research and Technology (MSRT) authorities are also recommended to coordinate their goals with the objectives of institutions that are more involved with families and family education. Based on the findings, the metacognitive and self-directedness skills are the most important predictors of academic achievement among students. In addition to having direct effects on the academic achievement, the meta-cognitive skills also indirectly influence this variable through reinforcing self-directed skills. Accordingly, the curri-

culum developers in the Higher Agricultural Education System are recommended to revise the curricula and programs related to agricultural courses with a focus on the aforementioned goal: "Students need to know (When) and (How) learn (What)." In order to operationalize this goal in the curriculum, the planners can teach students self-regulation, self-monitoring and self-evaluation of learning and teaching activities. If curriculum planning is underpinned by this objective, the students' meta-cognitive skills will be reinforced, and their self-directedness ability will be improved. Students' academic achievements will also be improved consequently.

To sum up, it can be concluded that self-directed learning abilities and meta-cognitive skills are of essence factor for all agriculture students, which should be considered in accordance with different fields of study in educational programs. These factors, if taken into consideration, can be extremely effective means to have academic achievement and lifelong learning among students. Finally, the study also suffered from some limitations. As the first limitation, this research was a self-reported study; therefore, there should be more caution in analyzing the results. The second limitation is the relatively small sample size in this study, which restricts the generalizability of the research findings to other agriculture students and agriculture departments at other universities.

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International Agency Extension Model in Ukraine: Retrospective Analysis

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Keywords

Extension model, International agency Extension model, and Extension in Ukraine

Abstract

This paper examined the international agency Extension model in Ukraine. International agencies Extension programs helped to develop Extension services in Ukraine. International agency Extension model was based on the grant-funded mechanism that supports projects that address specific issues in agricultural and rural development. The historical research method was used. Six Extension centers were analyzed based on the four criteria: a) organizational structure, b) program content, c) program delivery and audiences, d) post-project mechanism of functioning of the Extension project. There were five content areas identified: 1) farms profitability, 2) agricultural production, 3) agrarian marketing, 4) entrepreneurship and agribusiness (farm management), 5) rural livelihood. Delivery methods included workshops, training courses, demonstration, seminars, field days, and brochures. Target audiences were small and mid-size farmers, a population in rural areas were a predominantly male audience, youth, and women (for the last five years), and small family farms. The pilot extension initiatives role was to disseminate the best Extension practices in the country to educate people and enhance their quality of life. Many former international agencies Extension centers discontinued their activities because of funding constraints and limited portfolio of Extension products. Moreover, the cost recovery mechanism options were not explored. Recommendations provided.

Introduction

International organizations have similar mission of leading rural development around the globe. Governmental and non-governmental international agencies engage in efforts to improve rural citizens life. International agencies utilize Extension approach transforming science to citizens, providing farmers with practical solution, and engaging community members. International organizations fostering community leadership through community empowerment programs, woman's programs, human resource development, educational programs for youth and adults (Arnold, Meyers, & Place, 2014; Chamala & Shingi, 1997). For instance, one of the world leading agency is the Food and Agriculture Organization of the United Nations (FAO). The FAO provides "international efforts to defeat hungers" (FAO, 2006). The World Bank-funded agricultural development projects are primarily focusing on the following five areas: raising agricultural productivity; helping farmers reach markets; reducing risk, vulnerability and inequality; improving incomes off the farm; and making agriculture more environmentally sustainable (The World Bank, 2019). For example, non-governmental agencies such as ACDI/VOCA is an organization based in Washington DC working in 147 countries.

ACDI/VOCA creates vibrant communities and help agricultural producers with climate smart agriculture (ACDI/VOCA, 2019). The Global Forum for Rural Advisory Services (GFRAS) is “enhancing the performance of advisory services to serve farm families and rural producers, thus contributing to improved livelihoods in rural areas and the sustainable reduction of hunger and poverty”.

Diverse roles of international agencies require development of the international Extension organizational structure and leadership that help them successfully operates across borders. The leadership skills of international organizations staff help sustain successful programs for rural citizens. Effective leadership leads to positive impact and recognition by local program stakeholders (Roberst, 2000).

Over the last 25 years, international agencies created numerous technical assistance programs that helped developing Extension services in Ukraine. The development of international agency Extension model historically was based on the grant-funded mechanism. This mechanism was created to support individual projects that address specific issues and contribute to achieving results under the project’s main area of activities Ukraine. This paper discusses the international agency Extension model in Ukraine (Windon & Zaburanna, 2019).

Purpose and Objective

The purpose of this paper was to examine the body of scholarly knowledge reported in the different Ukrainian academic journals, official reports, and other official resources related to international agricultural Extension projects in the country for the last twenty-five years. The objective of this study was to explore the international agency Extension model in Ukraine.

Methods

I used historical research method guided by McDowell (2002) to describe the research objective of this study. The credibility and validity of this study were supported using a triangulation approach of multiple sources guided by Tracy (2010). Tracy (2010) suggested that high quality qualitative methodological research is marked by Eight “Big-Tent” Criteria for Excellent Qualitative Research namely, (a) worthy topic, (b) rich rigor, (c) sincerity, (d) credibility, (e) resonance, (f) significant contribution, (g) ethics, and (h) meaningful coherence. I obtained historical data from primary and secondary sources, including official Ukrainian government websites. I examined accessible sources for relevant content. I used post-structural and performative assumptions utilizing multiple data sources – which can be described in qualitative research as a crystallization or the “rigid, fixed, two-dimensional” triangle (p. 843).

We examined centers based on the following criteria (Windon & Zaburanna, 2019).

- organizational structure
- program content
- program delivery and audiences
- post-project mechanism of functioning of the Extension project

Data Collection

Historical research method was used to collect data from six Extension centers that were funded by international agencies during summer 2018. The collected information were grouped based on identified four main criteria of Extension centers functioning a) organizational structure, b) program content, c) program delivery and audiences, d) post-project mechanism of functioning of the Extension project. Many of Extension

centers discontinued their work because of funding constrains. In the Box 1 and Box 2 I provided example of history of development and functioning of advisory centers that were funded by international agencies.

BOX 1. Ternopol Regional Agrarian Advisory Service

In 2001, The Danish Agricultural Advisory Center (DAAC) established of the Ternopol Regional Agrarian Advisory Service in cooperation with the Ternopol Oblast Administration and the Ministry of Agrarian Policy of Ukraine. DAAC is the Danish national center that coordinates advisory, training and information services for farmers in Denmark, a process that began more than 100 years ago. All involved partners from the Danish and Ukrainian sides worked together to achieve the following objectives: 1) the creation of a functional and stable advisory service in the region, 2) provide training for advisers, and 3) increased productivity and profitability of the agrarian sector. The center provided the following advisory service: 1) plantation planning and fertilization for 2-3 cereals; 2) dairy cow feeding and accounting; and 3) farm management with specialization on accounting. Also, provide advising service using specific agricultural software programs. Relationships with farmers were based on commercial contracts where farms and farmers had to meet certain conditions; clear objectives of the advisory service expected to be identified and provided. Danish advisers prepared Ukrainian colleagues for the first two years for example how to offer general advice, provide training and information for farms and farmers. Also, they helped them to develop an individual advising contract practice. The project discontinued functioning because of funding discontinuation and budget constraint.

Source: Schmidt, R. (2002) Development of the Agricultural Advisory Services in Ukraine. Unknown. Kiev. Retrieved from https://www.icp.org.ua/aspekt/doradnictvo/dc/history/book_stan_sil_dor.doc

BOX 2. Training and Support Center for Private Agricultural Producers

In 1998, the Training and Support Center for private agricultural producers at the Vinnitsa State Agrarian University. The USAID funded this project in partnership with the University of Louisiana. The project goal was to lead the changes in the behavior of people providing educational activities (seminars, field days, consultations, and other). By 2000, created 27 district departments in the Vinnitsa region. The Extension center provided service in the following: farm planning, farm management, farm accounting, life skills for young adults. The center provided farm visits, seminars, field days, telephone consulting, and office visit, continuing education, demonstrations, and lessons for farmers. For three years, the Extension center provided the following: 160 seminars (6000 participants), 5000 individual consulting, 70 factsheets, created a local credit union for local farmers, provided education for farm wives, farm fairs, and creation of agrochemical laboratory. The center continued successful work for several years. Budget constraints decreased the amount of service provided for farmers.

Source: Schmidt, R. (2002) Development of the Agricultural Advisory Services in Ukraine. Unknown. Kiev. Retrieved from https://www.icp.org.ua/aspekt/doradnictvo/dc/history/book_stan_sil_dor.doc

Results

The primary agencies that supported Extension programs in Ukraine over the last 25 years were the following international organizations: FAO, The World Bank, USAID, DFID, IFAD, CIDA, ACDI VOCA, EU TACIS, and others. Common organizational structure of international Extension projects comprised of its framework, including lines of authority, communications, duties, and resource allocations and consisted of one central office and two or three other offices in a region (Windon and Zaburanna, 2019). Extension programs' content were focused on the following areas:

1. Farms profitability
2. Agricultural production
3. Agrarian marketing
4. Entrepreneurship and agribusiness (farm management)
5. Rural livelihood.

Delivery methods included workshops, training courses, demonstration, seminars, field days, and brochures. Target audiences were small and mid-size farmers, a population in rural areas were a predominantly male audience, youth, and women (for the last five years), and small family farms. The pilot extension initiatives role was to disseminate the best Extension practices in the country to educate people and enhance their quality of life. Newly created Extension centers

stopped their activities because they had a limited portfolio of provided services and did not explore options of the cost recovery mechanism (Windon and Zaburanna, 2019).

Recommendations

Historical research showed that international Extension projects had a specific aim and focused only on one or two regions primarily. This situation led to a fragmented approach of an international agency Extension model in the country. The results of a retrospective analysis suggested the following:

1. The development of the Extension system in Ukraine only makes sense when the society focuses on the development of small and medium-sized enterprises, in particular - family farming.
2. Capacity entrepreneurial skills development is a vital. This will help to diversify Extension activities, increase the ability to fundraising, and develop a cost-recovery mechanism that prepare new Extension centers to continue their operation.
3. The rural population needs more information about what an Extension service is.
4. Intentional Extension projects leaders should better understand Ukrainian political, economic, and social environment system. Swanson and Samy (2002) wrote ". . . Extension systems in developing countries are under increasing pressure to prove their relevance and importance . . . they deal with specific policy and institutional issues that: currently hinder their contribution to rural development" (p. 1).

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Understanding attitudes, values, opportunities and barriers in participatory research: the case of Riso-Biosystems project on organic rice farming

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Keywords

Organic farming, participation, partnership, research evaluation.

Abstract

Italy is the leading European producer of rice. The crop is grown mainly in Piedmont and Lombardy. The cultivation is typically intensive monoculture with high chemical inputs such as fertilizers and pesticides. The impact of rice cropping on the environment tends to be considered very high, especially on the quality of soil and that of superficial and deep waters, with risks to human health posed by drinking water contamination. The transition to organic rice farming is considered a solution for the environmental protection, the economic sustainability of the farm, consumer safety and as a measure of climate mitigation, but it meets several problems. With the elimination of chemicals for crop protection, the productivity must be pursued through a complex work of varieties selection, crop rotation and agronomic techniques to enhance soil and water resources and control weeds and pathogens, while respecting the specificities of the territory.

In the lack of dedicated advisory services, the farmer experience and expertise play an essential role. Even research, although it is committed to helping production move toward ecological intensification, has not yet developed specific experiments on organic rice farming.

For these reasons, the spread of organic methods has taken place rather slowly and organic rice production has always been limited to a niche of pioneer farmers who, in the absence of previous knowledge, test innovative practices with a self-help and trial-and-error approach. In recent years, however, while conventional rice suffered from a severe market crisis, organic rice prices continued to grow, attracting an increasing number of companies. The sector has been affected by tensions among farmers, speculations, suspicions of fraud, journalistic inquiries and loss of credibility among consumers. Regional administrations and farmers' associations have put pressure on the Ministry of Agricultural, Food and Forestry Policies (Mipaaf) for a reform of the certification and control scheme, judged to be lacking to guarantee the transparency and honesty of the system. To face this complex situation, Mipaaf has gathered for the first time in a single project all the Italian scientific excellences in the field of rice. Riso-Biosystems is a research, development and extension project in support of Italian organic rice farming,

funded with € 560,000 for three years (2017-2019). It involves five research institutes and a dozen farms, studying the organic rice system in its agronomic, breeding, environmental, socio-economic and political aspects.

Consistent with the indications of the European Commission for research and innovation initiatives in agriculture, the project has an interdisciplinary, participatory and multi-actor approach. It fosters a wide involvement of stakeholders, the integration between science and farmers' knowledge, and a mutual-learning processes. The goal is the co-creation of innovation that responds to real needs and its easy and quick adoption and dissemination.

An extensive literature on participatory research shows that these goals are not easy to achieve and very often they remain mere declarations of intent. The project includes specific activities to facilitate participation and to monitor its adequacy.

The work reports the results on the implementation of this approach within the Ri-so-Biosystems project. It investigates the partnership, the role of partners in the project and the relationships among partners and stakeholders. It explores the ways partners do research, the collaborations and the involvement of different actors, the values and the attitudes towards participatory research. The study evaluates the quality of the process in terms of quality of the interactions within the partnership and towards the outside. Finally, it tries to understand the barriers and the opportunities to effective participation.

The study uses a combination of ethnographic methods such as participant observation, in-depth interviews, systematic cataloging of communication documents such as e-mails, minutes, reports and agenda of meetings and workshops, from the origin of the project to a year of work, for a total period of two years (2016-2017).

The work argues that there is a diversified situation among research partners, with extremely heterogeneous values and attitudes. Despite a high level of commitment to their work, researchers show a general paucity of skills. Used to traditional, mono-disciplinary research and focused on publication, they lack familiarity with and incentives for participatory research. They manage with difficulty complex relationship systems and they lose efficiency in collective work. If guided by a facilitator team, they are open to innovative collaboration with farmers and stakeholders and become proactive.

Looking at current researchers' capacity and their needs for efficiently apply an inclusive and interactive approach, the work helps to understand the potential to develop participatory research in agriculture. Some policy recommendations on how agricultural research can effectively support participation are presented. The study concludes that there is a need for a thorough review of the evaluation system of public research and of an integration between research policies and agricultural policies in the new context of sustainability.

Cooperation Between Researchers and Practitioners in Small-scale Fisheries Co-management: a Comparison of Recent Experiences in the Mediterranean Sea

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Keywords

Keon fisheries policy, Fisheries governance, Fisheries co-management, Management plan, sustainable small-scale fisheries

Abstract

According to Council Regulation (EC) No 1967/2006, regarding management measures for the sustainable exploitation of fishery resources in the Mediterranean Sea, Member States are expected to adopt management plans for fisheries conducted by specific fishing gear types (trawl nets, boats seines, shore seines, surrounding nets and dredges) within their territorial waters. In addition, the revised Common Fisheries Policy introduced new elements for conservation such as the target of maximum sustainable yield for all the stocks by 2020 at the latest, the landing obligation and the regionalization approach. In line with this legal framework, the plans shall be based on scientific, technical and economic advice, and shall contain conservation measures to restore and maintain fish stocks above levels capable of producing maximum sustainable yield.

In this context, some Member States - including Italy, Spain and Greece - adopted national management plans and foresaw new co-management operational modalities, with the creation of management structures (the Management Body for transparent goby in GSA9 or the Catalan sand-eel fishery Co-management Committee, for instance), the involvement of different typologies of actors (national and local governments, fishermen, fishermen associations, environmental associations, research institutes), the implementation of diverse organizational models. The adoption of ad hoc national plans has therefore created new models of bottom-up co-management of the fish stocks, based on collaboration between the stakeholders involved.

This contribution explores the diverse experiences in the Mediterranean basin with the adoption of management plans in derogation of the Mediterranean Regulation, with the aim of highlighting the relationship between the actors involved and between researchers and fishermen, in the context of an innovative fisheries governance system.

The analysis is mainly based on official documents, mixed with the direct experience gained in the active participation to the management body of the plan operating in Liguria and Tuscany since 2011, in the capacity of reference person for biological and socio-economic monitoring.

The findings indicate that the introduction of new management measures for the sustainable exploitation of fishery resources required a change in the role of the actors involved; in particular fishermen and scientists had to establish and share appropriate co-management rules, based on defined objectives, as well as co-management tools to implement them, through a system of monitoring, control and surveillance. The co-management of small-scale fisheries in the Mediterranean coastal communities analyzed represent an ongoing collaborative and communicative process that continues to evolve over time and allows to observe the reduction of the gap between scientists, fishermen and policy makers, although communication efforts are necessary in the near future to ensure its success and the implementation of effective measures for sustainable fisheries.

The challenge of collaboration for achieving co-innovation in the New Zealand primary sector

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Keywords

Words: Co-innovation, collaboration, primary sector industry organisations

Abstract

Principles of co-innovation advocated in the literature emphasise the importance of collaboration between actors in the network of actors comprising innovation systems. Limited research linked to co-innovation and innovation systems has explored in depth how organisations do collaborate or the challenges that constrain collaboration and hence also the realisation of co-innovation. The research question the paper addresses is 'How do primary industry organisations collaborate and what shapes this collaboration?'

A qualitative research design was employed with data predominantly gained through semi-structured interviews with people from both organisations and key informants who had a knowledge of the two industry organisations and how they worked together on projects.

Interviews explored the organisation's collaboration within two particular projects but also explored more generally how the organisations worked together.

This research highlights the challenges to achieving co-innovation in the primary sector by focussing on the interactions between two industry organisations in the New Zealand primary sector. The organisations are both funded through farmer levies and fulfil what is 'industry good' role in different but inter-linked primary industry sectors. Distinct differences in resourcing, capability, internal decision making processes and approaches to engagement with farmers contribute to the challenge of collaboration between the two organisations. A theoretical framework for collaboration proposed by Thomson and Perry (2006) proves useful for exposing and articulating the dimensions that shape the interactions between individuals employed by and the organisations themselves.

The paper argues for the inclusion of the collaboration framework within co-innovation theory as a means of informing and exploring more deeply the interactions between individuals and organisations necessary for co-innovation.

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Pathways of social innovation in agriculture: good practices in Calabria region

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Keywords

Social innovation, civil economics, reciprocity, rural development

Abstract

Alternative practices in the agricultural and rural field have led agrarian economists and sociologists to speak of paradigmatic shift of the field of analysis from the production and sectoral process towards local systems and territory. Innovation studies increasingly underline that innovation has a systemic nature and depends on the social structure where innovators operate. The experiences of social innovation in agriculture have been analyzed according to different paradigms among which civic agriculture, social learning, actor-network approach. Our hypothesis is that the theoretical paradigm of civil economy proposed by Bruni and Zamagni (2004) can be used to analyse many of the experiences realized in agriculture that refer to the principles of sustainable and solidarity development, and to the creation of networks of reciprocity for the enhancement of local resources. The perspective adopted here is relatively neglected in the literature. Based on civil economics literature, we have identified the features of social innovation initiatives that we want to detect and then we have developed a survey form. This paper illustrates the first reflections concerning the birth of two initiatives, trying to focus on the context and the reciprocal relations activated to modify it. From the analysis of these two experiences it emerges that in contexts of poverty of social capital, the path of social innovation in agriculture requires the presence of charismatic people who activate relationships of unconditional reciprocity, of individuals willing to cooperate and of time. These experiences also show that changes do not have necessarily long run.

Introduction

There is a widening consensus around the fact that agriculture is undergoing a process of deep change processes. Since the early 1990s, much debate has ensued about the possible transition of contemporary agricultural regimes from a 'productivist' to a 'post-productivist' era (Ploeg et al., 2000; Cavazzani, 2013). Alternative practices in the agricultural and rural field have led agrarian economists and sociologists to speak of paradigmatic shift (Brunori et al., 2008). Ploeg and al.(2000), state that both in practice and policy a new model of rural development is emerging, as the modernization paradigm that once dominated policy, practice and theory is being replaced by a new rural development paradigm.

Innovation studies increasingly underline that innovation has a systemic nature, it is the outcome of collective action and depends on the social structure where innovators

operate.

In a conventional approach, innovation is mainly embodied into technological artefacts (improved seeds, machines, new fertilisers), and its successful application is related to the capacity of the users to learn to 'adopt' them according to given guidelines/blueprints. In the new approach, the very innovation occurs when the network of production changes its way of doing things, so that innovation is mainly related to the resulting pattern of interaction between people, tools, natural resources.

This paradigmatic shift implies a parallel shift of the field of analysis from the production and sectoral process towards local systems and territory. The centrality assumed by the territorial dimension for rural development implies a particular attention for the ability of the single territories to valorize the resources located internally through specific and distinctive forms. Food, one of the most important local resources, has been placed at the center of innovative local development strategies by social actors. The context is perceived by the individuals through information. Evaluation of this information brings to the assessment of a given situation. If the context is evaluated as source of a problem or an opportunity, the individual starts a process of search, which eventually may generate a novelty. "A novelty is a new way of doing and thinking, a new mode that carries the potential to do better, to be superior to existing routines" (Ploeg et al., 2004). From this definition it emerges clearly that innovation is not only technological innovation: any successful change in production, consumption, distribution routines can be considered a novelty.

Also agriculture and the Calabrian rural territories participate in this change as evidenced by the seminars and meetings organized by the CREA Research Center for Politics and Bioeconomy in Calabria over the years¹. In particular, the experiences presented during the seminars show development processes in rural areas based on the concepts of cooperation, reciprocity and trust and new forms of governance based on the principles of the involvement of a wide range of actors (Castellotti et al., 2016; Giannotta et al., 2009; Castellotti et Gaudio, 2003; Cavazzani et al., 2003).

This paper analyzes two experiences of social innovation in agriculture carried out in Calabria concerning different aspects and different kinds of people. From the first point of view, we analyze two experiences of local community recreation processes through the creation of agricultural supply chain and emancipation from the mafia mentality. From the second point of view, we show experiences realized by two types of individuals that carry out local initiatives of civil economy in Calabria: the Catholic Church and individuals or groups that promote the values of solidary and sustainable development.

Objectives and Hypothesis

The aim of the paper is to illustrate the first results of a research project on the detection and analysis of local initiatives able to recreate communities through activities of recomposition of economic ties inspired by the principles of reciprocity and social and environmental sustainability. These experiences of social innovation in agriculture have been analyzed from the sociological and agricultural economics according to different paradigms such as civic agriculture (Lyson, 2005), social learning (Portes, 1998), actor-network approach (Callon, 1986), Granovetter's theory of embeddedness of economic action (Granovetter, 1985).

Our hypothesis is that the theoretical paradigm of civil economy proposed by Bruni and Zamagni (2004) can be used to analyse many of the experiences realized in agriculture that refer to the principles of sustainable and solidarity development, and to the creation of networks of reciprocity for the enhancement of local resources. The perspective adopted here is relatively neglected in the literature.

The paradigm of civil economy

We propose the paradigm of civil economy (Bruni and Zamagni, 2004) for the study of experiences of social innovation in agriculture carried out in Calabria region. They follow an Italian tradition of Civic Humanism that began in the 15th and 16th centuries and which continued until the golden period of Italian Enlightenment as represented by the Schools of Milan and Naples in the 18th century (Verri and Genovesi). Its main contribution to the history of economic thought was its conception of the market driven by the principles of reciprocity and civil virtues. In the vision of civil economy, the market, business and economy are in themselves places of friendship, reciprocity, gratuitousness and fraternity. Above all, Bruni recalls the thought of Genovesi in which the development of markets must be considered an expression of “reciprocal assistance”. In other words, sociality, in this diverse conception of the market, goes back to being fraternity.

At the base of the civil economy there is an anthropological foundation of human sociality. Man is not antisocial and chooses to relate to others only for interest but man is from the beginning, anthropologically related to others.

According to Antonio Genovesi, there is a deep relationship between economy and happiness: “It is the law of the universe that we cannot make our happiness without doing that of others”. The Milanese school highlights the role played by of individual’s creativeness. According to Verri the government has the task of encouraging public happiness by allowing citizens to be creative.

Virtuous development mechanisms are born thanks to civil society considered as a subject that, alongside the State and the market, determines the distribution of wealth within a territory by carrying out economic activity through reciprocity’s relations. Bruni delves into the concept of reciprocity: “reciprocity is not one, but there are many reciprocities and only if society can hold all these reciprocities together will society flourish” (Bruni, 2006).

The author identifies three forms of reciprocity: the cautious reciprocity, the one necessary for the stipulation of the contracts, the reciprocity-*philia* that typical of the relations of friendship and the unconditional reciprocity, which starts from an act of gratuitousness but which requires a response, in how much is not philanthropy, which can also come from a third party. Unconditional reciprocity can also be interpreted as rationality of us: “this action is my part of our action that has good consequences for us” (Bruni, 2010).

The key element of unconditional reciprocity is gratuitousness: free action is not conditional on the response of others. Unconditional reciprocity is based on expectation and trust: if A transfers to B, A can only boast an expectation on the counter-performance of B or C. However, there must be a response because unconditional reciprocity is not philanthropy; the response, in fact, can also come from a third party because reciprocity is transitive. “If A puts in place an act that is not self-interested in relation to B, he experiences reciprocity not only if B responds to him but also if C responds to him” (*ibidem*). In reciprocity, therefore, transfers are interconnected so that the consideration is made globally and not for each individual transfer.

The unconditional reciprocity relations create communities and are the basis of the concept of common good. The individuals who act through an initial act of gratuitousness are called “Courageous” (Bruni, 2014). According to the approach of the civil economy, the Courageous are the bearers of a charism: “when in history a charisma breaks out, large or small, a process of change begins [...], the bearer of a charism is not an altruist and neither a philanthropist but a community builder” (Bruni and Smerilli, 2010). Together with the Courageous, in society there are the “Cautious”, people willing to cooperate but who never cooperate first, and non-cooperators, people who never

cooperate (Bruni, 2014).

For Bruni, widespread relations of unconditional reciprocity are lacking in situations of poverty traps of social capital. According to our authors, in order to avoid the risk of “poverty traps” of social capital, our societies “need collective actors who make reciprocal relations their reason to exist” (Bruni and Zamagni 2004).

Bruni does not talk about the time needed to activate widespread unconditional reciprocity relationships. However, we seem to be able to hypothesize that changes do not necessarily have long times because virtuous development mechanisms can be triggered thanks to the presence of Courageous who, through an initial act of gratuitousness, activate relations of unconditional reciprocity with the Cautious. Furthermore, a person can be Cautious in a certain context or period of his life and Courageous in another, and vice versa. The Cautious have an important role in the communities because they protect the initiatives from failure.

To be able to activate relationships of unconditional reciprocity a mutual recognition of the values at the base of the exchange is necessary: we can exchange because we recognize ourselves in the values of solidarity and fraternity. Profit is not the goal of the exchange but only an indicator that tells us that the relations of unconditional reciprocity are sustainable from an economic point of view.

Methodological approach and data collection

Based on civil economics literature, we have identified the following seven features of social innovation initiatives that we want to detect:

1. They are born of an ideal motive: very important expression of these experiences is the principle of gratuitousness.
2. They meet the needs of real people; in this sense they start from the bottom.
3. They are strongly linked to the person of the founder; therefore they can be replicated only if they provoke vocations and not simple techniques.
4. They activate unconditional reciprocal relationships inside and outside.
5. They are environmentally, socially and economically sustainable.
6. Freedom of and freedom from: they enhance individual creativity, they start from the know-how of the people involved and therefore require a high initial need for human capital. They provide the possibility of self-realisation for the most vulnerable members of the community.
7. They improve well-being and increase social happiness rather than individual happiness.

We have developed a survey form. The survey has been divided into three sections. The first section contains information on the birth of the initiative. This section contains background information and on the personal history of the promoters of the initiatives. The second section collects information on the path that led to the realization of the initiative. This section allows to investigate two aspects: the values at the base of the initiatives and the creation of networks of reciprocity between the individuals involved. In this section we try to focus on the activation of reciprocal-*philia* and unconditional reciprocity networks. It allows you to answer the following questions: does the initiative meet the needs of real people or do only you implement projects? This section also describes the preliminary animation and training activities for the mutual recognition of values between the participants in the initiatives, the obstacles and resistance and the ways in which they have been overcome. Animation activities have been defined as those activities fielded to involve those individuals who, “until yesterday”, had never cooperated (the Cautious) but who are now willing to do so because there is mutual recognition in the values between the people involved in the initiative. They have the aim

of reproducing the feeling of being an inhabitant of a place and not a simple individual producer and/or consumer of something with which there is no connection, of strengthening confidence in the individual and collective ability to be able to respond to the needs of the future. The training serves to acquire skills and competences to be able to carry out their projects.

The third section collects information on the activities carried out. This section also contains information on the rules underlying the initiatives: the Statutes, the contracts (also with employees), the binding agreements that govern the relationships between the individuals. Furthermore, firm governance have been described (top-down or based on participation, collaborators are mere executors or participate in the life of the project). In this section, the focus is on detecting networks of cautious reciprocity.

The survey form was prepared thanks to three different questionnaires addressed to the promoter of the initiative (Courageous), to the workers/collaborators and to the inhabitants.

This paper illustrates the first reflections concerning the birth of two initiatives and the history of the Courageous, trying to focus on the context and the reciprocal relations activated to modify it.

Two experiences of social innovation in Calabria region: GOEL BIO and Family gardens

Background information

Calabria, a region in the south of Italy, is the least developed region in Italy in terms of per capita GDP (Svimez, 2016). In 2017, its rate of unemployment (21,6%) is still higher than in Italy (11,2%) and Europe (7,6%), especially for women (24,2%) and young people (55,6%). The importance of agricultural sector in the regional economy in terms of GVA (5,9%) is still higher than in Italy (2,2%) and Europe (1,6%) (Istat, 2017; Eurostat, 2017). Demographic trends are negative across the region especially in the most remote areas where essential services are lacking. The percentage of Calabrian emigrants with a degree is 29.4% according to 2014 data (Svimez, 2016). Another key element is the criminal organisation: its control of territory is pervasive.

A summary description of the experiences

GOEL is a cooperative group composed of 10 social enterprises, 30 profit companies, 1 foundation, 2 voluntary associations, 2 non-social cooperatives and about 200 workers/collaborators. The goal of GOEL is the change and redemption of Calabria through the fight against the mafia mentality, widespread participation, social inclusion, local development, the creation of solidarity networks between territories and between social groups social, environmental sustainability, market freedom. GOEL BIO is a social cooperative for the production and packaging of organic oranges; the cooperative is made up of farms who oppose 'ndrangheta, many of which have suffered repeated attacks. Oranges are sold not only to fair trade but also to Natura Si, Eataly and Coop Switzerland.

Family garden project was born in 2014 as a mobilization action against the construction of one of Europe's largest landfills in the municipality of San Floro, a small Calabrian village. The aim of the project is the protection of the territory through agriculture. A protest committee is formed against the construction of the landfill, composed of local environmental associations, citizens and municipal administrations. A young San Floro resident also takes part in the protests. After the victory of the protest committee with the block of the construction of the landfill, he decided to continue the mobilization for the protection of the San Floro territory. He uses 4 hectares of family to grow vegetable

gardens, according to organic farming techniques, to rent to families. The families rent a plot of land of about 100 square meters and the possibility of harvest fruit and vegetables directly from their own family garden at least once a week, usually at weekends, without any effort, because a group of farmers deals with cultivation. Thanks to the use of social networks, the initiative succeeded to involve 155 families in a short time. Later, in the 2015, the young inhabitant, became farmer, activates another initiative for the recovery of the local wheat supply chain through the project “Mulinum”. The project was shared on social networks and funded through crowdfunding. To date, Mulinum has about 220 members, a capital raised through crowdfunding of around 1,4 million euros and 200 hectares of organic local wheat turned into flour by the company mill and is also emerging outside the borders of the region.

Mission in life and “Restanza”: the history of Courageous

The two experiences emerge from a powerful ideal motive. The GOEL's goal is the change and redemption of Calabria through the fight against the mafia mentality, widespread participation, social inclusion, local development, the creation of solidarity networks between territories and between social groups social, environmental sustainability, market freedom. The Family garden's goal is to defend the territory from disfigurement and abandonment.

Goel's founder describes his history with these words:

“Goel was born formally 15 years ago but its history begins in the mid-nineties. A great dream comes true, the constitution of a community of life, “Liberation”, in which we share goods, home, money and we give hospitality. Calabria seemed the symbol of the border between the North and the South of the world, therefore it seemed the most suitable place for a redemption project that starts from the marginalized people, victims of mafia violence. At the same time, Monsignor Bregantini became bishop of Locri and asked me to help him with pastoral of the labour. We have created a business incubator thanks to which dozens of companies were born, many of which are individual companies but some are social cooperatives. Around the beginning of 2000s we organize a meeting with social cooperatives to reflect on the reasons for the underdevelopment of Calabria and what we can do to change it. We can change the Calabria, that is our belief, that still guides us. We have seen that when gratuitous reciprocal relationships are in place, much more is generated than can be hoped for”.

Family garden's founder describes his history with these words:

“The important thing about the Family vegetable garden is why it is born. A friend of mine, Massimiliano Capalbo, founder of Orme nel Parco, makes me reflect on the fact that if the inhabitants of a territory do nothing to defend it, that territory is destined to disappear. What are you doing, he asked me. And so I started wondering what I could do with my skills and competences.

I wanted to leave a mark, I wanted to change my territory so that the inhabitants could also become caretaker. This has been my mission in life since that day. Everyone knew me because I was good with computers and communication but unfortunately these sectors did not exist in San Floro. I look around and see that San Floro is suited for agriculture, not industrialized agriculture, but family farming. This is how the idea of the family garden was born”.

In both cases, the redemption is strongly linked to remaining in one's own territory. Using an expression of Vito Teti, they express the ethics of “restanza”: to remain consciously to change the destiny of one's own territory (Teti, 2014).

In both cases, the relationship of unconditional reciprocity with other courageous is decisive: they arouse the vocation of the founders, who try to replicate the initiatives in their territories in an original way.

The Courageous as communities builders

As we have seen in the section dedicated to the analysis of literature, according to the civil economy approach, “the bearer of a charism is not an altruist and neither a philanthropist but a communities builder” (Bruni and Smerilli, 2010). Communities are created by reactivating the economic ties of unconditional reciprocity. To be able to activate relationships of unconditional reciprocity a mutual recognition of the values at the base of the exchange is necessary: we can exchange because we recognize ourselves in the values of solidarity and fraternity.

“We want to prove to the inhabitants of Calabria the power and strength of being a community. Death systems are fought through the community and not through individual heroes or individual organizations. An example of the strength of the community was the party „Starting again“, organized to respond to an attack on an agricultural enterprise, against the social depression of the attack. We were able to raise funds to rebuild everything thanks to the community” (Goel’s founder).

The community is created by leading those who are excluded into economic civic relations. “Thanks to Goel Bio we involved the resistant, those who were severely affected by the ‘ndrangheta. We have taken an agricultural chain of great exploitation, that of oranges, which come to be paid at 5 cents per kg to farmers, a price that does not allow to pay labor at market prices. Today our farmers receive 40 cents per kg. The message was: saying no to the ‘ndrangheta is a choice that pays. This is effective ethics” (Goel’s founder).

Ethics is effective if it succeeds in removing the disadvantaged conditions of vulnerable individuals through market civic relations. In this experience the attainment of cautious reciprocity expressed by the contract has meant freedom from the ‘ndrangheta and freedom from exploitation; the contract becomes the instrument to build civil ties and economic and social development.

Family gardens’s founder stresses that “a community has been created around the project. I think we can define a community in the following way: people who have the same values and act to affirm them. On this project I managed to involve many people because I told them that the project was meant to protect and defend their territory. In fact, in the press I sent out this message “The boy who cultivates the garden and defends the territory”.

Ultimately, through agricultural activity these experiences:

- Rebuild a sense of community
- Mobilize local resources
- Manage small farms in an innovative way
- Create spaces of freedom (provide the possibility of self-realisation for the most vulnerable members of the community you, the consumers can decide what and how to produce)
- Design local development from the bottom
- Create social quality markets: economic activity can become an exercise in unconditional reciprocity

Final remarks

From the analysis of these two experiences it emerges that in contexts of poverty of social capital, the path of social innovation in agriculture requires the presence of chari-

smatic people who activate relationships of unconditional reciprocity, of individuals willing to cooperate and of time. These experiences also show that changes do not necessarily long run. However, the presence of a charisma does not exclude failure because if the charismatic meets individuals who do not want to cooperate, who interpret themselves in the world according to the prisoner's dilemma, the process of change does not trigger: the spread of networks of unconditional reciprocity is therefore a cultural matter. Therefore, the policies role is fundamental. Civil agriculture is carried out by farms that manage to involve different people in relationships of reciprocity (unconditional, cautious, friendly): workers, volunteers, public institutions, consumers, inhabitants. We can define them as "community enterprises" (Bruni and Zamagni, 2004). The policies do not take into account this specificity: they draw for them coherent instruments to an "economicist vision of development in which production and markets are exclusively production and exchange of goods and not also of relations between people" (Fonte, 2010).

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Innovation in Swedish horticulture

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Keywords

Agricultural innovation systems, sectoral innovation systems, horticulture

Abstract

It has been argued that the current agricultural innovation system is ill-equipped to meet urgent sustainability and competitiveness challenges. This has led to recent calls for new approaches that enhance responsive multi-actor co-innovation. The aim of this paper is to conceptually model, analyze and describe the Swedish horticultural innovation system in order to identify opportunities for enhancing innovation and improving policy. Using the systems of innovation theory, literature views and semi-structured interviews with key Swedish innovation stakeholders, the study found the following:

1) Sectoral innovation systems theory is a suitable fit to understand and model the Swedish horticultural innovation system. However, the framework needs to be further adapted to better underpin comprehensive analysis, including market aspects, with regard to balance between structure and process.

2) There is a need to enhance collaboration and co-innovation between farmers, advisors, scientists and actors in the value chain, and to regard the sector in a broader context, as new technologies enter. Intermediaries such as advisors and intermediary platforms play a crucial role. The theoretical implications concern a conceptualization of Swedish horticulture as an innovation system, and the political/practical implications include collaboration and co-innovation between academia, advisors, farmers and business actors in the value chain. The originality/value consists of a contribution to the dialogue on innovation system studies in agricultural and horticultural contexts.

How to assess agricultural innovation systems for supporting policy decision makers: a Delphi consensus study

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Keywords

Agricultural innovation system, action-oriented assessment, methodology design, Delphi technique

Abstract

In many countries, policy-makers lack relevant information to guide the design of innovation strategies and policies that will help developing innovation capacities and triggering agricultural innovation processes. The literature emphasizes the need to adapt innovation policies to the national context by taking into account not only the characteristics and history of the country but also the characteristics of the agricultural innovation system (AIS). Due to the nature of innovation processes, which are usually complex, non-linear, uncertain and context-specific, there is no simple blueprint to support their emergence and upscaling. Hence a participatory action-oriented assessment of the AIS is seen as a way to provide policy makers with timely and usable knowledge and information to take informed decisions to unlock the potential of agricultural innovation for sustainable food and agriculture in their country. However, existing assessment methodologies consist mainly in taking stock of a current situation based on an external evaluation made by experts and are not embedded into policy dialogue, planning and decision processes.

Purpose

In order to overcome those challenges and design a tailored methodology, we used experts' opinions through Delphi technique. The objective was to gather data from experts in agricultural innovation within their domain of expertise (scientists, development workers, policy makers, farmers' representatives, entrepreneurs) so that to achieve a convergence of opinion on the way to conduct an action-oriented AIS assessment for supporting policy makers. This paper presents the Delphi technique and the consensus obtained regarding the rationale of the assessment, the indicators and information to be used and the process itself of the assessment.

Method The first round of the Delphi process consisted in sending questionnaires to 368 experts. Eighty-six questionnaires were usable for the analysis. Converging and diverging answers have been analysed and helped to shape the methodological challenges for the assessment design. The second round consisted in gathering a sample of about thirty experts during a workshop in order to reach agreement on the main drivers

of agricultural innovation and possible leverage for action, on a set of national high-level indicators for AIS performance assessment, and on the outlines of the methodology for an action-oriented AIS assessment including indicators, methods and tools.

Results

After the first round, four main areas of divergence among experts aroused: 1) the status of the AIS framework, either a lens or an operational objective per se; 2) the purpose of AIS transformation and support to policy-makers: either problem solving for the emergence of new paths of agricultural development or adoption of solutions for facing pre-identified challenges of sustainable development; 3) the way to support AIS transformation: either supervised or facilitated; 4) the role for AIS stakeholders into the diagnosis: either consulting, or collaborative or transformative approaches. In order to reach an agreement, three assessment models have been designed and proposed at the experts' workshop. They were distinguished against different baseline situations regarding the expectations of policy-makers and the nature of expected changes, i.e. incremental changes, reform or transformation of the current innovation support mechanisms. As a result of the second round, several principles have been agreed among experts for conducting the assessment. Experts emphasised the need for a process-based approach that favours inclusion of AIS stakeholders to build ownership through the implementation of capacity development activities. Such activities should enable stakeholders to contribute to the assessment as well as to the design of innovation policies and the implementation of strategic actions. The experts also advocated for a balance between internal (country-led and -owned) and external (technically supported by partners) assessment.

Perspectives

Lastly, the paper discusses the relevance of the Delphi technique for assessment design and raises research perspectives

Policy support for farm women's entrepreneurship and innovation comparing experiences and outcomes in Bavaria and Ireland

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Keywords

Entrepreneurship, business start-ups, agricultural innovation, gender equality, rural development policy

Abstract

In the European Union there are a number of economically disadvantaged rural areas experiencing outmigration of young people in the search of better education and employment opportunities. In some regions women are leaving in greater numbers than men (European Commission 2012). Bock (2015) considers the EU recognition that retaining women in rural areas is crucial to the long term viability of rural areas and how this is expected to be supported through the mainstreaming of gender in rural development policies.

Past research has demonstrated the important role of women in enterprise creation and their contribution to the economic and social viability of rural areas (Labrianidis et al, 2017, Markantoni and van Hoven, 2012; Anthopoulou, 2010; Warren-Smith and Jackson, 2004). Falling farm incomes have led to many farm families seeking to develop opportunities in the feminised domains of food and hospitality while rural womens' entrepreneurship has been depicted as both playing to and playing against conservative rural gender stereotypes (Ahl et al, 2017). Markantoni & van Hoven (2012) consider how the 'side' activities of rural women can act as social and emotional glue to motivate people to remain in declining areas and how they contribute to a better quality of life and sense of well-being. Steiner and Atterton (2015) consider how rural enterprises contribute to local resilience in both direct and indirect ways and how rural business owners act as agents of change in supporting local resilience and in creating solutions to economic, social and environmental challenges. Little (2016) has examined how entrepreneurial activity is socially constructed and how it relates to gender identity.

A number of researchers have analyzed the potential impact of policies on gender equality in agriculture and rural development. Shortall and Bock (2015) recognise that overall the EU has impacted very favourably in promoting gender equality across the member states whereas at the level of agriculture and rural development policy there are many shortcomings. Shortall (2015) takes a pan-European perspective to examine how the EU's stated commitment to gender equality works in practice and concludes

that it is empty rhetoric when it comes to the Common Agricultural Policy as the focus clearly remains on the mainstream business goal of an economically viable agricultural industry. Similarly Bock (2015) considers how EU rural development policies have failed to mainstream gender and that policy makers tick the obligatory gender box and maybe consider including some separate projects for women without any serious envisioning of rural development processes that challenge gender inequalities. She argues that a repoliticisation of gender in rural development is needed. Prügl (2010) suggests that, in Germany, elements of gender-mainstreaming policies in rural development either deny that gender is a problem, or reinforce gender divisions through the way programmes are implemented. Similarly in Austria, Oedl-Wieser(2015) argues that rural development policies are preserving and perpetuating traditional gender roles and patriarchal structures in rural society.

Ballesteros and Hernández (2017) consider the importance of evaluating the impact of EU rural development policies and programmes at a number of levels including how they impact on local people individually and communally. This paper presents recent research from the west of Ireland and Bavaria which examined whether and how EU and National rural development policies support female agricultural entrepreneurs. It considers which support tools have been fruitful in the past, how existing tools can be improved as well as identifying gaps in the current support system. The research was conducted with support of a Marie Curie Fellowship project FEMAGREE (Female Agricultural Entrepreneurs).

Literature Review

The notion that female entrepreneurs are a catalyst for economic development in the countryside has been explored by Ni Fhlatharta and Farrell (2017), who also look at how the social status of being an innovator or entrepreneur can impact on gender relations within the traditionally patriarchal rural society. They argue that rural women have historically remained as an invisible workforce within rural regions with their role and contribution largely unacknowledged and that the business sector is ingrained with hegemonic masculine ideologies. Anthopoulou (2010) also highlights that the conventional facets of business development include traits that are habitually associated with males: dominant, adventurous and creative. Such connotations of enterprise creation impede the participation of women. Ni Fhlatharta and Farrell (2017) consider that the pathways open to rural women's' enterprise are restricted by their limited resources and geographical barriers, often no business qualifications and little financial backing. Consequently, these women tend to favour smaller businesses that build upon indigenous traditions and resources, often developing enterprises within what is regarded as gendered sectors such as tourism, accommodation and craft.

In their extensive review of literature on rural enterprise, Pato and Teixeira (2016) found that eight distinct but inter-related topics were given attention including entrepreneurs' demographic and psychological traits; organisational characteristics; embeddedness; rurality; growth and development; policy measures and institutional frameworks and governance. Gender and age were found to be key demographic considerations and they cite Frear's (2007) finding that most female entrepreneurs are married with children, tend to start new businesses around the age of 40 and have some college education. Pato and Teixeira (2016) also examined literature on the importance of social capital and 'embeddedness' in terms of generating the trust necessary for economic activity to succeed as well as considering how the rural milieu can afford both opportunities as well as constraints to the rural entrepreneur. They review studies on a diverse range of policies, programmes and measures concerning rural entrepreneurship and highlight the complex challenge of leveraging the growth and development of rural en-

trepreneurship and the need for a more strategic and coordinated approach based on a clear view of the mission that enterprises can have in future rural development (Smalbone and Welter, 2006).

In the Irish context, McFadden and Gorman (2016) examined the nature and operation of linkages between farm diversification and innovation and local and regional development support institutions. They stressed how innovation and enterprise are always context-dependent and that some localities have qualities which apparently make positive business outcomes more likely, including infrastructural, technological, policy and institutional environments supportive of enterprise. They found that development agencies had been successfully involved in promoting and supporting a wide range of non-traditional farm businesses among Irish farm households and that those households who benefited most from this support were generally excellent networkers with a high level of self-belief and who often had a high level of education and previous off-farm work experience. The effectiveness of policy supports was found to depend to a varying extent on the commitment, expertise and good will of individual agents. Their study found a knowledge gap at policy level about the type of supports needed by rural entrepreneurs.

When it comes to policy support for rural women's entrepreneurship, Bock (2015) highlights the failure in most EU countries to address gender issues often because of lack of female representation on local action groups. However she notes that there are projects specifically designed for women. They aimed to support women's employment, often by encouraging self-employment and entrepreneurship. There were training programmes for start-ups and several projects supported business women's networks. Petterssen (2012) postulates that entrepreneurship is gendered both conceptually and practically. She examines policy supports for women's entrepreneurship across the Nordic countries and considers how they range from a feminist empowerment paradigm in Norway to a neo-liberal economic paradigm in Denmark. Her analysis contends that state support programmes, in the name of supporting women entrepreneurs, tend to put women in a subordinate position to men and thereby risk sustaining a male norm. Petterssen (2012) cites various studies into support for women's entrepreneurship that highlight the most important measures to be access to business support, microcredit financing, mentoring and networking activities.

Methodology

The institutional environment for start-ups rooted in agriculture is predominantly shaped through EU policies regarding agriculture, rural development and gender equality. The member states however are responsible for the actual implementation and design. In Germany, due to structure of the federal state, the 16 Bundesländer, one of which is Bavaria in the Southeast, are responsible for design and implementation of the policy supports.

Conducting a study in two different regions in Europe allows for researching whether different designs and implementation approaches of EU policies affect women starting businesses based in agriculture. Hence, the FEMAGREE study was conducted in two case study areas, in the West of Ireland and Eastern Bavaria. Both have similar agricultural structures (Table 1) and have experienced the outmigration of young people, particularly women, from rural areas.

Bavaria and Ireland have some notable similarities and differences with regard to the structure of the advisory service for diversification. Both regions offer diversification advice to farms, but the offer is broader in Bavaria. In Ireland Teagasc offers an information seminar on various options for diversification. In Bavaria each regional office has a specific unit for diversification support. These units provide both individual

Table 1: Characteristics of the case study areas

| | <i>Ireland</i> | <i>Bavaria</i> |
|----------------------------------|----------------|----------------|
| Number of farms | 140.000 | 106.700 |
| Average farm size | 45 ha | 35 ha |
| Average farm income | 31.400 Euro | 28.800 Euro |
| Proportion of family farms | 99% | circa 94% |
| Proportion of female farm owners | 12% | 9% |

Source: Bavaria Agricultural Statistic 2018, National Farm Survey 2018, Census of Agriculture 2010

consulting to farmers as well as a wide range of educational offers. Educational offers include information days, seminars up to whole courses on basic diversification options as well as specific training programs for gastronomy, tourism, food processing, educational offers, social farming, recreational sports (horses) and household services. In Ireland there are other sources of support and advice such as Local Enterprise Offices but these are more general and not limited to farm based enterprises.

So far, little empirical data has been collected on the influence of agricultural and rural development policies on female entrepreneurs in farming. Hence the study had to explore the issue in all its facets, giving participants the opportunity to reflect on their experiences throughout the whole start-up phase and give an account of the barriers and support resources having an influence on the process. For this purpose a qualitative approach was chosen, using the technique of narrative enquiry. In total 30 such enquiries or interviews were conducted with women, 29 of whom had started a business, and one had planned to do so but decided to not go ahead with it. The participants were chosen in order to cover a wide range of different enterprises in both case study areas (Table 2).

The interviews lasted between 30 minutes and 2 hours, were recorded, transcribed and analyzed with a specific software package. As a starting point for the analysis a basic structure was used comprising the following topics:

- Reasons for starting the business
- Barriers

Table 2: Enterprise types represented in the FEMAGREE study

| <i>Enterprise type*</i> | <i>Bavaria</i> | <i>Ireland</i> |
|-------------------------|----------------|----------------|
| Renewable Energy | 2 | 0 |
| Educational offers | 6 | 3 |
| Tourism | 5 | 3 |
| Direct marketing | 6 | 7 |
| Food processing | 4 | 5 |
| Social farming | 1 | 2 |
| Gastronomy | 8 | 2 |
| Recreational sports | 1 | 0 |

*multiple options possible

- Resources
- Results of business start-up

When analyzing the interviews sub-topics were created and subsequently added to the broad topics.

After analyzing the interviews a workshop was conducted with eleven female entrepreneurs in Eastern Bavaria, where the results were presented, discussed and recommendations developed as to how female entrepreneurs in farming can be better supported in the future. The results from the interviews and the workshop are presented in the following section.

Findings

The first section examines the motivations and triggers for the interviewees to get involved in setting up a new business. The second section deals with the barriers and difficulties the women have faced while the third section deals with their engagement with policy supports.

Who is starting a business and why?

The 30 interview participants came from different agricultural backgrounds and most of them had married a farmer. About half, in particular the younger participants, had no agricultural connection prior to their marrying a farmer.

The motivations for starting a business were as varied as the biographies of the women, nevertheless there were repeating patterns. There typically was a combination of push and pull factors: women were looking for a possibility to earn their own income while at the same time being able to look after the family and the farm household. Thus, many women had started the business after the birth of their first child. All but one of the participants stated that childcare facilities were available locally but they nevertheless had a preference to mind their children at home. In addition market opportunities were opening up, such as a demand for a particular service or product. Among the participants there were also women who were looking for a source of income or a fulfilling occupation, but did not know what kind of enterprise to start. They were actively searching for a business idea. In some cases in Bavaria the regional advisory services were able to provide and develop these ideas with the participants. These ideas were often influenced by current funding opportunities for example in the area of renewable energy or educational programmes for children.

Another source for business ideas were social networks. In other instances women reported to have 'stumbled' into their business or to have started it by 'accident'. These can be categorized as situations where women weren't actively looking for a business idea but came across it through an external influence. In Bavaria educational classes or information days run by the advisory services sparked some such ideas. The 'accidental' start-ups sometimes were also rooted in a particular interest or hobby of the participant.

Barriers and difficulties for female entrepreneurs

Almost every participant mentioned the average weekly working hours of well above 40 hours as the main burden. Additionally to the business work many women were responsible for household and care work for children and elderly or sick dependents. This confirms findings by Weinberger-Miller (2014) according to which farm women in Bavaria had an average weekly work time of 75 hours. Participants in both study regions had little time for holidays, regeneration or socializing. In the long-run the physical or mental health of some participants was affected. A few participants had started their businesses a few years ago and had managed to grow it to a level where it was possible to hire employees. In these cases the workload had decreased to an acceptable level.

The high workload negatively affected business management and development as little time was left to address issues outside the day-to-day running of the business, household and family (if present). This included dealing with bureaucracy, applying for funding, finding and managing personnel, visiting training courses, networking, strategic business and pension planning. Regarding bureaucracy the interviews confirmed results of a World Bank (2007) study: the more time consuming it is to address bureaucratic requirements, the more difficult it becomes for women to start a business, as they still take over most of the unpaid family and household work and their spare time is restricted (EUROSTAT).

Bureaucratic barriers emerged also when two or more offices were involved and passed back and forth customers with their requests. Furthermore women in Bavaria reported to have the impression that small businesses are controlled more rigorously and often than big ones. Barriers also exist when it comes to funding applications. Collecting information about funding options, finding the right fund and applying are all very time consuming. Some women also pointed to never qualifying for any fund because in one year their business was still too small and in the next it was too big and there was only one application and funding deadline per year. As a result these women invested their savings or got a bank loan.

The study examined whether the started enterprises have the potential to improve women's economic independence. When asked directly about their income most participants stated that it is rather low but enough to make a living. Any additional profit is reinvested either into the business or the related farm. To date most of the women said their income was not high enough to set aside money for pension payments. Most participants were satisfied with their income or optimistic, that it would increase in the near future. Where the farm was owned or co-owned by their husband, women had access to bank accounts and were involved in strategic decisions and felt that they had economic independence. However, in case of a divorce the situation would change dramatically, as diversification businesses are typically closely intertwined with the farm. This particularly applies in Bavaria where many participants were running the business, but hired by their husbands on a minimum wage to cover basic social insurance payments. Some participants reported that had been desperately trying for years to earn a satisfying income with their diversification business and were continuing to do so out of a sense of family responsibility.

Policy Support Schemes available

In Bavaria the study participants appreciated the quality of the diversification courses offered by the regional agricultural advisory services. They stated that they were of a high standard and relevant for starting a business. Furthermore they offered opportunities for networking with other course participants who were typically female, too. In situations where quick decision-making was needed women were missing easy-access overview information on regulations or funding requirements. Also the advisory service would not necessarily be aware of general business support outside agricultural schemes. Furthermore one-day overview seminars on business topics such as strategic planning, marketing, HR were not on the agenda of the advisory services' courses, which would touch on these topics but only briefly and mainly focus on technical aspects of the business. In terms of funding there are a number of diversification schemes available in Bavaria, however, only a farm owner qualifies for these. As a result very few women apply for diversification support. To be able to draw the funding the diversification business - at least on paper - was owned by the participant's husband who owned the farm.

In Ireland Teagasc runs the Options program, which includes seminar days with basic

information about various options to diversify the farm business. The course program is not as broad as in Bavaria and regional offices do not offer individual diversification advice. None of the Irish study participants had participated in an Options seminar. Another program available in Ireland is ACORNS, a six month programme available for female rural start-up entrepreneurs, that focuses on strategic planning as well as business knowledge transfer and networking. Some of the study participants had taken part in ACORNS and reported very positive experiences. The ACORNS programme involves interactive round table seminars led by a successful female entrepreneur and approximately 50 women are accepted onto the programme each year. In terms of funding there is no specific diversification support for farms, but diversifying farm enterprises can apply for LEADER funding. It has the advantage of not being tied to owning a farm, which many women don't. Also study participants availed of general business funding from local enterprises offices, but reported that some offices were more open to fund agricultural enterprises than others.

Discussion

Female entrepreneurs in agricultural diversification businesses face similar difficulties and challenges when compared to female entrepreneurs in general, such as the double or triple burden of managing household and care duties as well as the business tasks. Due to a lack of time women struggle to develop the businesses to a size where they can employ additional staff. Any mechanism aiming to support female entrepreneurs needs to respect the time restrictions women have and ideally help them to stand back from the day to day busyness and engage in longer term strategic planning. This study provides useful insights into the question of whether female entrepreneurship is challenging or playing into traditional rural and farm gender stereotypes. For the most part it shows women on farms having to create their own employment and do so in a way that fits in with their continued responsibility for the reproductive roles in the domestic sphere. In most cases the women were the spouses of male farmers/farm owners and their businesses were intertwined with the farm. There is little evidence of these diversified enterprises challenging the patriarchal structures of agriculture.

Because of the qualitative and exploratory nature of the study results cannot be generalized. Nevertheless we can assume based on the repeating pattern of the interview results that the income made from the diversification business is typically modest. During the start-up phase the income is low to non-existent, which is not unusual. When the businesses have achieved a certain maturity the income is acceptable. Once the business makes a profit the question remains as to how much of it actually is at the disposal of the women now and can be used for building up their savings. The diversification businesses started and run by women are closely intertwined with the farm in terms of location, legal status and economics. Frequently the profits are reinvested into the business, and it is not uncommon that they go back into the farm. With the latter owned by the husband only – which in this study was the case in a few instances in Bavaria, though not in Ireland – women are at particular risk in case of a divorce. Without pension planning or marriage contracts, the economic independence of these women entrepreneurs is questionable after a divorce and/or in old age. It would be important to follow up on this research with a quantitative study about how much profit the diversification businesses actually make and how much of it is available to the women now and in old age. More information is needed also on the divorce rate in agriculture as well as about the legal ownership status of the diversification businesses to better understand the number of women at risk. This study points to a lack of awareness and preparation by farming couples about the necessity of pension planning; any education and training in the area of diversification should contribute to this.

The findings of this study show a mixed experience with agencies and schemes that support farm diversification and rural development. There are lessons that can be learned from and between the two regions studied. As Smallbone and Welter (2006) argued there is a need for a more strategic and coordinated approach to policy supports based on a clearer view of the mission of diversified farm enterprises in future rural economic and social development. Within EU rural development policy, the commitment to gender equality in rural economic development is not mainstream but rather given piecemeal attention with some very good initiatives such as the ACORNS programme in Ireland. However whether the acorns become a forest of oaks or just an increased burden of work for women may require the repoliticisation of gender in rural development policy as advocated by Bock (2015).

In terms of providing the kind of practical support that women entrepreneurs need and want, the study shows that there is an uptake of the offering of the farm advisory services and in fact they are often the first point of contact. In terms of diversification support it might be useful to set up regional diversification advice structures in Ireland as there is in Bavaria, Also they are more likely to be more open to start-up ideas based on an agricultural idea or resource than a general business advisor. In Bavaria female agricultural entrepreneurs would benefit from more easy access information on regulation and business knowledge transfer.

Conclusion

The background of this study was the EU-member state's objective of achieving gender equality. In particular the study focused on the question of economic independence of women and men.

The employment of women in agriculture is much lower when compared to that of women in rural areas in general. Additionally women are more likely to leave rural areas, probably in the search of better employment opportunities. Starting businesses rooted in agriculture is one option for women to create an income for themselves, but also to provide jobs for others and thus improve the economic independence of women in agriculture. To increase the number of female start-ups in agriculture the study explored the barriers women experienced when starting and running a business as well as the support mechanisms used. For this purpose interviews were conducted with female entrepreneurs in agriculture in Eastern Bavaria and the West of Ireland.

In most cases economic viability is a challenge and there is evidence of a lot of work for relatively little return. Where businesses are successful, women's capacity to negotiate and network was found to be critical. The policy support system for women's agri-entrepreneurship in Bavaria was found to have been longer established and to be more comprehensive while it is more diffuse in Ireland but in both locations the level of engagement with policy supports varied, and again was highly influenced by women's capacity to network and negotiate and by the individuals working in the support agencies in particular locations.

The women in both countries also reported very varied experiences with banks and financial support agencies - again the influence of individual postholders was critical in terms of whether you got a positive or negative response, with some gender bias noted. As the agricultural diversification businesses are often based on farm resources the two of them are closely intertwined. Because of this close legal and geographic connectedness there is a risk of the women losing the business in case of a divorce. This is in particular the case where funding support is only available for farm owners and female ownership rate is low, as for example in Bavaria. In both locations a critical issue facing women entrepreneurs was social insurance, in particular pension provision.

In their strategy on achieving gender equality the EU-member states have agreed on

applying the instrument of gender mainstreaming. This includes assessing policies' impact on each gender separately. In Ireland and in Germany at national level gender mainstreaming concepts have been drafted and implemented to a various degree. At the federal level in Germany, gender mainstreaming concepts have been implemented in most states or Bundesländer. In Bavaria the responsibility for implementing the EU's gender mainstreaming strategy lies with the individual Departments. In the Bavarian Department of Agriculture a gender mainstreaming strategy is currently not available or envisaged. Introducing such a strategy would enable gendered ex-ante evaluations of planned policies, regulations and support tools and analyze whether they would have different impacts on the economic independence of women and men.

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Boosting different types of knowledge flows in EU AKIS's: an overview of R&I infrastructures

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Keywords

Entrepreneurship, business start-ups, agricultural innovation, gender equality, rural development policy

Background and objectives

An increased effort towards better integrating and coordinating research activities at national and EU level and setting-up of an EU wide Agricultural Knowledge and Innovation System (AKIS) is crucial to reach the objectives of speeding up innovation processes and boost the Innovation Union. This is challenging since the national and regional AKIS are still highly heterogeneous, fragmented and still insufficiently connected at EU level.

Strengthening the linkages between those AKIS and their components (soft & hard infrastructures) is necessary to enhance knowledge exchange and cross-fertilization, in view of generating, using and diffusing innovation.

In this context, the identification of Research and Innovation (R&I) infrastructures becomes strategic to be able to analyse how effectively the various AKIS are coordinated, integrated and to which extent they benefit the actors involved.

The aim of this study is to provide a map of R&I (soft & hard) infrastructures in Europe which support the flows of knowledge between multiple actors, to upgrade their competence and contribute to the generation and the implementation of interactive innovation in the broad agricultural field.

Design and data collection

The methodology combines primary and secondary sources in order to present a coherent picture of the inventory. A specific focus on case studies allows an in-depth understanding of different R&I infrastructures. Primary data sources rely on data collected via interviews with the relevant experts in the EU countries/regions, selected for the case studies, as well as on a questionnaire survey to be addressed to the EU AKIS stakeholders, and other networks. The questionnaire is specifically addressed to collect information concerning soft/hard infrastructures that significantly contribute to the successful performance of the relevant organisations. The respondent sampling is based on the CORDIS and EIP-AGRI databases. Secondary data sources relied on literature and data from studies and projects that have so far focused on describing the

EUAKI Sand R&I infrastructures. The secondary sources enabled identification of R&I hotspots, i.e. the conditions for both good and weaker performance of the systems. A comparative approach will be also used, in order to detect similar and diverging patterns between countries.

Results and Implications

The study shows a comprehensive picture (inventory and typology) and more thorough information about existing hard and soft infrastructures in the EUAKIS. Triangulated data and information from the primary and secondary sources allow to highlight a number of good practices and develop targeted advice for developing a more effective use and foster synergies between EU funds in regard to infrastructures.

The study provides a significant contribution to the improvement of the integrated approach within the European Agricultural Knowledge and Innovation Systems and the Implementation of the European Innovation Partnership (EIP). As well, it provides recommendations to enhance their impact on the dynamics of agriculture innovation.

4 Education and Extension: roles, functions and tools for boosting interactive approaches to innovation

Assessing Community Needs for Extension Programming

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Keywords

Assessing community needs, integrative approach assessing needs, asset-based approach to needs assessment, market analysis

Assessing Community Needs for Extension Programming Context description & Problem domain

The traditional approach to needs assessment, which Extension currently uses, has been criticized since the 1980s because of the following limitations: 1) the assets available for a specific community are not always known nor identified; 2) the needs assessment focuses on the negative aspects of the community; 3) the communities being assessed are always perceived as vulnerable and recipients of benefits; 4) communities perceive themselves as recipients of benefits and do not utilize the available assets to build their communities; instead, communities wait for external support to address identified needs (Altschuld, 2015). To overcome the weaknesses of a traditional or single-approach it is essential to use an integrative methodology in assessing community assets and needs. The researchers propose an integrative approach to needs assessment that will help to avoid discussed limitations.

Conceptual Framework

Mixed methodologies in research and evaluation have been widely accepted for the last decade in the social and behavioral sciences (Creswell, 2014). We are recommending the use of a modified, adapted from Creswell (2014), sequential exploratory methodology. Creswell's method includes exploring phenomena quantitatively first and then uses single or mixed method of data collection and analysis as a second phase. The second phase may include asset-based to needs assessment approach which builds on the positives of the communities and encourages communities to utilize their assets and not extensively rely on external aid (Altschuld, 2015).

Purpose and Objectives

The purpose of this pilot study is to test an integrative approach to needs assessment that allows the evaluator to assess local community resources/assets and citizen's needs. A research objective is to identify future demand for Extension programming using an integrative approach of needs assessment (research-based marketing and asset-based needs assessment approach).

Methodology

We offer a two-phased approach; Phase I is a market analysis approach, while Phase II is an asset-based approach to needs assessment. The market analysis approach focuses on a unique service market segment (i.e., non-formal education) through the comprehensive examination of local community resources, assets, and trends. Phase II utilized qualitative research strategy – discussion group.

Data Collection

For Phase 1, the market report for selected county (Phase I) was conducted in 2017. The following data were analyzed: demographics; health; agriculture; business and industries; local county Extension resources; recent Extension programming efforts; non-formal (community) educational opportunities outside of Extension; and world, national, and local trends. For the Phase 2, discussion group with county Extension advisory committee was utilized.

Data analysis and Conclusion

We identified the following possible future Extension programming for selected county: workforce development programs, assistance with federal, state, and local benefits, assistance with single-parenting issues, chronic disease management, challenges in the changing family structure, and urban farming. The discussion group with county Extension advisory committee was conducted. A summary report was generated from the qualitative data. There were major themes identified for the community's assets and needs. Defined community assets included: cultural attraction, active millennials/citizens, unique demographic, education, community resources, food access, and community programs addressing poverty. Defined needs comprised of the following: education, housing, employment, safety, and social norms.

Implications

Our research has practical implications for Extension professionals. Comprehensive community needs assessment helps to identify community assets and needs and do not rely on external assistance while developing and delivering Extension programs. Moreover, using this approach helps to develop specific Extension program for county or region while addressing local needs.

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Towards an evaluation plan: an on-the-job training experience in Piedmont Region

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Keywords

Evaluation, on-the-job training, participation, innovation

Abstract

The aim of the paper is to present the path of the evaluation of an on-the-job training project (Fruttijob) that aim to increase the competences of the fruit-growers to use innovative, economic and ecological techniques. The first step to determine the cognitive challenge and identify the best evaluation approach is to define to which questions you want to answer to take decisions: evaluate to choose (among alternatives), to manage (organize) or to account.

From this point of view, we have proposed to the actors of the Fruttijob training project an evaluation path oriented to the concrete use of the results to improve the intervention. The drafting of an evaluation plan, in the form of an inception report, has been the main tool to include users in the different phases of the design process and the start of the evaluation. In agreement with the intended users, in this case the provider of the training, we have defined the approach, methodologies, indicators and especially the evaluation questions.

The proposed approach follows two paths: process and effect analysis. This paper focuses on the process analysis that is centred to implementation modalities adopted to identify obstacles or bottlenecks and to verify the implementation mechanism.

The main goal is that the results coming from the evaluation must be usable, useful and used.

Introduction

The process that leads to an assessment is very complex and rarely interventions not co-financed by Community funds or not subject to specific obligations are assessed. In this sense, the Fruttijob project proves to be ambitious in its construction and implementation.

The evaluation can be defined as an activity aimed at offering to decision-makers elements of judgement on the success of policies (Martini, 2004) and with the goal of improving them (Martini and Sisti, 2009). It is evident that the manner to develop this judgement depends on what you want to evaluate and how you intend to use the results of the assessment. Here, we consider evaluation in a perspective of the result uses, especially in terms of implementation, but also with a focus on the effects (Stame, 2007). Our approach is to provide a proactive evaluation (Stake 2007, Patton 2010, Cagliero et al., 2013), in the field of the so-called Utilization-Focused Evaluation (UFE, Patton 2012)

and strongly oriented to the use of the actors involved (“intended user”, Patton 1997). To face this challenge, we have decided to involve the users of the evaluation from the first steps, through meetings and the drafting of an inception report, as an evaluation plan *stricto sensu*. In this report we have shared the most important evaluation topics: approaches, paths, methodologies, indicators, objectives and, especially, the evaluation questions. These questions, indeed, have considered both the peculiarities of the project Fruttijob¹ and the expectations of knowledge and action of the intended users. In this paper we present how the evaluation plan, also called inception report, is used in determining and starting an evaluation process towards a concrete use by the intended users.

The context and the Fruttijob project

Over eighty per cent of the fruit produced in Piedmont originates from the Province of Cuneo where many species are cultivated: pome fruit, shell fruits, kiwi fruit, strawberry, blueberry, raspberry, nuts. Most of the cultivars are characterized by a tardive ripening season and fruits are sold on the fresh markets, above all on foreign markets. In 2015-2017 the output at basic prices of main fruits harvested in the Province of Cuneo is about 225 million euros; the ratio of fresh fruits exports is 91,5% in volume and 93,5% in value as compared with Piedmont total volume of export sales in the period 2011-2016.

Lately orchards have been seriously damaged by negative weather trend (drought, late frost), plant disease and insects as kiwifruit disease Psa, early vine decline in kiwifruit, Sharka (PPV) on peach, fire blight (*Erwinia amilowora*) on pome fruit, brown marmorated stink bug (*Halyomorpha halys*), etc. Economic results of fruit-growing farms are often compromised by low prices on domestic market and by difficulties in reaching new overseas markets and, moreover, by complications in hiring wage workers especially for harvesting fruits.

A recent study commissioned to CREA by the Fondazione Cassa di Risparmio di Cuneo (Fondazione CRC, 2018) on innovation in agribusiness in the Province of Cuneo remarks that fruit cultivators require more support in the production and management. We can consider this study as a need’s assessment, in an *ex ante* perspective, of an intervention.

The on-the-job training project (Fruttijob) is the intervention to meet this need.

The objective of the training is to increase the competences of the fruit producers. The focus is on the dissemination of innovations and the growth of human capital, in response to the specific issues highlighted by the CREA study: business profitability, product quality and reduction of environmental impact. Starting from this *ex-ante* analysis, 4 macro-areas are identified for the training; these are: shell fruit, traditional fruit, berries, overall aspects. The main weakness has been identified for each of them. Subsequently, the issues that could be appropriately addressed by the training to reduce the critical points are identified and the expected outcomes of the on-the-job training are estimated. The training activities identified can be classified as follows: classroom training; outdoor training; coaching; study visit. The project started in 2018, has a planned duration of 3 years and the timetable includes 3 cycles of courses.

Methodological approach: the assessment from technical fact to a knowledge and recommendation system

The Utilization Focused Evaluation suggests that an assessment should be judged by its utility and use, in the sense of how people apply evaluation findings and process in a very concrete way: the focus UFE is on intended use by intended users (Table 1). It means the evaluation is conducted by working with, clearly identified, primary intended

users, who have responsibility to apply evaluation findings and recommendations. Under this point of view, it is central to build a strong relationship with intended users to help them to determine what kind of evaluation they need. In the case of the Furttijob project, the intend user is identified in the subjects who organize and deliver the service and the evaluation plan is drafted as an inception report.

When addressing an evaluation plan, the first problem to be set is to define which questions you want to answer and, as a result, which methodologies and techniques to choose. The UFE does not advocate any specific evaluation model, method, and theory; it is a process for helping intended users to select the most appropriate assessment for their specific situation. The Utilization-Focused Evaluation can include any evaluative purpose, any kind of data (quantitative, qualitative, mixed), any kind of methods or techniques. In the case of the Fruttijob project, we propose, in collaboration with the intended user, some main evaluation questions: What did it happen in the implementation of the project? And what it happened can be considered positive? Or is it necessary to change something?

Table1 Three main approaches to evaluation

| | Positivist Approach | Pragmatist Approach | Constructivist Approach |
|------------|---|---|--|
| Focus | Objectives | Standards | Stakeholder vision and social process (UFE) |
| Questions | Do the results correspond to the expected goals? | Do the results correspond to the quality criterion? | What happened in reality? Is it good? |
| Hypothesis | Explanation of Causal link: You can predict all the effects | In Every situation there is a concept of quality | The reality is richer than what can be predicted. Importance of unexpected effects and process |
| Domain | Cycle of decision | Administration and Management | Territorial context and stakeholder framework |
| Use | Instrumental for political decision | Instrumental for the management | Cognitive towards Empowerment |

Source: our elaboration on Cagliero and Cristiano 2013

To answer these questions with an UFE approach, we have inserted in the evaluation plan very pragmatic technique, such as the analysis of the deviation of results from the objectives or the analysis of the logical framework. The use of different methods is also explained by the need to apply clear and well-known techniques, to obtain an implicit consensus on the efficiency and effectiveness of the evaluative process, in order to activate his concrete use (Martini et al., 2006; Cagliero and Matassi, 2011).

On the one hand, we have shared the idea to set up a process analysis (implementation research) to reconstruct the implementation modalities adopted to translate into concrete activities and services the mandate of the intervention. This analysis, as highlighted by the intended users, is mainly aimed at identifying any obstacles or bottlenecks, that can slow down, or even block, the realization, and to verify the functioning

of the delivery mechanism. This activity tends to support operational management and possible reorientations of the intervention.

On the other hand, an analysis of the effects (results) has been centered on what has been done and what has been achieved. The analysis focuses on the strategies of intervention adopted, the activities carried out, the results achieved, the perceptions of the subjects involved (final beneficiaries and intermediate actors) and the effects. The analysis proposed is based on the logic of the intervention and the expected goals (Theory Based approach, Pawson, 2006, Cagliero et al., 2013). The aim is to judge if the intervention is acted in the desired way. Can it produce the expected changes, as carried out in the ex-ante analysis?

The two analyses can use both secondary data and primary data, applying quantitative and qualitative methodologies, also to triangulate information. More in detail, for the process analysis we used the data from an ad hoc monitoring system of the interventions and from ad hoc questionnaires posed to all the learners. In the case of the effects analysis, we used some result variables ex ante shared, with the stakeholders and already foreseen in the project, on which estimate the changes triggered by the intervention. This battery of variables has been shared with the intended user. All the results collected are triangulated with deep interviews with privileged witnesses, in agreement with the intended users.

The reconstruction of the intervention logic

Appraising the intervention logic of an intervention is an essential cornerstone for an evaluation exercise. It has been the first step we shared, in the evaluation plan, with the intended users. As outlined in the Guidelines for the Ex Post Evaluation of 2007-2013 RDPS (Evaluation Expert Network, 2014), the intervention logic: "...represents a methodological instrument which establishes the logical link between programme objectives and the envisaged operational actions. It shows the conceptual link from an intervention's input to its output and, subsequently, to its effects".

The overall objective of the project is to increase the competences of the fruit producers, to guide and stimulate them to use innovative modalities through a training-laboratory course (on-the-job training). The reconstruction of the intervention logic leads to the identification of two general objectives based on the introduction of innovative tools for achieving more sustainable and green productions: support the growth of human capital to increase the competitiveness of enterprises; get more sustainable and greener the productions.

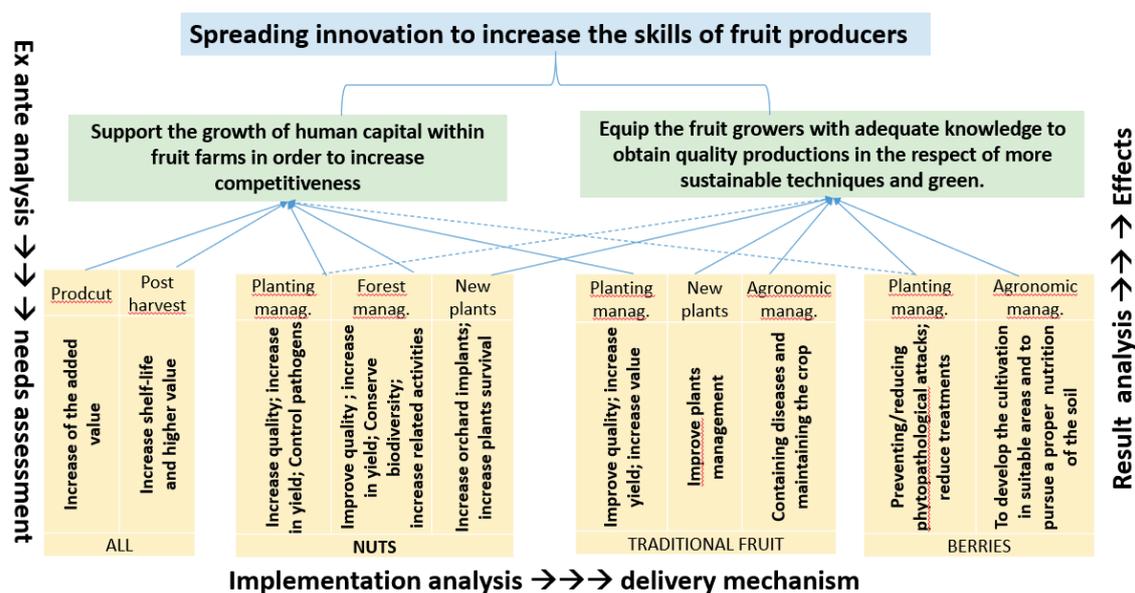
In this context, we can argue that the proposed intervention logic is well drawn, and it is able to reflect the most important needs, framed by objectives and identified through the description of the situation in the Cuneo area (Figure 1).

The ex-ante analysis driven by CREA have clearly highlighted a needs assessment, as those to be addressed in a timely and efficient use of the resources available. It has been also possible to formulate, together with the intended users as in the inception report, a hierarchy of objectives, to give an intervention response to the identified needs at various levels and area and a result indicator framework (see annex).

Results reporting and first evidences of the process analysis

The analysis refers to the first 10 courses organized between November 2018 and February 2019. The participants are in total 200, only 10% are females and on average there are 23 trained/per course (Figure 2). The chestnut and peach courses were carried out in two different municipalities to meet the specific needs of the different production areas: respectively Cuneo and Mondovì for the chestnut and Cuneo and Saluzzo for the peach. The most attended course is the walnut agronomic management: in Piedmont

walnut is a typical production mainly cultivated to produce wood while today, following the decrease in the price of wood and the difficulties encountered by other fruit trees, as peaches or kiwi, is finding new interest. Fruit growers therefore need adequate training for the agri-environmental management of the new varieties. On the other hand,



Source: Inception Report revised

Figure 1. The intervention logic and the hierarchy of objectives

the course with the lowest attendance is the one on berries held in Cuneo. The reason for the low participation seems to be due to the non-specificity of the course while in this area there is a specific interest in the cultivation of blueberry.

Among the 200 participants in the courses 113 subjects have the title of professional agricultural entrepreneur (IAP) and among them more than 70% is an individual entrepreneur or associate, family workers and assistants represent 20% and the remaining quota is to be reported to employees. With reference to the training level, the 60% of the respondents (156 people) states that they have a secondary school certificate, the 30% has a lower secondary school certificate and only the 2% has a degree.

At the end of each course a questionnaire was submitted to all participants, it aims at understanding both how they learned about the courses and what expectations they have from participating in them, both the level of knowledge achieved. The questionnaire also investigates the elements of strength and weakness.

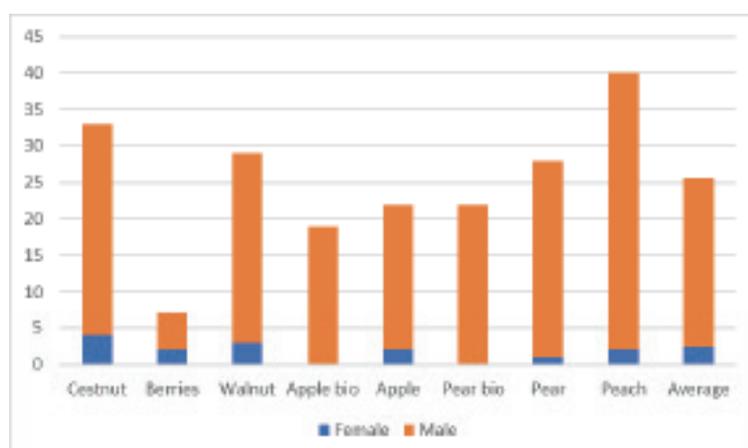


Figure 2. Participants: distribution by type of course and by gender

Source: Our elaboration on INIPA data

All data collected by questionnaire has been stored in a data base which is divided into four sections: in the first one there are basic information like name and surname, in what way the participant know about the course (news on line, news on specific magazine, friends/relatives/acquaintances, professional organisations or something else), why they decide to attend it and if they have already taken part in other courses in the past, if they belong to a professional organisation and/or a cooperative, then the last two about the total utilised agricultural area (UAA) and the fruit UAA. In the second section there are more specific information related to each fruit crop: character, relative utilised agricultural area, production, sales channels (contribution to a cooperative, stockist, fruit processor, retail, direct sale or something else) and selling price. The third section is the technical one; information collected are specifically related to the cultivation methods of the crop undergoing the course: the participant uses or not to prune fruit trees or/and irrigation system (micro-irrigation, flow irrigation, etc.) or he follows organic productions, or he is able to recognize crop diseases. In the fourth section information collected are related to the judgement of the course (communication, logistic, materials, etc.) and to the elements of strength and weakness of training.

The efficiency of the intervention is affected by the delivery mechanisms and implementation procedures, so these factors must be considered. In this sense, the analysis of the implementation has been, for now, focused on aspects related on the communication done and to the mode of delivery of the intervention. Participants received information about the initiative from professional organizations (45% of respondents), so in a balanced way through professional organizations, websites, newspapers and word of mouth.

To identify obstacles or bottlenecks that may influence the implementation of the project, the information collected through the questionnaire has been used as indicators to identify and explain the phenomenon as suggested by the intend users. The first, and obvious, indicator taken into consideration is the rate of participation in courses, compared to the number of students expected. We remind you that the average number of participants in each course must be 20, as we describe in the previous chapter the participants in these first 10 courses are 200 so the average of 20 is reached.

In general, the opinion of the learners on the quality and adequacy of knowledge acquired through the course is very positive. More than half of the participants gave a very positive opinion and more than 40% gave a positive opinion, while, the incidence of the negative opinions is residual (Figure 3).

The judgment expressed by trained on the adequacy of the information received is crossed, in a treatment in pairs, with other variables to deeply analyses the training implementations.

According to participants, the knowledge acquired is appropriate to the communication: the level show a positive and very positive degree (Figure 4). In fact, who has referred that the communication was very positive also show a very good opinion on the knowledge received: they are 85 people, which is the 40% of the total.

The knowledge acquired is appropriate to the mode of delivery of the intervention: 81 persons refer that both acquired knowledge and delivery are very positive and 57 persons that reach a positive level (Figure 5). The mode of delivery of the intervention is expressed by a multicriteria variable that combined the period of the year in which the training course is carried out, the course schedules, the locations and other elements of logistics, the trainers' competences and the materials received.

The evaluate the method of delivery it's used a proxy that is the time shared between classroom training and outdoor training. The method of delivery appears appropriate to the knowledge acquired, the degree is positive for both the variables: 185 people give a very positive or positive degree to both the indicators (Figure 6).

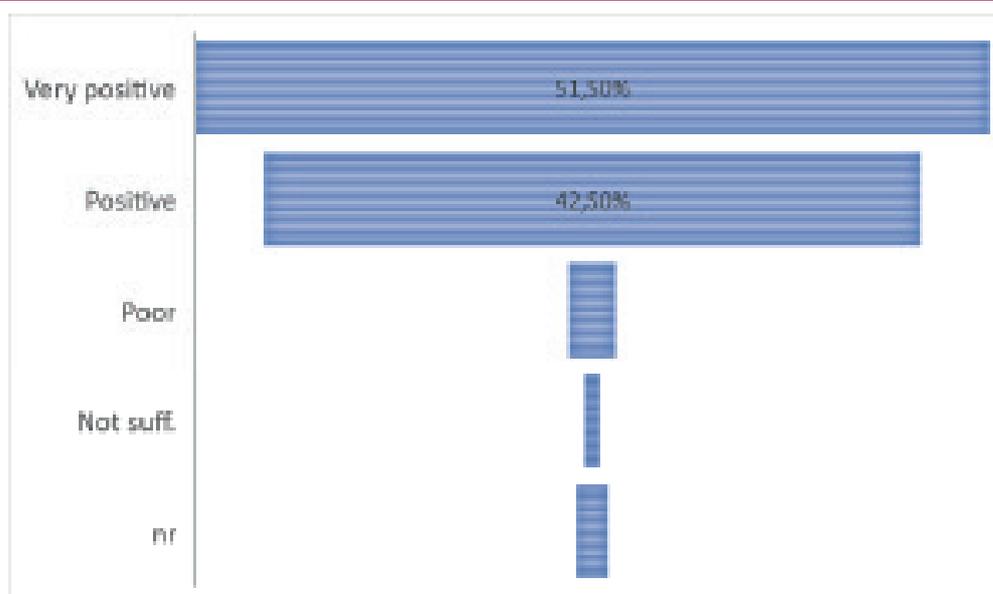


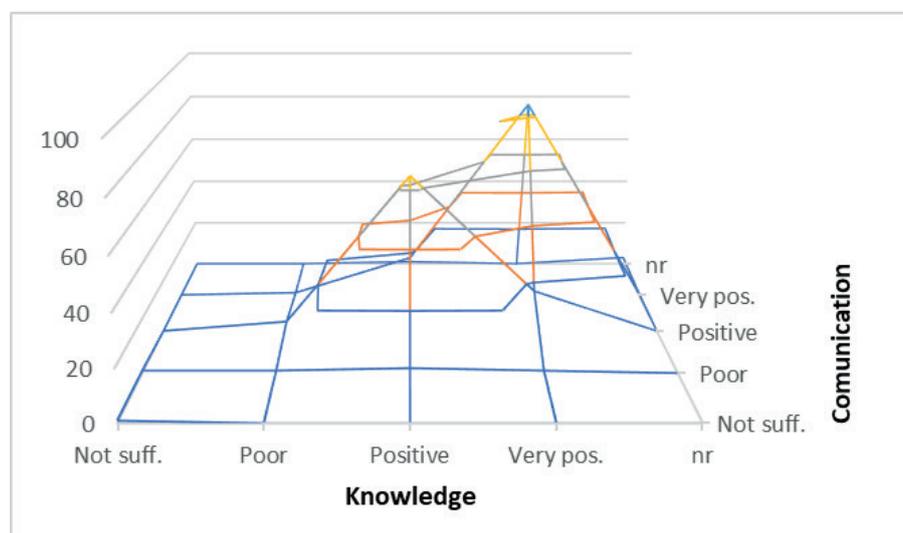
Figure 3. Participants' assessment of the knowledge acquired through the course

Final remarks

The results of the analysis carried out until now, designed and shared with the users within the evaluation plan, let us to highlight some main points, albeit still in a partial way. The project, in fact, is only at the very first implementation stage and at present only a partial number of questionnaires on implementation have been collected, while it is not yet possible to observe some effects.

The analysis of the intervention logic has shown the validity of the proposed framework, which is consistent with the identification of needs. The choice of the different training

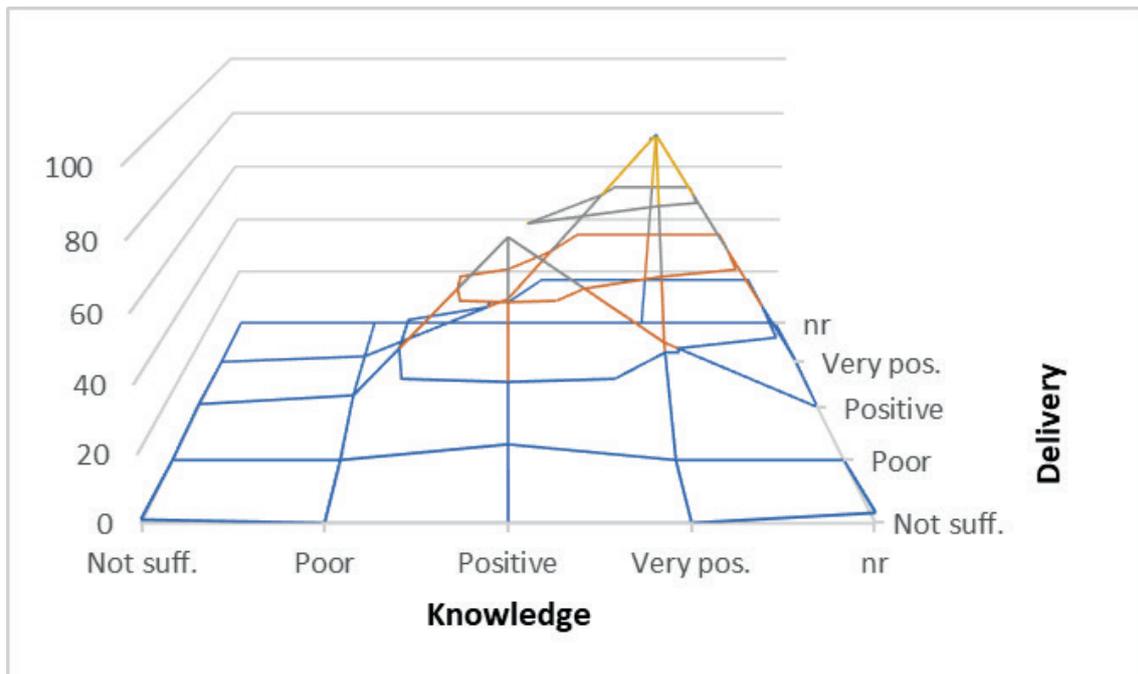
Figure 4. The combined judgement of the participants on the knowledge acquired and the communication received (frequency)



Source: Our elaboration on CREA data

activities and techniques and the articulation among different tools looks adequate to the observed criticalities and able to bring about a change in the behaviour of the final beneficiaries in the expected sense.

The profile of participants is substantially in line with the expected target as described in the ex-ante analysis; the level of participation in the courses, except those on berries, is essentially in line with expectations.

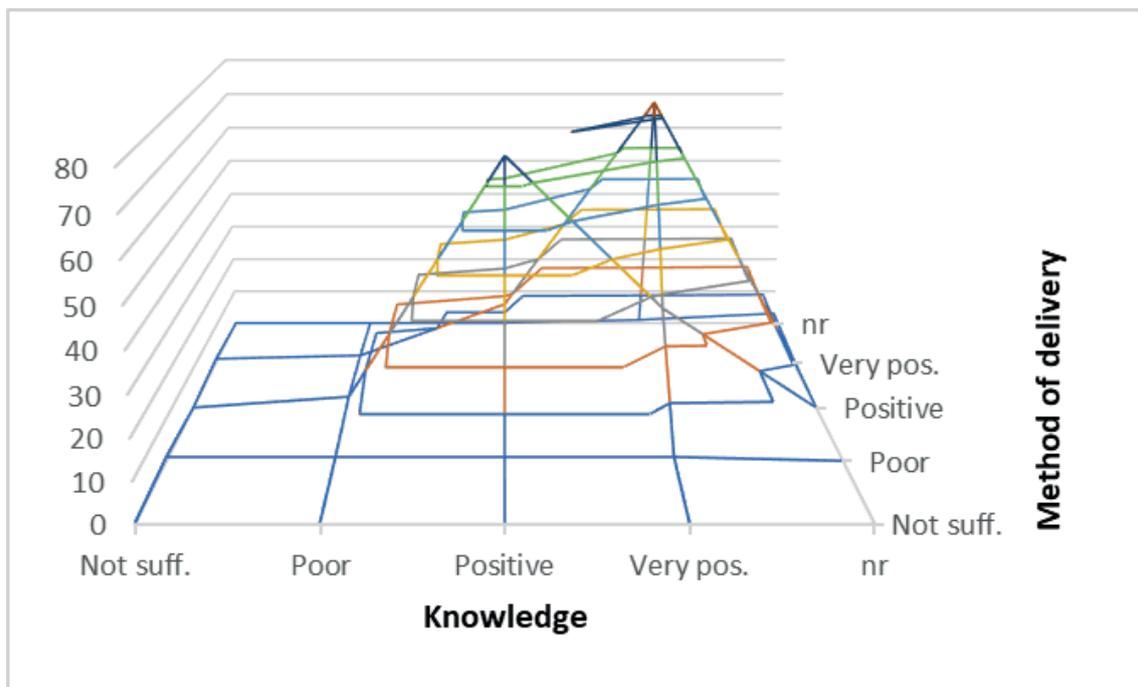


Source: Our elaboration on CREA data

Figure 5. The combined judgement of the participants on the knowledge acquired and delivery (frequency)

The main evidence deriving from the analysis of the questionnaires collected regarding the students' judgement shows an important degree of appreciation. It is more interesting to observe how a high degree of appreciation on the course outcomes corresponds also to a positive judgement on the articulation between theoretical and practical parts and a positive opinion of the communication. The first point allows us to say that the most innovative aspect of Fruttijob, its on-the job training characteristic, has properly taken the participants' needs into account, even if it is necessary to recom-

Figure 6. The combined judgement of the participants on the knowledge acquired and method of delivery (frequency)



mend a most consistent activation of all the foreseen tools, such as, for example, the coaching.

On the other hand, some courses have had limited success in terms of participation. This will be an element to be deeper investigated, but, as a first instance, we can recommend reviewing the structure of these courses; maybe it could be good to estimate if it is appropriate to keep them active.

A last point, foreseen in the evaluation plan and still to be developed, is how to observe the feedback from the intended users of the results of the evaluation. As already pointed out, now the process is only at the beginning, but the inception report proposed to activate the so-called logbook to collect and describe how the recommendations had a follow-up in the delivery and modification of the intervention. Today, also in a very limited way, this collection must start with the goal to evaluate (we can say meta-evaluate) the use of the assessment and judge its concrete support or not. The goal is that kind of results coming from the evaluation have to be usable, useful and used. This is about the culture of evaluation itself and it is anchored to the ability to react by Decision makers in a very pragmatic way, through which organizations can develop their adaptability capacity to the real world.

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ANNEX

Common monitoring scheme by course type (Chestnut)
Relationship between specific objectives and result variables

| <i>NUTS</i> | <i>Chestnut</i> | <i>Target</i> | <i>Year I</i> | <i>Year II</i> | <i>Year III</i> | <i>Achievement</i> |
|--|---|----------------------|----------------------|-----------------------|------------------------|---------------------------|
| <i>Operation (n°) 1</i> | Description of chestnut groves; recognition of the main diseases; correct agronomic management techniques | Y/N | - | - | - | - |
| <i>Classroom training</i> | Management and defence techniques 2 h | 12 | - | - | - | - |
| <i>Outdoor training</i> | Pruning trials; recognition of plant diseases, 5 h | 30 | - | - | - | - |
| <i>Study visit</i> | - | - | - | - | - | - |
| <i>Teaching material</i> | Study handouts; pruning tools | Y/N | - | - | - | - |
| <i>N. of participants per course</i> | 20 | 20 | - | - | - | - |
| <i>No. of courses/year</i> | 2 | 6 | - | - | - | - |
| <i>Total participants in training</i> | 120 | 120 | - | - | - | - |

| MACROAREA | Area | Specific objectives | Result variable (primary) | Result variable (secondary contribution) |
|--------------------------|----------------------|---|----------------------------------|---|
| ALL | Production | Increase of the added value | Market value crop yield | |
| | Post-harvest | Increase shelf-life and higher value | Market value crop yield | |
| NUTS | Plants management | Increase quality; increase in yield; Control pathogens | Market value crop yield | Cultivated areas |
| | Forest management | Improve quality; increase in yield; Conserve biodiversity; increase related activities | Market value crop yield | Diversification |
| | New plants | Increase orchard implants; increase plants survival | Cultivated areas | |
| TRADITIONAL FRUIT | Plants management | Improve quality; increase yield; increase value | Market value crop yield | |
| | New plants | Improve plants management | Cultivated areas | |
| | Agronomic management | Containing diseases and maintaining the crop | Cultivated areas | |
| BERRIES | Plants management | Preventing/reducing phyto-pathological attacks; reduce treatments | Cultivated areas | Market value crop yield |
| | Agronomic management | To develop the cultivation in suitable areas and to pursue a proper nutrition of the soil | Cultivated areas | |

Assessment and implementation of Farmer Field Schools: a literature review

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Keywords

Advisory services, extension, impact, adult learning, evaluation, impact pathway

Abstract

Assessment of agricultural extension and adult education approaches is crucial to improve the quality and effectiveness of interventions. Farmer Field Schools (FFS) have been adapted to meet context specific needs in crop or farm management and integrative topics. Implementation of FFS varies locally and FFS assessments mostly report effects on agricultural performance. We analyse whether a relation exists between the diversity of FFS interventions and the assessment methods used to evaluate them, by means of a systematic literature review. Implementation was characterised through farmers' participation and FFS topic. Assessment methods were analysed in terms of impact pathway using a causal chain of inputs, outputs, outcomes and impacts from farmers' point of view. 34 peer-reviewed articles were included. Results show three types of FFS: Transfer of technology at crop management or cropping system level; consultative participation at crop management or cropping system level; farm level or integrative topic with consultative or collaborative participation. However 15/34 studies did not describe the FFS implementation. Only consultative or collaborative FFS reached farm management or integrative topics. 23/34 assessments focused on inputs (knowledge) and outputs (change in practices, agricultural or economic performance) for farmers. Only six studies assessed long-term FFS impacts. FFS are not defined as a standardized extension method or a transfer of technologies approach and yet this was the most common FFS implementation type observed. Assessing FFS as a collective and farmer-centered experiential learning approach requires describing the FFS implementation and its underlying objectives. An impact pathway approach can support a better understanding of the impacts of FFS.

Using Program Theory to Evaluate a Forest Landowner Education Program

William G. Hubbard

Keywords

Program theory-based evaluation, mediator variables, moderator variables, impact evaluation, program evaluation, non-industrial private forest management, Extension, voluntary nonformal adult education.

Abstract

This purpose of this study was to assess a voluntary nonformal adult education program using program theory-based impact evaluation. Mediators (knowledge change, use of informal education, use of professional assistance and products, use of social networks) and program outcomes (forest management activity) were measured and their relationships studied. Several moderators (age, gender, education, etc.) were also measured to determine influences on mediators and outcomes. A multiple mediator-moderator model was developed to measure these relationships.

Six hundred and forty-seven participants of the 2004 Master Tree Farmer Program served as the population for this study, which measured changes in the above referenced variables over a five-year period. Two hundred and fifty-five usable surveys were returned for a response rate of 38%. Mean age of the respondents was 61 years. Eighty five percent of the respondents were male. Ninety six percent of the respondents were Caucasian. Seventy five percent of the respondents earned at least a Bachelor's degree, and 58.4% had at least an annual household income of \$75,000.

Key findings include the fact that knowledge change was a powerful predictor for increased forest management activity and explained 32% of its variance. Mean increases for the four mediator variables and one outcome variable ranged from low to moderate on a scale of 1 (no change) to 4 (substantial change). Of fifteen moderator variables studied, age class and the importance of the non-economic objectives of managing for wildlife, managing for recreation and beauty, and managing for the next generation were the only statistically significant predictors of changes in the mediator variables and the outcome variable. There were also high statistical correlations between the mediator variables and outcome (r of at least .57 for the mediators and outcome variables).

Based on these findings, recommendations for research and practice include: the need for qualitative research regarding the relationships between knowledge change and mediators, additional qualitative moderator research, more use of program theory-based models and evaluation techniques to better account for feedback loops and causality, and increased interaction with participants following program participation to understand motivations and barriers to use of mediators.

Redefining the value of agricultural innovation: Between value propositions and value co-creation

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Keywords

Agricultural innovation systems, solution networks, service ecosystems, value, propositions, value in use, co-resourcing

Findings

By using our model we uncovered several factors that block innovation processes, thus preventing innovation systems from reaching their full potential. The cooperation among actors complicates resource integration thus reducing the levels of network commitment, whereas institutional factors impede the development of new architectures for value cocreation.

Furthermore, the overemphasis on the presumed value of an innovation reduces common ideation, conception and visioning, finally leading to limited development of new resources.

Practical/Theoretical Implications

Overall, our findings indicate that innovation is not a oneshot process, but an iterative series of actions, marked by significant bumps and dips. Based on these results, we argue that a shift in the evaluation approaches from innovation “coproduction” to the processes of “co-resourcing” can shed more light on the ways innovation systems reciprocally and interactively (but not always intentionally) co-produce value that extends across and beyond the system.

Originality/value

This study, drawing on service marketing literature and viewing agricultural innovation systems as solution networks, offers an alternative view of agricultural innovation process.

Understanding interactive innovation for sustainable agriculture

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Keywords

Interactive innovation, multi-actor approach, thematic networks, EIP-AGRI, evaluation, impact pathways

Background and objectives

Interactive innovation has become an increasingly popular description of processes in developing solutions to problems, promoting practice change and the delivery of projects creating a paradigm shift towards more sustainable and productive agricultural systems. Networking and collaboration of multiple actors towards solving the most pressing agricultural challenges, has gained momentum in the EU policy frameworks. In our study we will draw upon the recent policy developments, highlighted in the key EU agendas, such as the EIP-AGRI and Horizon 2020. This study was realized in the framework of the EU H2020 LIAISON project (grant agreement No 773418, in progress).

Design and data collection

The study is based on a thorough review of the relevant literature, supplemented by interviews with actors involved into the delivery and evaluation of interactive innovation projects. We interviewed representatives of nearly all EU countries, and specifically sought a variety of stakeholders concerned with policies dealing with the concept of interactive innovation. For additional insights, we also examined the practices based on interactive innovation approaches in the developing and transition countries around the globe.

Results and Implications

A range of understandings of interactive innovation emerged from the interviews. Respondents especially emphasized their need to be actively involved as partners in projects rather than merely being consulted about them. Several consistencies of opinion became apparent, including an emphasis on multi-actor involvement in such approaches, with farmers and researchers specifically referred to as the main actors. Although various terms have been used to describe it, the understanding of interactive innovation is found to be similar in developing and transition countries, which suggests

a certain consistency across a diversity of geopolitical contexts. A few inconsistent accounts were found but were mostly context-specific, i.e. linked to location at a macro-regional scale.

Interactive innovation is widely acknowledged as an effective mechanism to boost innovation and improve the uptake of research results. Nevertheless, its effects and impacts are still insufficiently explored and stronger evidences are needed in that regard. On the basis of the literature review and interviews, the supposedly main impact pathways of interactive innovation projects were identified.

Moreover, we looked at the current and most promising evaluation approaches, along with related methodological challenges and the expectations of evaluation stakeholders. The findings of this study enable a better evaluation of interactive innovation projects and thereby inform policy to improve the general performance of research and innovation for a more sustainable and productive agriculture.

A qualitative approach to evaluate the effect of the introduction of “innovations” in mountain zootechnical holdings

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Keywords

Innovation of product/process, Quality of work/life

Context description: problem domain; conceptual framework; practical and theoretical background

The evaluating methods proposed by the Community guidelines on rural development do not always adapt to particular situations such as those in the Provinces of Bolzano and Trento, where the structure of agricultural holdings is composed of small/ really small realities where the effect of the introduction of innovations in the holdings are not often measurable with econometric means. This results in the objective of identifying an alternative approach to evaluate the results of those innovations. An innovation can be considered as such when it introduces a significant improvement in the scope of a productive process. It cannot have the same meaning when introduced in holdings localized in specific areas or with different productive characteristics. This means that the concept of innovations varies from holding to holding and from area to area depending on the productive systems previously adopted. In mountain family holdings (95% of the total of the analyzed area) innovations rarely affect the profitability of the holding and, more often, affect the quality of work of the farmer, which means their quality of life.

Purpose; questions

Can the introduction of innovative process bring forth positive effects in mountain agricultural holdings?

Design; methodology; approach

The conducted evaluating activity has not focused on the economical effects brought forth by the introduction of innovations in holding, moving the analysis towards the qualitative/quantitative effects that these innovations generate such as improvement of the quality of work and products. These effects are not always measurable through income or added value growth. It becomes necessary to go beyond a strictly economi-

cal-financial and quantitative approach to the evaluation, focusing on the quality of the obtained results. This approach also allows to do evaluating analysis a short time after the conclusion of the investments (and not only when the effects of the investment show in profit statements). Furthermore it adapts to smaller situations of mountain holdings.

Data collection and analysis; evidence

Monitoring data, official statistical sources (RICA and ISTAT), surveys with privileged witnesses, case studies.

Results and Implications.

The performed analysis allowed to evaluate in which way the introduction of innovations in holdings can result in positive effects in the improvement of quality of work (i.e. the working life of the farmer) and in the quality improvement of the product (i.e. the ability to maintain profit). It has also been verified that the improvement of the quality of work has a direct effect on the continuation of the agricultural and zootechnical activity. Without the investments this activity would cease, in the short to medium term, with serious consequences in environmental, social and cultural terms.

In zootechnical mountain holdings, for instance, it was verified how the introduction of innovations in stables is mainly aimed at improving working methods, ensuring better occupational safety conditions to the worker and a clear improvement of the working environment, which can assure more dignity to the work done. On the other hand usually the interventions have no to marginal influence (for instance an improvement in the hygienic quality of milk) on the holding's ability to increase its profits.

A two-mode network approach to analyse the interaction processes among farmers

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Keywords

Agricultural extension, Social Network Analysis, Indirect ties, Information networks

Conceptual framework

It is well recognised that interactive approaches in agricultural extension have an interesting focus on enhancing the interaction among different sets of actors (Spielman et al., 2008). Depending on this, different extension approach could be applied (Birner et al., 2009). Given that agricultural extension is used as a political instrument, it should be assessed. Thus, we proposed the use of social network analysis (SNA), since SNA provide us with a set of tools for the formal study of relationships among different actors (Borgatti et al., 2009).

Purpose

This proposal aims to add to the literature new insights about the underlying interaction process, which is implemented in any interactive extension approach, by analysing how farmers attending different extension events shape a network of indirect interactions.

Methodology

Broadly speaking, it possible to recognise two types of networks: one-mode and two-mode. In one-mode networks, all nodes can be related to each other node, and it has used in agricultural networks (e.g., Aguilar-Gallegos et al., 2015). While in two-mode networks, nodes are divided into two sets, and they can be only linked indirectly (Wasserman and Faust, 1994). We are focusing our proposal on a two-mode network perspective to explore indirect interactions among farmers and other actors.

Data collection

The data were gathered from a governmental program which gave some support and advice to farmers in a productive region of rubber in Oaxaca, Mexico. The program considered hiring a group of seven extensionists for providing this service through the

organisation of different events. In order to register each person in the events, an attendance list was filled out at the beginning of each event. The interactive processes were planned, carried out, and analysed for almost six months. Network data was analysed in the software UCINET (Borgatti et al., 2002). To visualise the whole network and how it changed across the different events, NetDraw was used.

Results

Based on the attendance records, a total of 110 events were carried out, and the number of unique attendees was of 828. The network results of the cumulative attendees show different dynamic patterns. By using SNA indicators, it was found that almost 75% of attendees were involved in a single event, and a small group of people (2.1%) attended five or more events. Additionally, we found that at least one different person was involved in two or more events and, 16 events were isolated which imply that people who attended them only were involved in a single event.

The results support the idea that a network approach, first, opens new possibilities and alternatives to analyse agricultural interaction processes and, second, that the evolution of the network, the analysis of the attendees' network and, the network of events are important outcomes, which could be used to evaluate the performance of an extension service.

Implications

A network perspective can provide valuable insights about important issues, such as participation rates of attendees and events, the evolution of the participation, actors who are more central or who have more intermediation, and so on. It is also possible to propose improvements and ways to encourage the network dynamic among actors.

Assessing Leadership Development Needs for the Modern Extension Organization

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Keywords

Leadership skills, leadership development needs, assessing leadership needs, Extension organization

Introduction

The U.S. Cooperative Extension is the transformational education system that operates through land-grant universities in partnership with federal, state, and local governments. Extension organizations provides public non-credit education to help people and communities solve their problems. Extension educators or agents translate science for the public for a better quality of life through engagement and partnerships. New technologies allow Extension to connect and educate people online. Academic faculty members with Extension appointment responsible for developing educational curricula for targeted audiences. Extension educators work with local community leaders and citizens, deliver educational programs, evaluate the effectiveness of program curriculum, and identify future needs of citizens and communities that help to provide input in prioritizing future research.

Penn State Extension became a pioneer in the reorganization of traditional Extension operational model into a business model, beginning these efforts in October 2011. The business model will help to build a stronger relationship with Extension customers and stakeholders. A new model of operation could able to maintain a competitive advantage by bringing together organizational strategies to attract and sustain talented employees. Main principles of the business model are the following:

- Focus on strategic areas of excellence
- Extension program team approach
- A county-based presence for addressing local needs, universal access to research-based information and Extension programs (Penn State Extension

What should an organization do to support a new path and effort? How should Extension employees lead program efforts that will be relevant locally, responsive statewide, and recognized nationally and internationally? Reorganization and changing environment require new leadership skills development for Extension educators. Leadership skills will help educators reach and engage their audience more effectively. Extension professionals involved in the newly created cross-cutting program teams need available leadership development training to serve customers and stakeholders successfully. Penn State Extension brings support and educates citizens of Pennsylvania in the following seven program areas:

1. 4-H Youth Development
2. Agronomy and Natural Resources
3. Animal System
4. Energy, Entrepreneurship, and Community Development
5. Food, Families, and Health
6. Food Safety and Quality
7. Horticulture

Due to these changes, current leadership professional development activities may not be preparing Extension educators to lead in a new working environment. The results of this research initiative will be a foundation to strategically obtain, develop, and utilize the Penn State Extension workforce by understanding the leadership development needs.

Literature Review

Formal professional development

Scholars previously defined professional development as a “formal process such as a conference, seminar, or workshop” or “collaborative learning among members of a work team” that furthers professional competence (Mizell, 2010). Formal professional development and continued adult education are vital contributors to the advancement of the modern workplace. In today’s rapidly changing global work environment, members of the workforce are expected to be lifelong learners (Tierney, 1998). However, the literature shows that postsecondary education, workforce education, and current professional development practices may not be addressing these needs. For example, employers today complain of a skill gap in the modern workforce between how employees are trained and what competencies are actually required to complete a job (Cappelli, 2014). In addition, education scholars have surmised that a college education does not provide students with all propositional and procedural knowledge needed to do their jobs (Knight, 2002). Employers also have noted that college students entering the workforce usually have subject-area knowledge, but are not equipped with the desirable soft skills, which are just as necessary for employees to complete their work (Crawford, Lang, Fink, Dalton and Fielitz, 2011).

Leadership development

These non-standardized, or more creative, working environments require a different kind of skill set for modern workforce leaders (Carnevale and Smith, 2013). These leaders will need to be able to solve complex social problems (Carnevale and Smith, 2013; Mumford, Zaccaro, Harding, Jacobs, and Fleishman, 2000). Also, they will need to be able to communicate, work in groups, exercise influence, manage themselves, and be resilient (Carnevale and Smith, 2013). Attention to the global aspect of today’s modern workplace leaders is also necessary due to the increased effects of globalization on business (Alon and Higgins, 2005). Authors recommended companies to incorporate emotional intelligence (EQ) and cultural intelligence (CQ) training into professional development activities to help address these issues. Milliron (2007) discusses the need for the newly educated workforce to possess soft skills that can be applied in a global context to help address social problems: critical thinking, creativity, and courage.

Previous research identified this need and shows postsecondary education and job training in this area may be lacking. Crawford, Land, Fink, Dalton, and Fielitz (2011) talked with several companies and identified hands-on experiences, team communication, leadership, decision-making/problem solving, self-management, and professiona-

lism as skills lacking among new hires. Because colleges are not always providing all of the soft skill training employers desire to their students, practitioners of leadership professional development programs within companies will need to work to fill these gaps.

Leadership professional development opportunities

As we have discovered, leadership development scholars and practitioners need to adjust how they create and assess leadership programs to meet new leadership professional development needs. However, past studies have struggled to identify a set of competencies that constitute effective leadership behavior within organizations (Yukl, 2012). Also, various leadership development programs have found that while short-term impacts are being achieved, virtually no programs are making long-term impacts and significant change in leadership approach (Zenger, 2000). CEOs report seeing no substantial changes in leadership competence among leadership development program participants. They identified “overlooking the context” as a common mistake made in creating and running leadership professional development programs (Gurdjan, Halbeisen, and Lane, 2014). Despite research demonstrating programs conducting needs assessments show significant program increase in knowledge and skills of participants (Collins and Holton, 2004). With this point, evaluation is also an important consideration when developing leadership professional development programs. Due to the importance of accountability and reporting in today’s world, leadership professional development programs must be able to demonstrate real value to program stakeholders (Shaha, Lewis, O’Donnell and Brown, 2004).

Need for leadership professional development within Extension

There is a need for a systematic leadership development program for Extension that considers input from Extension professionals and recognizes their efforts (Bruce and Anderson, 2012; Ladewig and Rohls, 2000; Woodrum, 2003). The literature review showed that Extension leadership development is essential for all Extension employees; various populations, including specialists, new educators, and experienced educators, have been studied (Bruce and Anderson, 2012; , Lamm, and Stedman, 2011; Radhakrishna, 2001; Ricketts, Carter, Place, and McCoy, 2010; Stedman and Rudd, 2006; Woodrum, 2003). Successful leadership development programs exist at the regional and national levels. However, only selected individuals by the state are given the opportunity to participate in this program each year (the University of Minnesota, n.d.). State-wide leadership development programs may provide access to all state Extension employees.

State Extension systems also may need to re-evaluate their professional development approaches due to organizational restructuring. Extension reorganization is an important priority for several Extension systems (Braverman, Franz, and Rennekamp, 2012; Schmidt and Bartholomay, 2009). The importance of professional leadership development and the need to adjust it to the 21st century is identified in the general literature and Extension literature. Extension reorganization and new operating models are changing how we do the business of Extension. This may be affecting Extension employees’ leadership professional development. Therefore, it is time each state Extension critically examine how it is approaching its leadership professional development program and adjust to the current conditions.

Purpose and objective

The aim of this study was to assess Penn State Extension leadership development

needs for Extension educators from the administration perspective. The future goal is to conduct a broader assessment to create an accessible leadership program for all Extension educators. The research objective was to identify leadership development needs for Penn State Extension educators.

Method

We used a qualitative method to address the study objective. We utilized a modified brainstorming technique to assess leadership development needs for Penn State Extension educators, from the administrator perspective. We developed three open-ended questions based on the literature review. Five Extension administrators helped establish face validity of the questionnaire to ensure questions' relevance to the organization. The final instrument comprised of three questions:

1. What are the leadership development opportunities available to Penn State Extension educators?
2. What limitations and barriers surround the leadership development of Extension educators?
3. What leader and leadership knowledge and skills do you feel Extension educators need to improve working with Extension program teams, local communities, and individuals?

Instead of utilizing a traditional brainstorming technique, we used a writing brainstorming approach. Nine Extension administrators participated in the study. After completing the questionnaire, we asked participants to review two other participants' responses and provide additional thoughts or ideas. The writing brainstorming technique helped to avoid criticism or rewarding ideas and synthesized diverse experiences. This fostered collaborative problem and solution generation. The modified brainstorming technique is provided below.

Step-by-step approach of modified brainstorming technique

1. Establish and provide a comfortable meeting environment.
2. Present the problem based on the literature review and describe the purpose of the session
3. Introduce audience to the writing brainstorming technique
4. Give participants 20 minutes to silently complete the three open ended questions
5. Give participants an additional 10 minutes to provide new ideas or thoughts generated by reviewing two others

Data collection and analysis

We collected data in January 2019. We used NVivo software to analyze the data. We utilized an analyst triangulation method to analyze the qualitative data. Researchers worked together to generate themes and categories through a consensus-based approach, which helped validate findings (Armstrong, Gosling, Weinman, and Marteau, 1997; Worker et. al. 2017).

Results

Participants identified two opportunities available to educators related to leadership skills development and improvement:

1. *Leading peers that included:*

- Leadership roles in state and national professional Extension associations

- Penn State Extension program team leaders
- Professional interest area leaders and project leaders (i.e. leadership roles as program leaders; team leaders; project leaders; and officer positions in state, regional and national associations)

2. Professional development events and resources.

- Leadership professional development at the university, college and Extension organization levels
- Leadership professional development programs sponsored by local agencies and nonprofits
- Leadership professional development programs sponsored by national Extension associations
- Resources (i.e. published Extension products)

Among limitations and barriers surround the leadership development of Extension educators Penn State administrators identified the following:

1. Organizational policies at the University, college and Extension levels

- Lack of financial resources
- Lack of promotion opportunities
- Lack of professional mentoring

2. Individual level barriers

- Lack of time management skills
- Lack of motivation
- Heavy workload
- Lack of advanced degree

Administrators identified the following leadership knowledge and skills that require improvements working with Extension program teams, local communities, and individuals:

1. Leader Development (individual level)

- Self-awareness
- Self-regulation
- Self-motivation

2. Leadership Development (group level)

- Social awareness
- Social skills
- Visioning and communication Implication

Extension educators have both internal and external professional development opportunities that help to improve and practice their leadership skills. However, there is a need to enhance leadership education for Extension professionals. Our findings on Extension educators' leadership development needs have implications for Extension professionals, administrators, and agriscience educators. Administrators might address issues related to educators' promotion, professional mentoring, financial resources, and heavy workload. Human resource practitioners might focus on both leader (i.e. self-awareness, self-regulation, and self-motivation) and leadership (i.e. social awareness, social skills, and broad visioning and communication) skills development. Future research might investigate how specific organizational policies and individual level barriers can positively affect educators' leadership development among Extension educators. The results of this study cannot be generalized across all Extension systems, as only Penn State Extension professionals were involved. This study could be replicated in

other state Extension systems or nonprofit organizations working to investigate leadership professional development needs for employees. This type of study could inform the creation of a broader assessment that could be distributed to all employees across the organization.

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Using a digital tool to gauge the relevance of agricultural advisory services

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Teagasc

Keywords

Evaluation, Advisory Services, Methods and Instruments, Indicators

Context description; problem domain; conceptual framework; practical and theoretical background

Teagasc (Irish Agriculture and Food Development Authority) carries out cyclical peer reviews of its 12 Advisory Regions. One of the key evaluation criteria is the Relevance and Impact of the advisory service provided in the region, with a sub criteria being client reputation, one of the indicators of which is satisfaction levels. A recommendation from the peer review process in 2017 was the need to consider approaches to collecting client feedback that would provide valuable insight to the region to improve services and delivery. This was based on the observation that although the Peer Review Panel recognised the attempts by Teagasc to gather client feedback they felt there was no systematic method used and that much of the feedback that was gathered, lacked detail and depth to provide meaningful insight that may help inform future service delivery.

Design; methodology; approach;

In November 2019, a short, 5 question survey based on the Net Promoter Score (NPS) methodology (Reichheld, 2003) was distributed in 2 waves by SMS (text message) to clients in one of Teagasc's 12 advisory regions. The NPS is an alternative to traditional customer satisfaction research. It is internationally recognised, simple to implement (one question), easy to calculate and comparable over time and locations. Although most of the questions in the survey were closed, some open questions were included. The client population was segmented by enterprise type and farm size. A small number of clients, unable to respond to the SMS based survey, were interviewed by phone.

Data collection and analysis; evidence;

A survey of 910 Teagasc clients out of a population of 4,200 clients in the Wexford-Wicklow- Carlow Advisory region was carried out in December 2018 by an externally contracted market research company. Responses were analysed using descriptive statistics and thematic analysis. In addition to the NPS question, additional questions on farmers' experiences with their advisors in terms of meeting their needs, levels of trust, accessibility, knowledge, responsiveness to their problems were asked. In addition, the survey sought farmers' feedback on different advisory contact channels including on the farm, over the phone or in-office consultations. Farmers' expectations for the future

and associated actions were also solicited through the survey. The survey collected data was matched with other pre-existing farmer level data (discussion group membership, face to face contact with agricultural advisor, size of farm, type of farm enterprise) and incorporated into a dashboard (with hierarchical access) for analysis, interpretation and presentation purposes.

Results and Implications.

Overall, the NPS for farmers in this region was 35, which compares favourably with other B2B NPS scores. Looking at farm enterprises, cattle farmers had the highest NPS (38) followed by dairy, sheep and tillage (32). Underpinning these strong NPS scores was farmers' feedback on the professionalism of advisory staff; an excellent service; up to date expertise on the part of their advisors and strong communication of information and advice. Apart from dairy farmers, those farmers from other enterprise who were in discussion groups had a lower NPS than those in discussion groups, an unexpected finding which needs further analysis of the open questions responses. However, some of the explanation centres on the cost of advisory services to those farmers and access to services; advisory staff changes which disrupt the farmer-advisor relationship; lack of tailored advice and communication shortfalls.

From a management perspective, this survey helps Teagasc to focus on the identified 'passives' and address the particular issues they raised about the advisory service: this is the strongest leverage point to improve service delivery to clients. From an evaluation perspective, the NPS based survey is an instrument providing a more robust measure of Teagasc clients' satisfaction with advisory service over time and across locations, which will form part of the cyclical peer review process into the future.

Understanding farmers' innovation needs: a proposal for supporting the Public decision-making process to improve innovation adoption in agriculture

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Keywords

Innovation, entrepreneurial objectives, FADN survey, rural policy evaluation, AKIS

Abstract

Innovation is considered as one of the key drivers for a competitive and sustainable agriculture and the European Commission highlights the importance of evaluating innovation for rural development programming. The scientific literature offers a wide panorama of tools and methods for the analysis of innovation in agriculture but the lack of data on the state of innovation in the farms, hampers such studies.

A partial answer to overcome this limit is the use of the data collected by the Farm Accountancy Data Network (FADN). The wide range of information collected by this survey in Italy has made it possible to measure the management results affected by the adoption of an innovation. The comparison of these results between different territories and farm typologies is the basis of the proposed methodology aimed at providing evaluation elements useful for understanding entrepreneurial innovation needs.

In our opinion, the originality of the proposed analysis does not concern the method that is commonly used for business management analysis, but its application to a set of indicators associated with the entrepreneurial objectives that motivate the adoption of an innovation. If a public intervention for the innovation diffusion can meet these objectives, it is more likely that innovation will be implemented by the farms concerned. In this context, the role of the AKIS is crucial to support the decision-making process of both the entrepreneurs and the policy makers, so this methodology can provide a "fine-tuning" tool for a better recognition of farmers' innovation needs.

Introduction

In the last years, the AKIS studies agree on the importance of the direct involvement of the farmers in the innovation processes to identify the better response to the farm problems and to improve the effectiveness of the innovation (Leeuwis, 2004; Botha et al., 2017; Fielke et al., 2017; J. Ingram et al., 2018). Direct involvement means the operational collaboration of all actors (researchers, consultants, farmers, etc.) in the actions using tools appropriate to the target (Bargellini et al., 2015), providing partners with some opportunities to verify the activities and the possibility to modify the process.

The European policy has also adopted this approach (EU SCAR, 2012; Brunori et al., 2013; Vagnozzi, 2015). Regulations (particularly on Horizon 2020/Horizon Europe and

rural development policy) and guidelines/technical fiches have been published with rules and recommendations that require projects co-managed among different types of participants having a same “decision making power” (Operational Groups of EIP AGRI or innovation pilot projects or Multi-actor projects etc.) (Zezza et al., 2017). It has often been highlighted that tacit and experiential knowledge is as important as scientific knowledge to promote an effective innovation process.

However, in our opinion, there are many scientific analysis, operational case studies, good practices to guide and support the activities of AKIS operational actors, but there are not so many analyses on how this approach can be applied in public programs, in the official instruments that define the policy strategy to promote the diffusion of knowledge and innovation. In these cases, the question is: how to draw up a program that considers the real context situation? How can we promote a strategy that starts with a credible needs’ analysis?

Currently, almost all public programs involving development funding are introduced by a section describing the context of program implementation, providing qualitative and quantitative information and data related to the needs of an area, productive sector, etc..

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However, there aren’t many information of the agricultural sector - with reference to detailed data on specific sectors and rural territories - and about the knowledge and innovation needs of farms. Specifically, the data that can support a development strategy addressed to specific target of beneficiaries are often very lacking (Poppe et al., 2016). It’s the case of small and medium- sized farms competitiveness for example. So, the consequence is that the programs have a very generic description that does not indicate the specific goals and strategic choices, limiting the use of participative approach and co-innovation activities only to the funded projects.

In this way, public programs don’t have the opportunity to direct the interventions they finance (often through calls for proposals) towards development priorities, weak sectors or beneficiaries in difficulty. The whole policy system loses effectiveness and efficiency and it can be important in a period of limited resources. The solution of this problem is not easy because the provision of detailed data and information on specific contexts and needs is always connected with the high availability of human, technical and financing resources.

Another issue related with the comprehension of the innovation needs is the difficulty to bring out the farmers’ point of view. The importance and the positive effects of the innovation are often studied considering the general context and the critical economic and environmental trends, more rarely are analysed starting from the specific characteristics of the production processes and of the farm types.

In this document we are trying to give a partial answer to the above problems by verifying whether the use of the economic and financial data collected under the European initiative that has been operating in all the Member States since the 1960s, the Farm Accountancy Data Network (FADN), can be useful for this purpose. In fact, these data make it possible to identify some economic, environmental and social problems of the farms that could be an indirect proxy of innovation needs.

In addition, FADN data cover specific categories of farms that differ in geographical location, economic size and production processes. The data therefore allow problems and needs to be identified in a sufficiently circumscribed way.

Another question that we have addressed concerns what information and policy suggestions could derive from these data, and what usefulness they could bring to institutional actors or, more generally, to agricultural actors.

Finally, we asked ourselves what methodological problems might arise from the use of FADN in its current approach.

Why a farmer should innovate?

The entrepreneurial drivers to innovate usually comes from a need for change induced from outside or inside the farm. For example, the process of globalization and market opening is a powerful external stimulus, while the reduction of production costs is an internal decision-making lever. Often the two drivers are closely connected: in the previous example, an innovation that allows costs reduction would also improve the farm's competitiveness in the market. In general, a rationale entrepreneur decides to innovate when there is a clear business advantage, regardless of the possibility of accessing public funding.

Policies for farm innovation pursue public and private goals (Knichel et al., 2009), the former justify public funding, such as reducing negative externalities or improving food security, the latter motivate the entrepreneurial decision to implement the change. The effectiveness of public action mostly depends on the coherence between public and private interests.

The public objectives are outlined by the strategic priorities of the policies, while the private ones can be multiple and diversified according to the expectations of the entrepreneurs, their skills and the firm characteristics (Diederer, 2003). Many of these different entrepreneurial objectives can express the innovation needs of farmers, so the evaluation and measurement of their implementation can provide indications worth to respond to these needs. Starting from the three general objectives of rural development policies¹, i) economic competitiveness, ii) environmental sustainability and iii) social equity, it is possible to derive more specific entrepreneurial goals, considering that any public support for innovation in agriculture must be consistent with these overall objectives.

The economic competitiveness of a farm depends on its technical efficiency, on the ability to transform the raw materials into products and/or services, using the available resources (land, labour and capital). To improve technical efficiency, a farmer should be able to increase outputs and/or decrease inputs of the production processes, and this could be achieved by a technological innovation adoption. Any innovation capable to improve productivity or profitability (Viaggi, 2015), for example increasing the production yield or reducing the labour, responds to farmers' needs.

The environmental sustainability of agricultural activities is a very important objective for European policies. Every innovation financed must be sustainable and addressed to reduce environmental impacts or inputs. Probably this goal is not so straightforward for a farmer who sometimes perceives it as a constraint, in any case, the rational use of natural resources, such as water for irrigation, and the containment of the consumption of technical means, such as fertilizers and pesticides, are low environmental impact goals (Abitabile et al., 2013) that facilitate the adoption of sustainable innovation.

The social sphere is certainly the least explored, in terms of the evaluation of farm social equity and sustainability. It is quite rare for an agricultural entrepreneur to consider innovation also as a tool for improving the social conditions in the farm, but there is no doubt that, for example, improving occupational stability or decreasing physical fatigue (Abitabile et al., 2013) can motivate the adoption of an innovation.

These and other professional objectives can be associated with innovation needs, in the sense that farmers expect an innovation to be able to pursue these goals. Each of these objectives can be measured by at least one managing indicator, and the values comparison between different type of farms can identify the relative position of each with respect to the objective.

The use of FADN for the innovation assessment in agriculture

Innovation is seen as one of the key drivers for a competitive and sustainable agriculture. Recently, the European Commission highlighted the importance of evaluating innovation for the programming period 2014-2020, “due to the prominence that the topic has achieved on the general policy agenda”, even if “capturing these effects brings several methodological challenges for the evaluation” (EC, 2017). In contrast to farm competitiveness analysis, we are not aware in-depth studies on the impact of innovation on the general sustainability of farming in European Union member States (Van der Meulen et al., 2016). The lack of data on the state of innovation hampers such studies. Against this background, the EU framework 7 project FLINT identified the gaps in the current data availability and collected farm-level indicators on innovation in nine EU State members in combination with FADN data (Poppe et al., 2016). Based on the result of the Flint project, Van Galen and Poppe (2013) propose that “monitoring of innovation in the FADN should be installed”. Indeed, the FADN does not provide any specific information concerning the implementation of innovation by farms, except for some types of investments in assets, which can be used as a proxy for innovation (Van der Meulen, et al., *ibidem*).

Therefore, few studies use data from FADN to analyze innovation on farms and, when they use, they propose to integrate the FADN data with data collected from ad hoc surveys. It's the case of Cristiano and Proietti (2019) that explore the potential of FADN to assess technical, economic and environmental effects of cooperative innovation projects at farm level.

Brennan et al. (2016) examines the use of extension services by farm households across eight European Union (EU) Member States, exploring the type of extension services engaged with, the degree of engagement and the type of information requested. The impact of extension on economic, environmental and social sustainability is also considered. The data are collected from a pilot sample of 820 households in 2015/2016 as part of the EU mentioned above project (FLINT), and, also in this case, the results are incorporated with FADN data. The results outline the differences between the selected countries and suggest that the degree of households engaged with extension services is primarily influenced by national policies. In addition, this analysis indicates that the extent of this engagement has implications for sustainability at the farm level.

Ryan et al. (2014), identified farm indicators on innovation in Ireland: they shown that the adoption of innovative practices to be highly correlated with farm economic performance: “wider adoption of innovative practices which increase the efficiency of resource used have potential for a win-win outcome by not only reducing the impact on the environment, but also reducing production costs”.

Diederer et al. (2003), analyzed the choice to be an innovator, an early adopter or a laggard, in a context of a large sample of farmers participating in the Dutch FADN. They found that structural characteristics (farm size, solvency, age of the farmer) explain the difference in adoption behavior between innovators and early adopters on the one hand and laggards on the other. Bremmer et al. (2002), studied the effects of farmer characteristics, firm structure and firm performance on firm renewal (innovation and diversification) and firm growth in Dutch farms. It is obvious from the results that firm structure has a larger impact on firm development than farmer characteristics and performance. Contrary to prior expectations, no significant relationships have been found between age, succession, of farm income and firm development indicating that the life cycle has no influence on firm development. The results indicate that the degree of mechanization has the largest marginal impact on firm development, i.e. it is positively correlated with both firm growth and renewal. A high degree of mechanization implies high investments in the past, encouraging firm renewal and firm growth. Family labour

input and solvency are negatively correlated with firm growth. Renewal is more likely at big firms than at small firms, whereas, firm size has no significant impact on firm growth.

Within this framework, this paper presents the path analysis followed to contribute to the identification of the innovation needs of Italian farms through the data collected by the Italian FADN survey.

In our opinion the originality of the present study concerns two aspects. The first is the attempt to analyse innovation needs by observing them from within the farms and its management, trying to bring out the differences that are determined by geographical location, production orientation and economic dimension.

The second relates to the proposed information analysis process: the choice of the indicators and the use of the processing method to measure farm's critical issues to innovate.

Finally, this study aims to provide useful information for the decision-making process of the rural development stakeholders.

The Farm Accountancy Data Network

The Farm Accountancy Data Network (FADN) is the only harmonised source of micro-economic data of agricultural holdings in the European Union²; they are systematically gathered at national level from 1965. It contains information at the farm level about structures, production and economic results. It is a data analysis tool designed to evaluate the income of agricultural holdings or farms and the impact of the Common Agricultural Policy (CAP).

The Italian FADN sample survey of about 11,000 farms, has been designed considering the main types of regional farms, with a coverage of at least 90% of the total Standard Output (SO)³. This characteristic allows to represent the most professionalized part of the Italian farmers.

The surveyed sample is randomly drawn from the structural survey of the Italian National Institute of Statistics (ISTAT), and provides representative data along three dimensions, i.e. geographical region (location), economic size (ESU) and type of farming. The strategic variables used to assure sampling significance along the three mentioned dimensions are the Standard Output (SO), the value of production at basic prices and the value of intermediate production costs.

The accounting network in Italy collects more information than the ones established in the European regulation. The final database contains structural and activities information useful for analysing costs and revenues, CAP contributions, labour and other productions factors.

The FADN is therefore used as a tool for policy evaluation (e.g. Rural Development Programmes in the period 2007-13 and 2014-20) and planning of interventions (Mantino et al., 2000, Agriconsulting, 2016; NUVAL, 2016; Abitabile e Scardera, 2008). The information available is particularly relevant for scenario and counterfactual analysis, because there are many indicators that can be quantified with the data collected. However, certain limits or warnings must be considered, both when setting up the analyses and when reading and interpreting the data. It should not be forgotten that the survey has been designed for accounting purposes and therefore economical and productive outcomes are more relevant than social and environmental ones. However, the evolution over the years of the survey methodology has led to the introduction of further managing aspects, extending the range of possible uses in the analysis of agricultural enterprises (Bassi and Cislino, 2010).

Methodological approach

The methodology applied for the analysis is based on the comparison between indicators calculated for similar farms in terms of economic size (small, medium, large) and production sector (type of farming - TF). The aim of this approach is to identify some critical aspects, faced by rural farms, that can be improved by the adoption of one or more innovations.

The steps of analysis design can be listed as follows:

- (1) identification of farms' objectives (economic, environmental, social);
- (2) identification of indicators related to the objective;
- (3) comparison of the value of each indicator between homogeneous groups of farms and the correspondent average value of the relevant geographic area.

The first step of the analysis is the identification of the farms' objectives, that represent the entrepreneurial reasons of the innovation/s adoption. These specific objectives can be associated to the three European rural policy macro objectives: i) economic competitiveness;

ii) environmental sustainability; iii) social equity.

For each farm objective, an indicator has been identified and calculated to assess the expected effects on farm management results. The indicators list is shown in Figure 2. The indicators are drawn up on the farms of the Italian FADN sample, for the period 2011-2017, with more than 8,000 euros of Standard Output (SO).

The dataset contains more than 61.000 observations along 6 years of about 21.000 farms. The indicators are calculated for groups of farms distinguished by regional localization (21 territories), type of farming (TF)⁴ for 61 categories, economic size (ES) for 3 classes⁵. This stratification has generated more than 1.800 groups of farms that represent the analysis units.

Within each group the averages values of each indicator were calculated dividing the whole period in two phases: 2012-2014 and 2015-2017. The second period identify the current situation (static analysis); the comparison between the two periods, shows the trend (dynamic analysis). The groups are formed by 10 firms at least, and the group



Figure 1: Analysis design scheme

value of each indicator is a trimmed mean ($\pm 5\%$).

The indicators have been calculated in such a way that their bigger values state a better management situation related to the associated objective. The indicators measured in euros are deflated to remove price trend effects.

| Objective for the adoption of the innovation | | | Indicators | | | | | |
|--|----------|---------------|------------|---|---------|--|-----------------|-------------------|
| Macro Objectives | Economic | Environmental | Social | Objective | Acronym | Description | Unit of measure | Innovation Impact |
| | | | | | | | | |
| ✓ | ✓ | ✓ | ✓ | lower energy consumption | CO2EUA | share of energy costs / Present Value | € | ▽ |
| ✓ | ✓ | ✓ | ✓ | lower water consumption | CO2EUA | share of water costs / Present Value | € | ▽ |
| ✓ | ✓ | ✓ | ✓ | greater sustainability of productive processes | INDVITA | stable indicators on climate and soil health control | Index | ▲ |
| ✓ | ✓ | ✓ | ✓ | lower water stress | INDVITA | average age of buildings and facilities | years | ▽ |
| ✓ | ✓ | ✓ | ✓ | greater supply chain integration | PRIPAN | share of Present Value of processing products | € | ▲ |
| ✓ | ✓ | ✓ | ✓ | improved economic efficiency of production processes | PRIPAN | share of variable costs / Present Value | € | ▽ |
| ✓ | ✓ | ✓ | ✓ | new investments | PRIPAN | new investments / Total capital | € | ▲ |
| ✓ | ✓ | ✓ | ✓ | greater farm profitability | PRIPAN | average Present Value / Income | years | ▲ |
| ✓ | ✓ | ✓ | ✓ | greater farm profitability | PRIPAN | net income / Present Value | € | ▲ |
| ✓ | ✓ | ✓ | ✓ | higher labor productivity | PRIPAN | sales / Total work cost | years | ▲ |
| ✓ | ✓ | ✓ | ✓ | greater profitability of family work | PRIPAN | net income / family work cost | years | ▲ |
| ✓ | ✓ | ✓ | ✓ | increase in the share of income not supported by European funds | PRIPAN | percentage of European funds on net income | € | ▽ |
| ✓ | ✓ | ✓ | ✓ | low use of fertilizers | PRIPAN | average price / hectare of NPK | € | ▽ |
| ✓ | ✓ | ✓ | ✓ | increased use of milk crops | PRIPAN | share of milk crops area | € | ▲ |
| ✓ | ✓ | ✓ | ✓ | lower nitrogen density | PRIPAN | kg / hectare of fertilizer area | kg | ▽ |
| ✓ | ✓ | ✓ | ✓ | greater crop diversification | PRIPAN | number of crops/ha | years | ▲ |
| ✓ | ✓ | ✓ | ✓ | low use of phytochemicals | PRIPAN | use of phytochemical per hectare | kg | ▽ |
| ✓ | ✓ | ✓ | ✓ | low use of herbicides | PRIPAN | use of herbicide per hectare | kg | ▽ |
| ✓ | ✓ | ✓ | ✓ | increased family employment | PRIPAN | share of family labor | € | ▲ |
| ✓ | ✓ | ✓ | ✓ | increase in training level of workers | PRIPAN | level of education of workers | Index | ▲ |
| ✓ | ✓ | ✓ | ✓ | greater farm turnover | PRIPAN | average age of the farmer | years | ▽ |
| ✓ | ✓ | ✓ | ✓ | low farm internal productivity indicators | PRIPAN | Work Unit per hectare of UPA | € | ▽ |
| ✓ | ✓ | ✓ | ✓ | greater long-term employment | PRIPAN | share stable working days (family and employees) | € | ▲ |

Figure 2 – Objective for innovation adoption and related indicators

The situations of territorial advantage or disadvantage have been identified by comparing the average of the indicator of each group, with the average value of the correspondent geographical area (North-West, North-East, Centre, South and Islands). A value of 100 indicates the equality between the territorial and the reference area.

The formula used is:

$$II = \frac{xxiii}{XXiii} * 100$$

where x and X are the average values of the indicator (i) calculated for each group (g), for a region (x) and for the related geographic area (X). The ratios have been reversed when a lower indicator value states a positive management impact of an innovation (e.g. less water consumption). After this reversal, all indexes below 100 identify groups that show a situation of disadvantage related to the objectives associated with indicators. In fact, it was considered more interesting to evaluate the most disadvantaged groups, because these include the farm typologies where the positive impact of innovations could be more evident and measurable.

The results are summarized and analysed in regional reports, published on the Italian Rural Development Network site⁶.

Results Analysis

The following tables⁷ show for each of the four regions analysed so far, the five business groups that report the most critical issues measured by the indicators listed per row. The severity of the disadvantage is measured, by the deviations of the indicators from the reference averages, both in the most recent period (static analysis) and across the two considered periods (dynamic analysis). Furthermore, these deviations are wei-

ghted by the number of firms belonging each group, to give greater relevance to the most common types of farms in the region.

By reading these tables, the analyst can obtain some information to refine the interventions that promote the spread of innovations on farms. For example, in the Sardinia region, sheep farms are lacking in terms of efficiency and economic productivity, moreover they highlight a relevant use of energy. Crossing these results, it could be inferred that these farms could benefit from innovations that improve the efficiency of production processes but without increasing energy consumption. These innovations could be technological but also organizational and the Measure 4 of the RDPs, dedicated to material investments, associated with the third measure, that promotes certification systems, could support this type of innovations.

In the Marche region small farms with arable crops show the greatest disadvantages, in all the indicators considered in the example tables. These small farms seem to need innovations

The results of the Piedmont region show that specialist cattle - rearing and fattening farms are these with greatest disadvantages in all the indicators analysed and proposed in the following tables. The medium farms seem to need innovation that can improve the production efficiency and therefore processes aimed at identifying equipment should be encouraged to produce improvement in economic efficiency in terms of costs reduction (Measure 4 - Investment in physical assets). The same farms seem to need also innovation that can reduce mechanization intensity and Fertilizer Consumption (Measure 10 - Agri-environment-climate commitments).

In the Campania region the small specialized olive farms show the greatest disadvantages for economic and environmental components. Particularly, they are deficient in terms of efficiency productivity and they have environmental problems because of the higher mechanization intensity and use of fertilizers. These same economic and environmental issues concern small specialist dairying farms, while small specialist quality wine farms are lacking in terms of labour productivity and should also reduce the intensity of mechanization. Crossing these results, it could be inferred that these farms could benefit from innovations that improve the efficiency of production processes in economic and environmental terms. Measure 4 of the RDPs, dedicated to material investments, associated with Measure 16 for cooperation projects, could support this type of innovations.

These examples outline some common weaknesses of specific farm typologies and allow to identify possible "tailor made" interventions to spread innovations. They can be also used for planning public interventions addressed to support innovation diffusion (ex-ante evaluation) but also to assess whether these interventions have produced measurable effects on farms (ex-post evaluation).

To facilitate the reading and interpretation of these results for evaluation purposes, a regional reporting system has been settled by the Italian Rural Development Network. The reports present and analyse the results with an increasing level of detail.

Each report provides some policy briefs, where the detailed results are reorganized considering the extent of the negative deviations of the groups (in static and dynamic terms) and the number of farms included in each one. By the combination of the results, the analyst who knows the regional agriculture sector, can express an evaluation about the appropriate interventions to support innovations.

We are aware that the above information provides only some indications about the farms' problems, and that these ones are not always connected with innovation needs, but they alert to deepen the farm situations with other qualitative and quantitative information.

Table 1.a – The first 5 farm typologies with serious disadvantages measured by economic indicators

| Objectives (indicators) | Italian regions | | | |
|--|---|--|--|--|
| | Piemonte | Marche | Sardegna | Campania |
| Increase of Production Efficiency (Share of Variable Costs) | MF specialist cattle - rearing and fattening | SF specialist various field crops combined | MF specialist sheep | SF specialist olives |
| | LF specialist pig fattening | SF specialist wine other than quality wine | MF specialist cattle - rearing and fattening | MF specialist fruit (other than citrus, subtropical fruits or nuts) |
| | MF specialist quality wine | MF specialist various field crops combined | SF specialist sheep | SF specialist dairying |
| | SF specialist various field crops combined | SF specialist cattle - rearing and fattening | MF mixed livestock, mainly non-dairying grazing livestock | SF specialist goats |
| | MF mixed field crops and vineyards combined | MF specialist fruit (other than citrus, subtropical fruits or nuts) | MF specialist various field crops combined | SF specialistcereals (other than rice) oilseeds and protein crops |
| Increase of Labour Productivity (Gross Value Added per Work unit) | LF specialist pig fattening | LF specialist various field crops combined | MF specialist sheep | SF specialist various field crops combined |
| | SF specialist cereals (other than rice) oilseeds and protein crops | SF specialist quality wine | LF specialist sheep | SF specialist quality wine |
| | SF specialist cattle - dairying, rearing and fattening combined | MF specialist quality wine | MF specialist dairying | SF specialist cereals (other than rice) oilseeds and protein crops |
| | SF specialist fruit (other than citrus, subtropical fruits or nuts) | MF specialist cereals (other than rice) oilseeds and protein crops | MF specialist cattle - dairying, rearing and fattening combined | SF specialist vegetables indoor |
| | MF specialist rice | SF specialist nurseries | SF specialist sheep | SF specialist olives |

Legend: SF - small size farms (8K€<=SO<50k€) MF - medium size farms (50K€<=SO<200K€) LF - large size farms (SO >=200K€)

Table 1.b – The first 5 farm typologies with serious disadvantages measured by environmental indicators

| Objectives (indicators) | Italian regions | | | |
|---|--|---|---|--|
| | Piemonte | Marche | Sardegna | Campania |
| Reduction of Mechanization Intensity (Energy Power per hectare) | SF specialist cattle - rearing and fattening | SF specialist various field crops combined | SF specialist sheep | SF specialist olives |
| | LF specialist pig fattening | SF mixed field crops and permanent crops combined | MF specialist dairying | MF specialist sheep |
| | MF specialist cattle - rearing and fattening | SF specialist field vegetables | SF specialist field vegetables | SF specialist quality wine |
| | MF specialist rice | MF specialist cattle - rearing and fattening | SF specialist cereals (other than rice) oilseeds and protein crops | specialist dairying |
| | MF specialist dairying | SF specialist cattle - rearing and fattening | MF specialist field vegetables | MF specialist nuts |
| | MF specialist cattle - dairying, rearing and fattening combined | SF specialist cereals (other than rice) oilseeds and protein crops | SF specialist cattle - rearing and fattening | SF specialist various field crops combined |
| Reduction of Fertilizer Consumption (Use of Fertilizers per hectare) | SF specialist cattle - rearing and fattening | SF specialist cattle - rearing and fattening | SF specialist vegetables indoor | SF specialist olives |
| | LF specialist cereals (other than rice) oilseeds and protein crops | LF specialist various field crops combined | MF specialist field vegetables | SF specialist dairying |
| | LF specialist cattle - dairying, rearing and fattening combined | MF specialist quality wine | MF specialist quality wine | SF mixed field crops and permanent crops combined |
| | LF specialist pig fattening | MF specialist cereals (other than rice) oilseeds and protein crops | | MF specialist field vegetables |

Legend: SF - small size farms (8K€<=SO<50k€) MF - medium size farms (50K€<=SO<200K€) LF - large size farms (SO >=200K€)

Final remarks

This methodological proposal, based on the identification of the farm management critical performances, facilitates the spatial and sectorial analysis of a rural territory, delimiting the business contexts where the diffusion of innovation can be more effective.

The selection of indicators associated with the business objectives that motivate the adoption of innovations, and the farm clustering, allow not only to highlight the disadvantages but also to order them by relevance and diffusion on the territory.

Moreover, the periodic verification of the results, could be a diagnostic tool to check the “health state” of the regional production system and to assess the possible effects of the intervention strategies for innovation.

The method and the reporting have been designed in the first instance, for policy ma-

Table 1.c – The first 5 farm typologies with serious disadvantages measured by social indicators

| Objectives (indicators) | Italian regions | | | |
|---|--|---|---|---|
| | Piemonte | Marche | Sardegna | Campania |
| Increase of the Instruction Level (Instruction Level of Farm Workers) | SF specialist cattle - dairying, rearing and fattening combined | SF specialist cereals (other than rice) oilseeds and protein crops | MF specialist various field crops combined | SF specialist various field crops combined |
| | LF specialist dairying | LF specialist various field crops combined | SF specialist quality wine | SF mixed non-dairying grazing livestock combined with field crops |
| | LF specialist quality wine | MF specialist various field crops combined | SF specialist various field crops combined | LF specialist vegetables indoor |
| | MF mixed various crops and livestock | SF specialist various field crops combined | SF specialist various grazing livestock | MF specialist various field crops combined |
| | LF specialist pig fattening | MF specialist cereals (other than rice) oilseeds and protein crops | SF specialist field vegetables | MF specialist fruit (other than citrus, subtropical fruits or nuts) |
| Increase of Family Engagement (Share of Family Work Units) | MF specialist quality wine | SF specialist various field crops combined | MF specialist field vegetables | LF specialist field vegetables |
| | MF specialist cattle - rearing and fattening | SF specialist cattle - rearing and fattening | SF mixed field crops and vineyards combined | SF mixed non-dairying grazing livestock combined with field crops |
| | SF specialist cereals (other than rice) oilseeds and protein crops | MF mixed livestock, mainly non-dairying grazing livestock | SF specialist wine other than quality wine | LF specialist dairying |
| | MF specialist cereals (other than rice) oilseeds and protein crops | SF specialist field vegetables | SF specialist various grazing livestock | MF mixed field crops and horticulture combined |
| | SF specialist cattle - rearing and fattening | SF mixed cropping, mainly field crops | SF specialist various field crops combined | MF specialist dairying |

Legend: SF - small size farms (8K€<=SO<50k€) MF - medium size farms (50K€<=SO<200K€) LF - large size farms (SO >=200K€)

kers and evaluators of public actions supporting innovation, but they also provide useful information to Extensions services. For example, by comparing the same farm type in two different regions, it is possible to assess whether it is useful to promote actions to transfer innovations, experiences and skills.

The proposed methodology is only descriptive, because it does not use statistical significance tests to validate the outcomes. This was a choice to facilitate the interpretation of the results even by those who do not have specific scientific skills. It is therefore not possible to demonstrate the existence of an actual need for innovation on farms, but the outcomes indicate situations of relative weakness and / or delay that can be potentially addressed by introducing appropriate innovations to pursue the objective associated with each indicator.

With reference to the methodology of comparative analysis proposed, it should be noted that not all situations of disadvantage can be faced with a greater spread of innovations but there may be structural, geographical, environmental or social constraints that limit the farm development.

Despite these and other limitations, this methodology allows us to have, at a glance, a summary of the regional production systems that focuses on the main strengths and weaknesses of farm types. This analysis can help to identify those areas of production that need more attention and to investigate more deeply even through the Extensions support.

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Development of a participatory approach to foster transdisciplinary knowledge exchange on agroecological farm innovation in an interregional context.

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Keywords

Reflexive monitoring in action, agroecology, learning processes

Abstract

Within the context of an Interreg V project, an interregional (France, Wallonia, Flanders) collaboration between researchers, advisors, and farmers has been set up to support the development of agroecology at the farm level. One of the objectives of the project is to create a context that feeds collective knowledge exchange, co-creation and learning, as a way to stimulate farmers in adopting agroecological measures. We developed a participatory approach that fosters an iterative, collective learning process in which challenges are identified and solutions are co-designed with the partners along the project. We based our monitoring approach on the framework of reflexive monitoring in action (RMA) consisting of alternating stages of observation, analysis, reflection and action. Monitoring occurs in terms of set-up of the learning environment, motivation to invest in agroecology, and the extent and nature of learning. We use questionnaires, semi-structured interviews and observations for monitoring during project activities. Focus groups will be established to reflect with the participants on the results of the observations and to discuss solutions to particular challenges. In this paper, we describe the establishment of the RMA cycle during the first year of the project. We mention the difficulties we came across and how we dealt with them. During the following 3 years of the project, these experiences can be used to further establish RMA in an effective way in order to support the transition to agroecology.

Focus Group Discussion: a multi-purpose tool for stakeholder consultation, fostering social learning processes and monitoring learning outcomes

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Keywords

Focus group discussion, social learning, stakeholder consultation, participatory, experimentation, sustainable development, Tigray

Abstract

Participatory approaches, like for example, Focus Group Discussion (FGD), are often seen as suitable tools for planning and implementing within the context of social learning. FGDs are frequently used in social learning processes, not only in relation to stakeholder consultation but also to support these processes through developing trust and commitment. FGDs alternatively also might be used to monitor learning processes by documenting views of participants. A research project on the effectiveness of participatory experimentation in Tigray, Northern Ethiopia, served as a case study. In this project different FGDs were applied and we specifically analysed the outcomes of two workshops on the identification of constraints and opportunities, one at the start and one on the end of the project. Participants also considered in retrospect constraints and opportunities identified five years before. Furthermore observations were made in the FGDs and in throughout project. All participants continued their involvement for the full duration of our research project. Comparing between the initial and final workshops we observed that outcomes for the locations were relatively congruent but that categories identified became more outspoken. The observation that all groups kept being involved indicated that outcomes were considered meaningful. Farmers also felt more in control, suggesting double loop learning. In processes aiming at social learning in relation to sustainable development, FGD provides a valuable tool that, next to stakeholder consultation, not only supports the process as such but, at the same time is well suitable to inform about changes taking place with respect to learning.

Facilitating innovations in rural communities for Carbon Sequestration Project in Iran

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Keywords

Facilitation, Carbon Sequestration Project, rural communities, Participation, Iran

Abstract

The purpose of this paper is to assess the innovation facilitation interventions conducted in rural areas for the International Carbon Sequestration Project (CSP) in Iran.

Design/Methodology/approach: The study utilised a document analysis to study the process and impact of this project in Iran.

Findings: Starting from 2004, this project has emphasized on the mobilization and empowerment of the local communities through facilitating extension interventions. The projects has been built on the study and working on sustainable livelihood capitals and strategies. The main activities of the CSP are mobilizing local communities, institutionalization, and group working; improving knowledge; income generating and sustainable livelihoods; improving development services; and sustainable and participatory natural resources management (NRM). Facilitation and extension efforts were tailored to communities' needs, leading to increasing their knowledge and ability; introducing and institutionalizing participatory NRM techniques and approaches; increasing diversity in livelihood strategies; reducing the dependency on rangelands; and establishing Village Development Groups and rural credit funds.

Practical/Theoretical/Political Implications: The CSP can be seen as a sustainable rural development approach and extension interventions have encouraged rural communities to become more responsible for the sustainable use of water resources and land. In addition to absorbing and reducing atmospheric

18-21 June 2019, Acireale (Italy) carbon dioxide, benefits such as poverty reduction, community empowerment, environmental protection, and supporting local livelihoods have been addressed.

Originality/Value: Environmental issues, particularly carbon emissions have been escalated and it is necessary to utilise extension interventions through facilitating participatory approaches, including the CSP to manage these challenge.

Introduction

Global warming and climate change have been reported to be one of the most impor-

tant environmental issues and sustainable development challenges at local, national and global level in the 21st century (Awanthi & Navaratne, 2018; Chu, Zhan, Li, Zhang, & Qi, 2019; Wilnhammer, Wittkopf, Richter, & Weber-Blaschke, 2017). Increased greenhouse gases (GHGs) emission and concentration in the atmosphere is the main influential factor on global warming (Qi, Liu, & Leung, 2019). It is anticipated that CO₂ concentration in atmosphere would reach at least to 410 or 486 ppm (Leung, Caramanna, & Maroto-Valer, 2014; Raymond et al., 2013), which is very critical, comparing to pre-industrial value 280 ppm.

According to multiple studies, the CO₂ emissions from human activities are responsible for almost 60% of GHGs, which is produced especially from burning fossil fuels (Letcher, 2019; Mikayilov, Galeotti, & Hasanov, 2018; Scott & Lindsey, 2016). According to a European Union Joint Research Centre (JRC) report, fossil fuel combustion accounts for 90% of total global CO₂ emission (Balsalobre-Lorente, Shahbaz, Roubaud, & Farhani, 2018). Deforestation, vegetation and biodiversity loss, and soil erosion which have been mostly induced by human activities, also contribute to CO₂ emissions in the atmosphere (Abo, Kuma, & Hailu, 2016; Chazdon et al., 2016; Sil et al., 2017).

The average earth temperature based on current carbon dioxide emission rates is about 1.3- 1.5°C higher than before the pre-industrial time (Obergassel et al., 2015; Zhang & Da, 2015). This temperature is projected to continue to rise at a rapid rate, about 2-5 °C (Kolström et al., 2011; Raymond et al., 2013; Ren, Wang, Wang, & Liu, 2015) or 1.6 up to 5.8°C until 2100 in line with current rates of population growth and GHG emissions (Awanthi & Navaratne, 2018).

This challenge have raised concerns about increased catastrophic disasters, such as severe droughts, flood, storms and water scarcity (Irvine et al., 2017; Qi et al., 2019); seasonal changes, rainfall shortage in arid and semi-arid regions, various plant and animal species extirpation, negative impact on plants and trees growth (Fuhrer et al., 2006; Kolström et al., 2011), economic and environmental consequences; changes of rainfall/precipitation patterns, atmosphere, food production, pests and diseases (Bellard, Bertelsmeier, Leadley, Thuiller, & Couchamp, 2012; Fuhrer et al., 2006; Perez, Roncoli, Nely, & Steiner, 2007) and impact on maintaining human welfare and global ecosystems (Byrne, Hughes, Rickerson, & Kurdgelashvili, 2007).

Governments have started activities to reduce greenhouse gas and carbon emissions at various levels through the implementation of legal and voluntary initiatives and various projects, so they have tried to apply comprehensive solutions (Kurbanov, Vorobyov, Gubayev, Moshkina, & Lezhnin, 2007; Lauterbach, 2008). Carbon sequestration actions have been taken into consideration in the legislation forms, long-term plans or national and international projects in several countries or regions, including Iran, Africa (Powlson, Stirling, Thierfelder, White, & Jat, 2016; Rohit, Brent, & John, 2008; Unruh, 2008), USA (Woodbury, Smith, & Heath, 2007), Latin America (Chazdon et al., 2016; Lorenz & Lal, 2014), Himalaya (Upadhyay, Sankhayan, & Solberg, 2005), Asian countries such as Pakistan, Sri Lanka, Bhutan, Nepal (Fox, Castella, & Ziegler, 2014; Upadhyay et al., 2005; Yu et al., 2014), China (Deng, Shangguan, & Sweeney, 2014; Gao et al., 2014) and in parts of Europe (Katja, Axel, & Heinz, 2015; Lugato, Bampa, Panagos, Montanarella, & Jones, 2014).

Carbon sequestration is a long-term process through which CO₂ is removed from the atmosphere by capturing, collecting, and storing carbon dioxide as organic matter in long-lived plants and in soil (Kavehei, Jenkins, Adame, & Lemckert, 2018; Wu, Chen, Mao, & Feng, 2018). So carbon sequestration interventions play vital role in climate change mitigation, stability of global climate and the carbon cycle (Kavehei et al., 2018; Wu et al.,

2018). Sustainable natural resources management can facilitate introducing carbon sequestration through processes such as reforestation, afforestation, combating de-

certification and rangeland conservation and is considered as an approach for climate change mitigation (Tang & Zhang, 2018; Torres, Marchant, Lovett, Smart, & Tipper, 2010). It also provides economic, environmental, social and cultural benefits, which can have a key role in developing countries, especially in developing countries and rural areas, particularly maintaining and improving the economies and livelihoods of the local people, including rural communities and farmers for different generations (Babulo et al., 2009; Canadell & Raupach, 2008; Fabricius, Koch, Turner, & Magome, 2013; Wakeel, Rao, Maikhuri, & Saxena, 2005). Moreover, this approach will ultimately maintain food security and human well-being along with the conservation of natural and biological resources (Elmqvist et al., 2015; Hill & Mustafa, 2011; Wakeel et al., 2005).

The experience of carbon sequestration projects implemented in recent years shows that achieving their goals not only requires to apply environmental activities, such as measures for pollution control, energy efficiency, emissions reduction and carbon storage (Lauterbach, 2008), but social- economic aspects should also be taken into consideration, such as poverty reduction, community empowerment and environmental protection, helping to improve local livelihoods in developing countries (Rohit et al., 2008; Stringer et al., 2012). Local communities should receive benefits to apply sustainable land management and these projects should help them diversify their livelihoods and support their employment, not being in conflict with natural resources conservation (Jindal, 2004; Nematollahi, Kaboli, Yazdani, & Mohammadi, 2018). In this project context, a combination of various activities can be noted, such as forests and grasslands management, agricultural activities improvement, facilities and payments for environmental services. However, the implementation of these activities is associated with numerous political, social, economic, geographic and cultural challenges (Corbera, Estrada, May, Navarro, & Pacheco, 2011).

The carbon sequestration project has been designed, based on the United Nations Convention on Climate Change and the Kyoto Protocol (Blake, 2016) and has mainly been implemented in arid and semi-arid regions (Murdiyarsa, Herawati, & Iskandar, 2005). It defines means to reduce global warming and encourages industrialized countries to invest in carbon sequestration projects in developing countries (Jindal, 2006).

In fact, the most important goal of carbon sequestration is the process of eliminating (or reducing) carbon dioxide emissions from the atmosphere and increasing its storage in plants biomass, with measures to preserve and restore degraded natural resources and support sustainable development, especially in poor countries (Figuroa, Fout, Plasynski, McIlvried, & Srivastava, 2008; Jindal, 2006; Mbow et al., 2014). Reducing the greenhouse gases and climate change effects happens by regenerating the degraded natural resources which relies on reducing the human pressure on natural ecosystems and increasing their services (Canadell & Raupach, 2008; Feng, Fu, Lu, Zeng, & Wu, 2013; Kolström et al., 2011; Liu et al., 2014). Natural resources, as agriculture farm, forests and rangelands are sink of greenhouse gases (GHGs: CO₂, N₂O, CH₄) and can act as a carbon sink, absorbing carbon dioxide from the atmosphere through the photosynthesis process. Hence it is pivotal to mitigate anthropogenic greenhouse gas and climate change (Baker, Wade, Sohngen, Ohrel, & Fawcett, 2019; Fiore et al., 2018; Murphy, Gross, & Jaccard, 2018).

International Carbon Sequestration Project (CSP) in Iran

The interest in carbon sequestration as a mechanism for protecting the environment and reducing poverty has been rising significantly over the past decades in developing countries. Carbon sequestration can also increase the forests, rangelands and agricultural lands economic values of environmental services, especially biodiversity and sustainable agriculture development, and may help to reduce rural poverty (Lipper,

Dutilly-Diane, & McCarthy, 2010; Perez et al., 2007). Therefore, environmental services and livelihoods are likely to benefit from carbon sequestration (Stringer et al., 2012). The annual CO₂ emissions of Iran was reported 655.89 million tons, as the 7th CO₂ producers in 2017 globally.

The project has been defined at three levels: global, national, and local, focusing on a continuous and systematic relationship between reducing global warming and land reclamation in arid areas and natural resources management with the local people participation. At the local level, the project has been implemented to develop participatory perspectives on rangeland regeneration, to increase carbon sequestration and capacity, and to enhance local residents' socio-economic conditions. Therefore, the local community mobilization and empowerment is the main tool for managing rangeland and economic activities. This requires extension and facilitation interventions, such as diverse training courses for human capital growth, the formation of rural development groups for social capital development, establishing microfinance funds to improve financial capital, rural development for people and with people's help to enhance physical capital, and rangeland restoration for improving natural capital (Emami et al., 2017). This project in Iran aimed to sequester atmospheric carbon in arid and semi-arid areas and improve the socio-economic status of local communities. The project has used a community-based natural resource development approach and has followed three general objectives: 1) at global level (providing a model for carbon sequestration in arid lands considering economic issues and the potential of such lands to act as carbon sinks), 2) at the national level (restoring degraded natural resources), and 3) the local level (improving socio-economic status of local communities, poverty reduction and improving human development index by empowering development groups and enhancing ecosystem services (Ghasemi Aryan, Azarnivand, & Yari, 2015; UNDP, 2018). It can be considered as a part of the national development and a rural development project, in which topics related to social and human development are addressed along with considering physical, financial and environmental capitals (Mohamadi, Nematolahi, & Sepahvand, 2017). The CSP has three main strategies: 1) Enhancing local community participation through their membership in rural development groups; 2) Financial mobilization of rural communities through the formation of micro-credit funds and disbursement of small loans without any collateral; 3) Fostering various environmental activities stimulated by local community participation including rehabilitation, conservation and management of rangelands and natural resources, in general (Golmohammadi, 2013). The aim of this paper is to show the process of implementing this project and the facilitation and communication intervention in this project. Some outputs of the project are also presented.

Methodology

The study used a case study methodology using document analyses, focus groups and semi-structured interviews. The research conducted a document analysis of the CSP reports in 18 provinces of Iran and applied semi-structured interviews and focus groups with the experts of this project at national level (Forest, Rangeland and Watershed Management Organisation (FRWO) of Iran) and the facilitators and experts of the Natural Resources and Watershed Management of the Qom Province.

In the following, the findings of this research process will be presented.

Results

The CSP in Iran was a joint initiative between the Islamic Republic of Iran's government and the United Nations Development Program (UNDP), sponsored by the Global Environment Facility (GEF) in arid and semi-arid and undeveloped regions of Iran (Gha-

semi Aryan et al., 2015). The aim was carbon sequestration and improving the local communities' socio-economic condition using a participatory and community-based natural resources management approach. Considering the target communities' social, human, financial, physical and natural capitals, the project main activities were categorised in five main groups:

- a) mobilizing the local community, institutionalisation and group working; (b) training/ extension and applying knowledge and skills; c) income generating and establishing sustainable livelihoods; d) improving basic development services; and e) sustainable and participatory natural resources management (Kargar, Sardari, Pooyafar, Yari, & Ghasemi- Aryan, 2016).

The project intended to promote the capacity of local communities to revive, manage, develop and use sustainably natural resources and enhance rural development. Therefore, the planning programmers and practitioners believed that rural communities were at the core of this project and its implementation strategies focus on addressing three main sustainability principles that affect the natural resources management, including developmental needs, environmental issues and socio-economic concerns. The project has applied a bottom-up planning programme, which strives to give the authority to local people and leads to enabling target communities to take much more responsibility of local resources management and addressing their livelihoods' needs. These programmes are integrated with other local agencies' projects through a comprehensive process and led to developing local rural development programmes (Kargar et al., 2016). Therefore, the goal is to develop a participatory regenerative model of rangelands and to increase the capacity of absorbing carbon dioxide in degraded rangelands, while reducing the deprivation of local communities in the region.

The first step of this project was carried out in the Hussein Abad Gaynab area, located in the Sarbisheh County, in South Khorasan Province in 2003 (Fal-Soleiman & Chakoshy, 2011; Golmohammadi, 2013). The project's achievements encouraged the government (FRWO) to continue its second step in Tehran and Kerman provinces in March 2012 and its third step in four other provinces, Alborz, Semnan, Markazi and Bushehr in May 2013. The participatory management approach used in this project not only focused on reviving the natural resources, but other relevant programs were also implemented for rural development planning, especially financial resources management in the framework of organising rural development groups, locally micro-finance/ credit funds, and women's participatory projects. This perspective was welcomed by public organisations of other provinces, leading to defining it in 12 further provinces in Iran in 2014, including North Khorasan, South Khorasan, Khorasan Razavi, West Azarbaijan, Golestan, Isfahan, Fars, Ilam, Qom, Sistan and Baluchestan, Yazd, and Southern Kerman (Jiroft and Kahnouj). So the project was implemented in 18 provinces in an area of 1232360 hectares, covering 107 villages in the country in 2015 (Kargar et al., 2016; UNDP, 2018). In June 2017, the agreement between the FRWO and the UNDP for public cost sharing was revised. The aim was also to achieve participatory natural resources management and sustainable rural development in five new pilot sites in the four new provinces.

The UNDP reported that the project covered 2,832,471 hectares and 623 villages with 214,105 residents in 2017. This coverage was extended to 24 regions in 32 township/ county in 18 provinces, an area with 4,167,764 hectares, 806 villages and 269686 population. The area under implementation covered 331 villages with 150282 population.

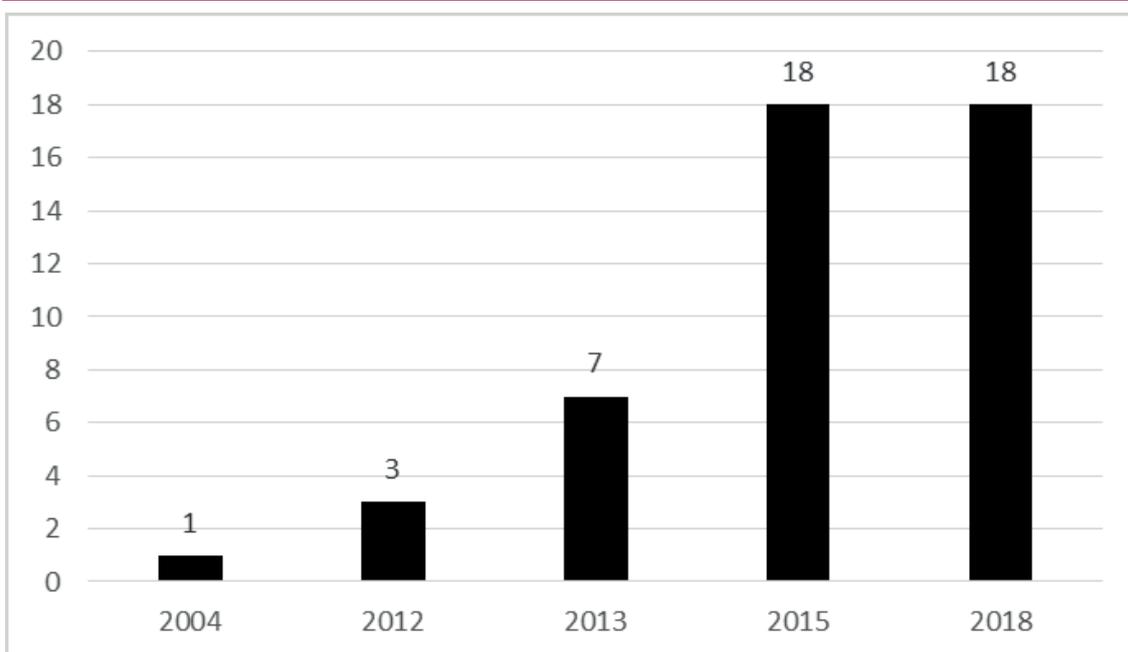


Figure 1. Number of provinces covered by the CSP project

Communication intervention and facilitation in Iran's Carbon sequestration project

Since the start of the CSP project, extension and facilitation projects have been organized to help rural communities and other stakeholders achieve the carbon sequestration goals. This depended on how to proceed the project, which included selecting rural communities and facilitators, situation analysis, project design, implement interventions and doing monitoring and evaluation.

Selecting rural communities and indicators

According to the focus groups and interviews, the main criteria for selecting rural communities in the CSP were having over 20 households; deprivation and poverty; intention to participate in the project; having the potential of combating desertification and watershed management, due to rangeland degradation and vegetation loss; the possibility of diversifying livelihoods (through agricultural and non-agricultural activities); and the existence of natural capital.

Facilitation process

The main focus of the project was on applying a participatory approach for combating desertification, the reviving of natural resources, supporting sustainable rural development and promoting human development indicators of local residents through improving livelihoods and social conditions. The facilitation was carried out in all the project steps: situation and stakeholder analyses, strategic plan design, action, monitoring and evaluation and documentation. Together with rural communities, the facilitation team assessed and analysed communities' situation, needs and problems through participatory rural appraisal techniques, such as visiting area, problem tree diagrams, transect walks, seasonal and daily calendars, mapping (village and resources), focus groups, observations, trends, cost-benefit analyses, and semi-structured interviews. They also defined solutions and mechanisms to manage and act with local residents. These actions were implemented with rural communities and other institutions, e.g. establishing credit funds, nest seeding in rangelands, organising workshops and training courses, etc.

Role of local leaders and representatives

Key informants, village council members and village manager (Dehyar) were mostly involved in this assessment. Local development committees were also established to involve rural communities' representatives institutionally.

These leaders were the gatekeepers of the projects. Initial meetings were mainly organised with village council members and Dehyar, who also facilitated interventions in their communities and made the households readiness for the project. If the leaders of a village were opposed to the project in initial stages, that village was replaced with those villages that showed their willingness to participate and act. Subsequently, when the council members became convinced and trusted the team and project, they discussed the project with other members of communities in subsequent meetings and they invited people to attend the meeting for assessments and decision making. In fact, the council and Dehyar were considered as local facilitators and a link between the outsiders and the community in the project. They also played important role in the implementation step, including the formation of the village credit funds. The biggest benefit of the funds was considered to be an opportunity for all rural households to involve in its financial management of the credit funds, based on a democratic election, so the power would not remain merely in the hand of the council and Dehyar, though they facilitated this participation and the interaction between people and facilitators.

Workshops and training courses

Analyzing the documents of the CSP in 18 provinces showed that the project implemented 554 extension programmes for rural communities and 26 capacity building workshops on participatory natural resources management approaches for 910 provincial managers and social mobilization consultants and facilitators between 2004 and 2017. In addition to individually inter-personal facilitation intervention and networking, the CSP has organized diverse and multiple training and participatory workshops for rural households. Other activities were the distribution of seedlings for rural rangeland for plantation with the aim of natural resources rehabilitation and erosion control. Since the start of the project by 2018, a total number 33421 people attended the workshops (Table 1).

Most facilitation interventions have contained training courses organised for project planning programme, institutionalisation, people's awareness and knowledge in the project sites, cooperatives' establishment credit management, and financial management (78.5%). Other workshops were related to subjects such as natural resources importance, rangeland rehabilitation, and soil erosion control (9.9%), job creation, income

Table 1. Workshops and training courses organised in the CSP

| Workshop/ course | | |
|---|-------|-------|
| | No | % |
| Livestock keeping and poultry production and aquaculture | 534 | 1.60 |
| Crop production and horticulture | 1423 | 4.26 |
| Handicraft making | 1709 | 5.11 |
| Health and hygienic issues | 135 | 0.40 |
| Natural resources rehabilitation and soil erosion control | 3299 | 9.87 |
| Services | 75 | 0.22 |
| Training courses related to the project process and cooperatives' establishment | 26256 | 78.56 |
| Total | 33421 | 100 |

generating activities, and diversifying livelihoods' strategies, for example handcraft making (5.1%), crop production and horticulture (4.2%), livestock and poultry production (1.6%), and service activities such as tourism (0.2%).

Outcomes and Impacts

From the viewpoint of planners and administrators, the carbon sequestration project in Iran has used participatory practices in mobilizing and enabling community members, especially low-income and vulnerable groups, to manage their own resources and build the capacity and self-confidence to influence the project's policies and ultimately restore their degraded lands through their own communities (Emami, Ahmadpoor, Abedi Sarvestani, & Shahraki, 2018; Hasannejad, Kohansal, & Ghorbani, 2010). In other words, the CSP has pursued developing local communities through self-help and improving socio-economic conditions of local residents and crop and livestock farmers. It has subsequently aimed at reviving degraded pastures and applying sustainable management practices and sustainable livelihoods through decentralizing decision-making and controlling natural and material capitals by local communities (Emami et al., 2018; Hadarbadi & Pouyafar, 2006). In line with the implementation of this project, rural development groups and micro-finance/ credit funds have been developed as strategies to reduce the pressure on natural resources in villages covered by this project.

Based on the UNDP (UNDP, 2018) report on Iran's experience, the project has been able to increase the potential of carbon capture from a significant amount of marginal land and the capacity and potential of local communities to engage in sustainable rural development. The project has empowered local communities, established sustainable enterprises and local institutions and guaranteed the ownership of local communities. These communities, in turn, are responsible for the rehabilitation, conservation and sustainable use of Iran's limited water and land resources.

Analysing the documents of the CSP in 18 provinces showed that through the project 3690 permanent job opportunities in 2564 small enterprises were generated by the end of 2017, which included livestock and poultry production and fish farming, arable and permanent crop production, handcraft making (such as carpet and rug weaving, knitting, and dressmaking/ sewing), food processing and services (such as tourism and hairdressing).

Moreover, 1904 Village Development Groups and 261 micro-credit funds were established, which covered 25403 members. This micro-credit system provided 7183 loans to their members.

The project also implemented conservation activities, such as tree planting, seeding and seed scattering in rangelands, check dams and terraces in 55223 ha and almost 32000 people or 60 percent of rural community members participated in these activities by 2018. Gender empowerment also showed that women have been involved in all project initiatives. Approximately one-third of the person-days of labour (8,600 out of 24,500 by the end of year 2017) needed for rangeland restoration works was provided by female Village Development Groups.

Conclusions

The CSP project and its communication intervention through extension activities has benefited from a participatory and community based approach, in which planning, decision-making and implementation stages have been conducted with the participation of relevant stakeholders and this has been a key factor for achieving the objectives of the project. The interventions have emphasised on strengthening the spirit of co-operation and collaboration in the region and establishing institutions for this purpose. Facilitation efforts and extension training courses were tailored to communities'

needs, leading to increasing their knowledge and ability; introducing and institutionalizing participatory natural resources management techniques and approaches; increasing diversity in livelihood strategies; reducing the dependency on rangeland use; and establishing rural cooperatives. Communities and other stakeholders can realise that they can manage sustainability challenges through inter-sectoral and group cooperation and collaboration. This can improve social capital, including communication, trust and synergy among members of communities, and between communities and external institutions, particularly government. This approach can be considered as an appropriate strategy for empowering and enhancing the livelihoods of poor and low income households, living in difficult conditions. The project have also faced with some financial and management challenges that needs to deal with them in the future.

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