Use of FLINT indicators in case studies

Meetings of:

Expert group for monitoring and evaluating the CAP – May 10, 2017

Committee for the FADN – May 11, 2017

European Commission, Brussels, Belgium

Use of FLINT indicators in case studies - Introduction

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General objective of the case studies

- **To analyse the farm-level indicators: what is useful?**
- **To illustrate the contributions of FLINT data**

1. More precise recommendations for policy makers (e.g. see FLINT deliverables D5.2B (subsidies and technical efficiency); D5.2F (age of assets and profitability))
2. Better understanding of the sources of farm performance (e.g. see FLINT deliverables D5.2D (land fragmentation); D5.2H (age of starting as a decision maker), D5.2I (advisory services))
3. Additional insights into the challenges faced by farmers (e.g. see FLINT deliverables D5.2L (tradeoffs between economic, environmental, social performance))
4. Filling gaps in terms of research methodologies (e.g. see FLINT deliverables D5.2E (social performance), D5.2G (economic viability))

The data

- **Range of observations**
  - 9 countries: DE, EL, ES, FI, HU, IE, NL, PL, FR
  - Total of 1,099 farms

- **FADN data**
  - Year 2015, except FR and DE (2014)

- **FLINT data**
  - Same year as FADN
  - Approximately 400 FLINT variables (on economic, environmental, social themes)
  - 150 farm-level indicators calculated on these variables

Environmental indicators

- **32 indicators**
- **Cover 11 themes**
- **Examples**
  - Share of utilised agricultural area (UAA) with ecological focus areas (EFA)
  - Average distance of reference parcels to farmstead
  - Nitrogen use efficiency
  - Greenhouse gas (GHG) emissions per hectare
  - Water consumption per Euro of output produced

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Economic indicators

- **58 indicators**
- **Cover 9 themes**
- **Examples**
  - Innovation or not
  - Share of utilised agricultural area under EU quality label
  - Number of market outlets
  - Average age of machinery
  - Number of insured categories
  - Share of turnover under production contract

Social indicators

- **60 indicators**
- **Cover 7 themes**
- **Examples**
  - Number of advisory contacts per farm per year
  - Degree of farmer's social involvement
  - Share of persons on the farm participating in training
  - Farmer's quality of life
  - Farmer's age of starting as a decision maker
  - Succession

List of case study reports (1/2)

van Asseldonk, M., Tzouramani, I., Ge, L., Vrolijk, H.	**Adoption of risk management strategies in European agriculture**	D5.2A
Latruffe, L., Dakpo, H., Desjeux, Y., Justinia Hanitravelo, G.	**Subsidies and technical efficiency including environmental outputs: The case of European farms**	D5.2B
van der Meulen, H., van Asseldonk, M., Ge, L.	**Adoption of innovation in European agriculture**	D5.2C
Saint-Cyr, L., Latruffe, L., Piet, L.	**Farm fragmentation, performance and subsidies in the European Union**	D5.2D
Herrera, B., Gerster-Bentaya, M., Knierim, A.	**Social indicators of farm-level sustainability**	D5.2E
Kis Csatari, E., Keszthelyi, S.	**Effect of age of assets on farm profitability and labour productivity**	D5.2F
O'Donoghue, C., Devisme, S., Ryan, M., Conneely, R., Gillespie, P., Vrolijk, H.	**Farm economic sustainability in the EU: A pilot study**	D5.2G
Brennan, N., Ryan, M., Hennessy, T., Cullen, P.	**The impact of farmer age on indicators of agricultural sustainability**	D5.2H

List of case study reports (2/2)

Brennan, N., Ryan, M., Hennessy, T., Dillon E. J., Cullen, P.	**The role of extension in agricultural sustainability**	D5.2I
Lynch, J., Finn, J., Ryan, M.	**Investigation of indicators for greening measures: Permanent grassland and semi-natural area**	D5.2J
Buckley, C., Daatselaar, C., Hennessy, T., Vrolijk, H.	**Using the Farm Accountancy Data Network to develop nutrient use efficiency indicators for milk production**	D5.2K
Latruffe, L., Desjeux, Y., Justinia Hanitravelo, G., Hennessy, T., Bockstaller, C., Dupraz, P., Finn, J.	**Tradeoffs between economic, environmental and social sustainability: The case of a selection of European farms**	D5.2L
Herrera, B., Gerster-Bentaya, M., Tzouramani, I., Knierim, A.	**Advisory services and farm level sustainability**	D5.2M
Uthes, S.	**Deriving indicators for soil organic matter management from FLINT data**	D5.2N
Eguinoa, P., Intxaurrandieta, J. M.	**Water usage, source and sustainability: Examples from the region of Navarra (Spain) and Greece**	D5.2O

General conclusions from this test project

A lot of interesting and useful information collected – But:

- Missing and unreliable data for several FLINT variables and indicators (e.g. highest data quality is for social variables)
- Some indicators are not relevant for some countries or areas or types of farming (e.g. water use, erosion risk)
- Some indicators are difficult to compare across countries (e.g. subjective concepts such as stress, innovation)
- Some information should be collected at the same time as FADN (e.g. manager's social indicators, so that they could accurately be linked to the FADN data of this specific manager)
- Repeating data collection over time will improve data collectors' and farmers' skills and reduce errors due to misunderstanding
- Necessary to collect some information on a long period to clearly see causalities and to capture potential delays in response

Next slides illustrate with a few case studies

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CAP subsidies and technical efficiency including environmental outputs: the case of European farms

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Objective and background

Objective

Effect of subsidies on farms' technical efficiency when environmental outputs are accounted for

Background

- Technical efficiency: representing how well a farmer uses the technology; relates all outputs to all inputs
- Literature: subsidies believed to negatively impact technical efficiency ("lower effort" of farmers)
- But only marketed outputs (i.e. food, feed and fibre) are considered, although inputs are used also for producing non-marketed (e.g. environmental) outputs
- FLINT allows to integrate environmental outputs in the technical efficiency calculations

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Method

Calling of technical efficiency

- Data Envelopment Analysis (DEA) with 2 technologies
- 4 inputs: UAA, quantity of labour, asset value, variable costs (FADN)
- 1 marketed output: value of total output (FADN)
- 1 environmental output (FLINT) in turn:

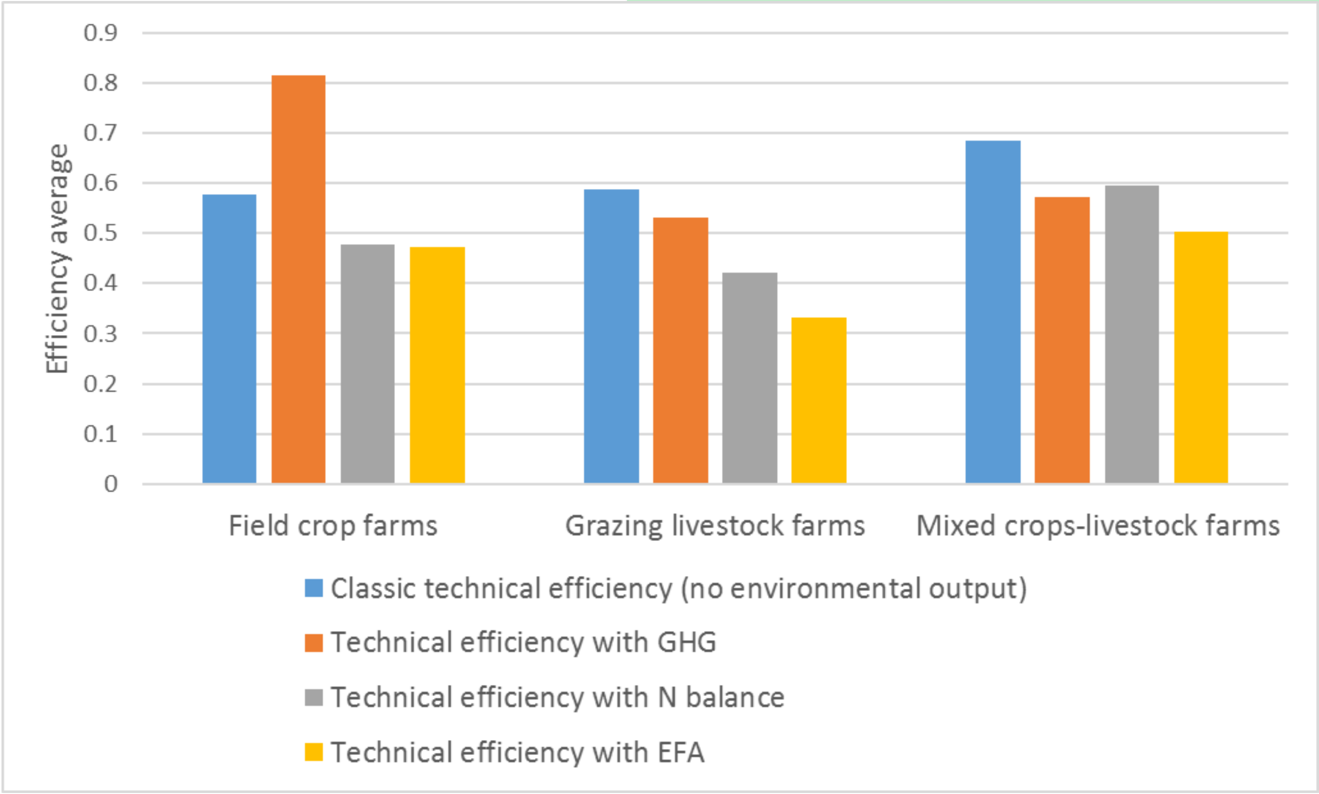
greenhouse gas (GHG) emissions ; N balance ; ecological focus areas (EFA)

Determinants of technical efficiency

- Econometric regressions: technical efficiency explained by subsidies
- Subsidy proxy: the value of operational subsidies per hectare of UAA or per livestock head (FADN)
- Operational subsidies = direct payments to crops and livestock, Single Farm Payments (SFP), agri-environmental payments and Less Favoured Areas (LFA) payments

Results

Comparison of technical efficiency with and without environmental output



Results

Comparison of the effect of subsidies on technical efficiency with or without environmental output

	Field crops farms Subsidies per ha	**Grazing livestock farms** Subsidies per LU	**Mixed crops-livestock farms** Subsidies per ha	Subsidies per LU
Classic technical efficiency (no environmental output)	-	-		-
Technical efficiency with GHG		+	-	-
Technical efficiency with N balance				
Technical efficiency with EFA				-

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Note: empty cells indicate non-significant effects

Conclusion

Effect of subsidies on farms' technical efficiency changes when environmental outputs included in efficiency calculation:

- Some effects that are **non-significant** on classic technical efficiency become **significant** when environmental outputs are accounted for
- Some effects that are **significant** on classic technical efficiency become **non-significant** when environmental outputs are accounted for
- Some effects that are **negative** on classic technical efficiency become **positive** when environmental outputs are accounted for

Main limitation: only one year of data

- The effects of subsidies may be correlations rather than impacts
- Delays in the effect of policies cannot be accounted for

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Tradeoffs between economic, environmental and social sustainability: the case of a selection of European farms

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Objective and method

Objective

Top performing farms from economic perspective: are they also high-performing farms from environmental and social perspective?

Method

- Creating clusters of similar farms (statistical hierarchical ascendant classification)
- Clustering done on the basis of farms' economic performance, with 8 indicators:
  - output per ha or LU; output per capital; output per AWU;
  - operational costs per output;
  - net value added (NVA) per ha or LU; NVA per capital; NVA per AWU;
  - family farm income per FWU
- Comparing environmental and social indicators across clusters

Results

Economic sustainability and environmental sustainability are positively correlated for some farm types but not others, and this depends on the type of environmental indicator

(among GHG emissions, N balance, water consumption, and EFA; all related to size)

Examples:

- Field crop farms, permanent crop farms, mixed cropping farms: farms that perform well in economic terms are also the ones that perform well in environmental terms
- Grazing livestock farms: farms that are best performing in economic terms are highly performing for GHG and N related to output value, but are low performing in terms of GHG per ha, water per ha and share of EFA

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Results

No tradeoffs between economic performance and (private) social performance

(in terms of perceived quality of life; perceived stress; social engagement)

More precisely

- High social performance linked to high economic performance for field crop farms, grazing livestock farms and mixed crops-livestock farms, granivore farms and mixed livestock farms
- Social sustainability does not significantly vary with economic sustainability for horticulture farms, permanent crops farms and mixed cropping

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To go further

- This analysis assumes that our selection of a limited set of environmental indicators are sufficient to reflect the environmental performance of these farming systems, but further research is needed to **define the minimum set of environmental data** that is required.

- Depending on the policy focus or on the stakeholders' interests, **some indicators may be given higher weight** than others

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Adoption of risk management strategies in European agriculture

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Objective

Background

- CAP has increased its attention to risk management issues
- Important to monitor and evaluate the rate of risk management adoption
- FADN data base has limited information on the applied risk management strategies

Objective

To monitor and analyse the relation between the adoption of risk management strategies (FLINT indicators) and the determinants of farmers' choice (FADN variables)

Methodology and data

FLINT data on risk management indicators

- **Insurance uptake**
  - Crop insurance, livestock insurance, property insurance, occupational accident insurance
- **Marketing contracts' uptake**
  - Type, price, quantity, duration, share in turnover, other
- **Alternative methods' uptake**
  - On farm (diversification, on- farm processing/sales, off-farm investment, credit avoidance, hedging, financial reserves)
  - Off-farm employment
  - Other gainful activities (farm tourism, nature management, production of renewable energy)

Methodology and data

- **FADN data: selecting relevant characteristics of farm:**
  - Structure: type of farming, farm size, age of the farmer
  - Economic indicators: total farm output, farm net income, total subsidies, total liabilities, total assets, cash flow
- **FLINT data on risk management indicators, the use of the advisory services**
- **Econometric model for the probability of adoption:**

To analyse the driving forces of adoption of risk management strategies,

for each type of risk management strategies

FLINT

Results: adoption of risk management strategies (share of farmers in each country)

Member State	Crop insurance	Livestock insurance	Market price contract	Diversification	Off-farm employment
Finland	0	90	56	40	44
Germany	61	51	27	54	60
Greece	90	93	19	90	23
Hungary	34	11	36	38	43
Ireland	0	11	0	30	53
Netherlands	35	56	12	33	51
Poland	41	9	29	62	26
Spain	50	95	59	28	23

FLINT

Results: econometric models of the probability of adoption of each risk management tool

Explanatory variables	Adoption of crop insurance	Adoption of livestock insurance	Adoption of price contract	Adoption of diversification	Adoption of off-farm employment
Economic size class	+		+	+	+
Total farm output			+	+	
Farm net income					
Total subsidies					
Total liabilities			+		
Total assets			+		
Cash flow			+		
Age					+
Advisory				+	
Member State					+
Type of farming	+	+	+	+	

Note: empty cells indicate non-significant effects

Conclusions

- **Adoption rates of risk management strategies vary across EU Member States and farming types**
- **Larger farms more often adopted insurance, price contracts and diversification and were less likely to adopt credit avoidance and off-farm employment**
- **Yet the adoption of these risk management strategies as measured by these FLINT indicators are gaining relevance since the new CAP promotes risk management uptake (under the second pillar)**
- **Feasibility and interpretation of the data**
  – Impact assessment is hardly feasible. Risk management strategies may not be effective on performance indicators in the same year (and **requires times series** of uptake of risk management strategies and performance indicators)

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The role of extension in agricultural sustainability

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Context and Objectives

An improved understanding and uptake of technologies are crucial for the continued sustainability of agriculture and extension contact is the most logical mechanism for the transfer of such knowledge to farmers.

Objective: **examine the use of extension services by farm households across eight European countries.**

How?: explore the type of extension service engaged with, the degree of engagement and the type of information sought.

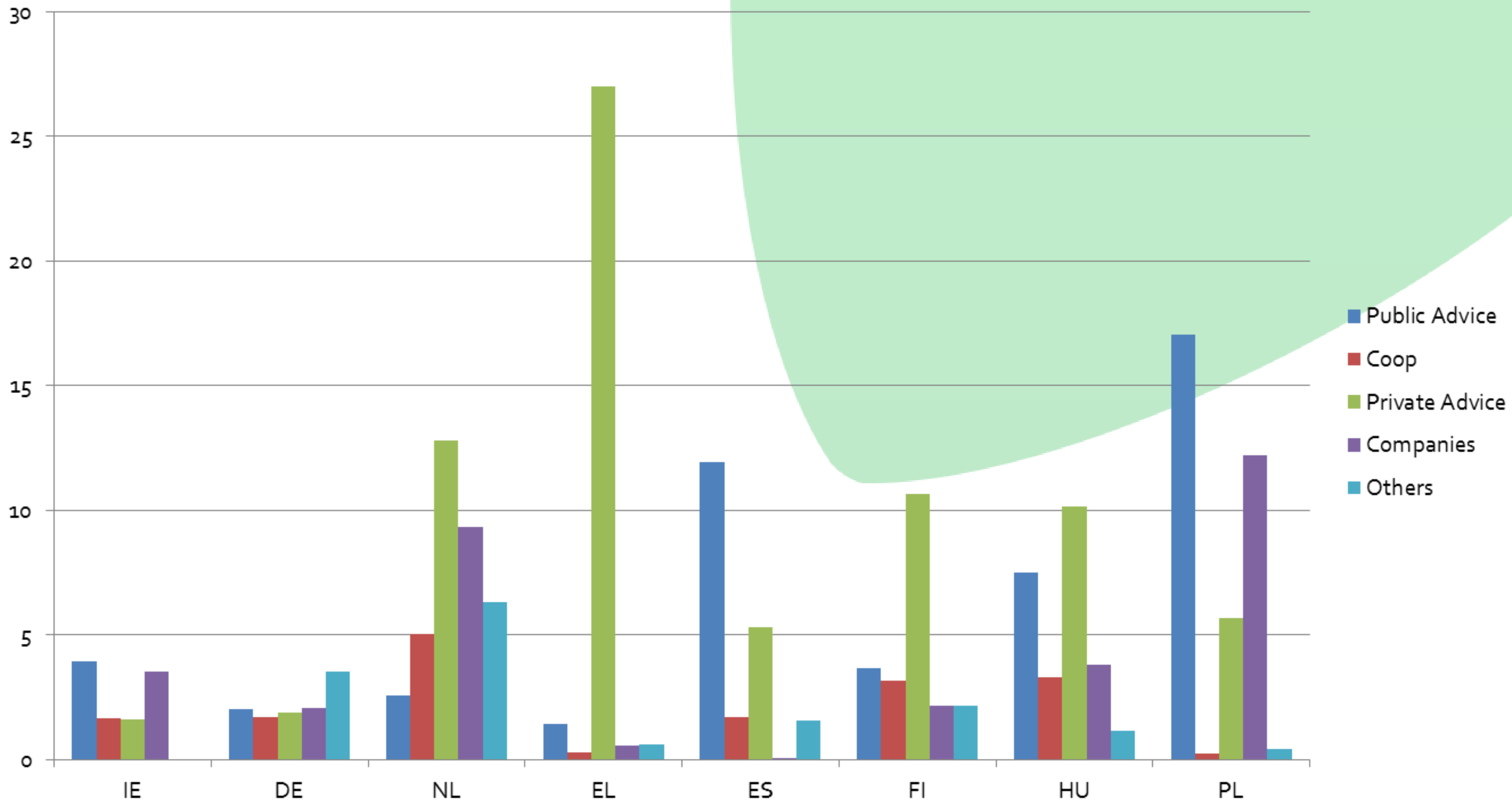
The impact of extension on economic, environmental and social sustainability is also considered.

FLINT

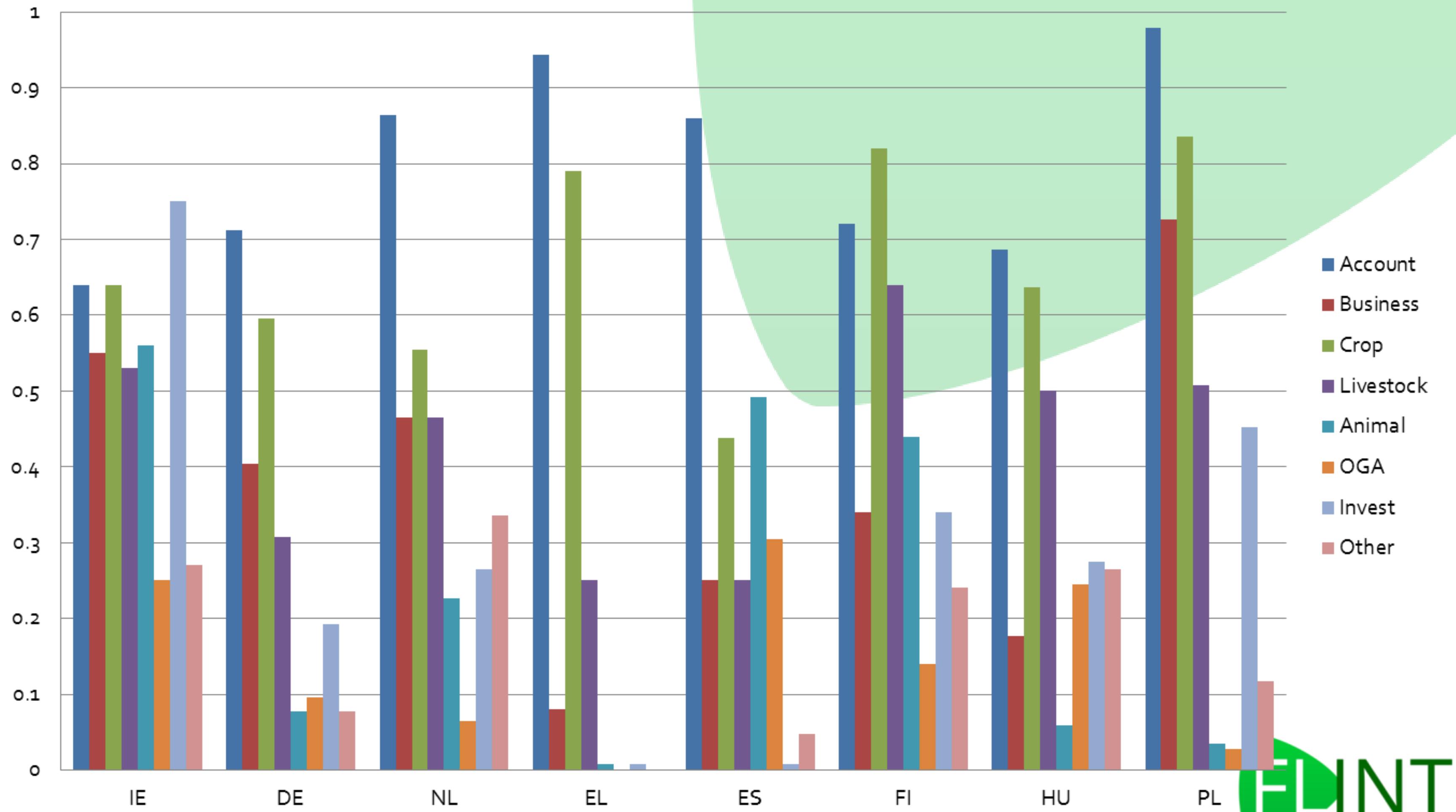
Methodology

- **Using the Irish national FADN (NFS)**
  - Irish national FADN includes information whether farmer uses advisory service or not **("extension" binary variable**)
  - 11 econometric regressions of 11 sustainability indicators (economic, environmental, social)
  - Among the explanatory variables: the "extension" binary variable
- **Using the FLINT+FADN data for Ireland**
  - FLINT data include more precise information on advisory services: number of contacts (→ creation of two binary variables **"low extension use" and "high extension use"**)
  - 11 econometric regressions of 11 sustainability indicators (economic, environmental, social)
  - Among the explanatory variables: the "low" and "high" extension use binary variables

Results: Extension service use by number



Results: Proportion of respondents requesting information by information type (OGA: other gainful activities)



Results: Regressions

- Previous studies paid little attention given to the range of extension services, the sort of information requested and level of engagement.
- The regression results using Irish national FADN and using FLINT outline the importance of engagement with extension services.
- The regression results using FLINT outline specifically the impact that greater degrees of engagement have on economic and social indicators.
- In addition, this analysis indicates that the extent to which households engage with extension services has implications for sustainability at the farm-level.

FLINT

Usefulness of FLINT data

Despite the limitations of this research, the findings indicate that a large-scale FLINT study could prove very useful:

- as a measure of farming sustainability throughout Europe
- to provide policymakers with information on the types of extension service that are most valuable to farmers in their country
- provide data on possible improvements to services that may be required
- to allow policymakers to anticipate the information burden that a new policy will place on farmers and
- to aid in the design of targeted extension programmes.

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The impact of farmer age on indicators of agricultural sustainability

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Context and Objectives

Context: Only 7 % of farmers in the EU 27 are under the age of 35 and one third of farmers are aged 65 years or more (EC, 2011).

The farming age profile for many European countries is rapidly rising and European Union's (EU) Young Farmer Scheme (<40 yrs) aim to redress this balance. Transition towards sustainability requires the support of young farmers and new entrants .

Objective: Analyse the impact of farmer age on economic, environmental and social indicators of sustainability in EU.

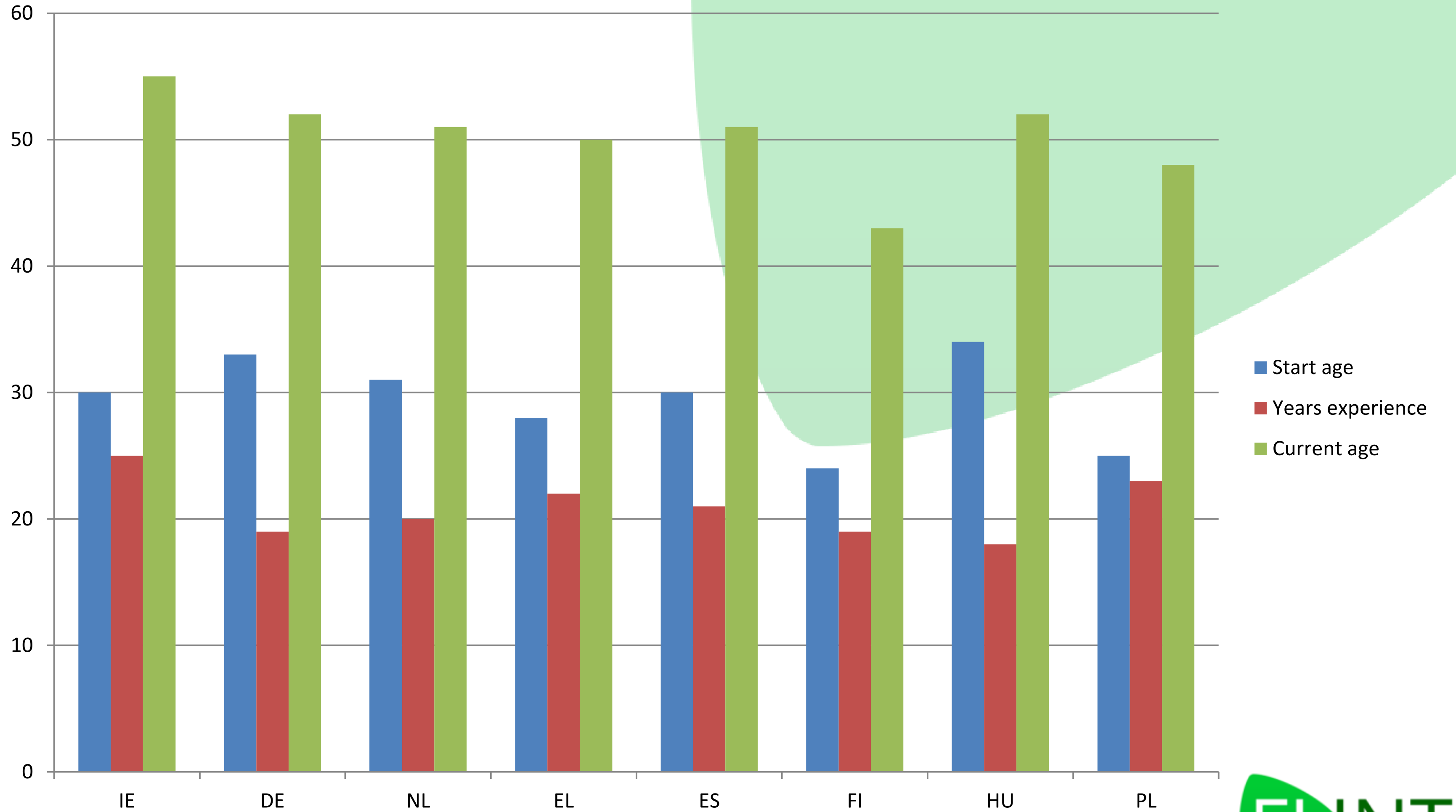
How?: incorporate new data from the FLINT project on the **age at which a farmer becomes a decision maker**.

FLINT

Methodology

- **Using the Irish national FADN (NFS)**
  - Variable of interest: **“age” (current age of the farmer**)
  - 11 econometric regressions of 11 sustainability indicators (economic, environmental, social)
  - Among the explanatory variables: the “age” variable
- **Using the FLINT+FADN data for Ireland**
  - FLINT data include information on the **age upon which the farmer became a decision maker: “start age”**)
  - 11 econometric regressions of 11 sustainability indicators (economic, environmental, social)
  - Among the explanatory variables: the “start age” variable

Mean starting age as decision maker, years of experience as decision maker and current age



Results: Regressions

- **Using Irish FADN (and variable "age")**
  - Significant relationship between economic, environmental and social sustainability and the age of the farmer.
  - As age increases: **decline in economic performance, decline in environmental impacts, decline in social sustainability**.

- **Using FLINT+FADN for Ireland (and variable "start age")**
  - Suggests that the age at which the farmer becomes the decision maker matters in terms of viability and household sustainability.
  - The older the farmer is when he/she establishes themselves as a decision maker, it is less likely that the farm will be sustainable.

Results: General

- Ageing farming population, with mean farmers' ages of 43 - 55.
- These results show that the rising mean farmer age could be detrimental to the industry, particularly for economic and social sustainability.
- The majority of EU farmers are over 55 years old and one-third are above the standard retirement age of 65. In Ireland, currently less than 6% of farmers are under the age of 35.
- The combined results indicate that the age at which a farmer becomes a decision maker matters also in terms of social sustainability, particularly for viability and household vulnerability.
- Limitations: Missing observations for decision maker start age – clarify: decision maker + "taking over " or "working alongside"…

Usefulness of FLINT data

- The FLINT descriptive data highlight the difference between mean age at which the farmers become decision makers and current mean age of farmers.
- The may be a wider issue to be analysed in terms of encouraging new, younger entrants into the farming industry. It is possible that a larger sample could find that the age 40 cut-off for the Young Farmer Scheme may be too high in terms of attracting young and dynamic entrants.
- Despite limitations, as this work was undertaken as a pilot test study it provides a considerable level of groundwork and valuable learnings from which a full scale project could be established.

FLINT

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Social indicators of farm-level sustainability

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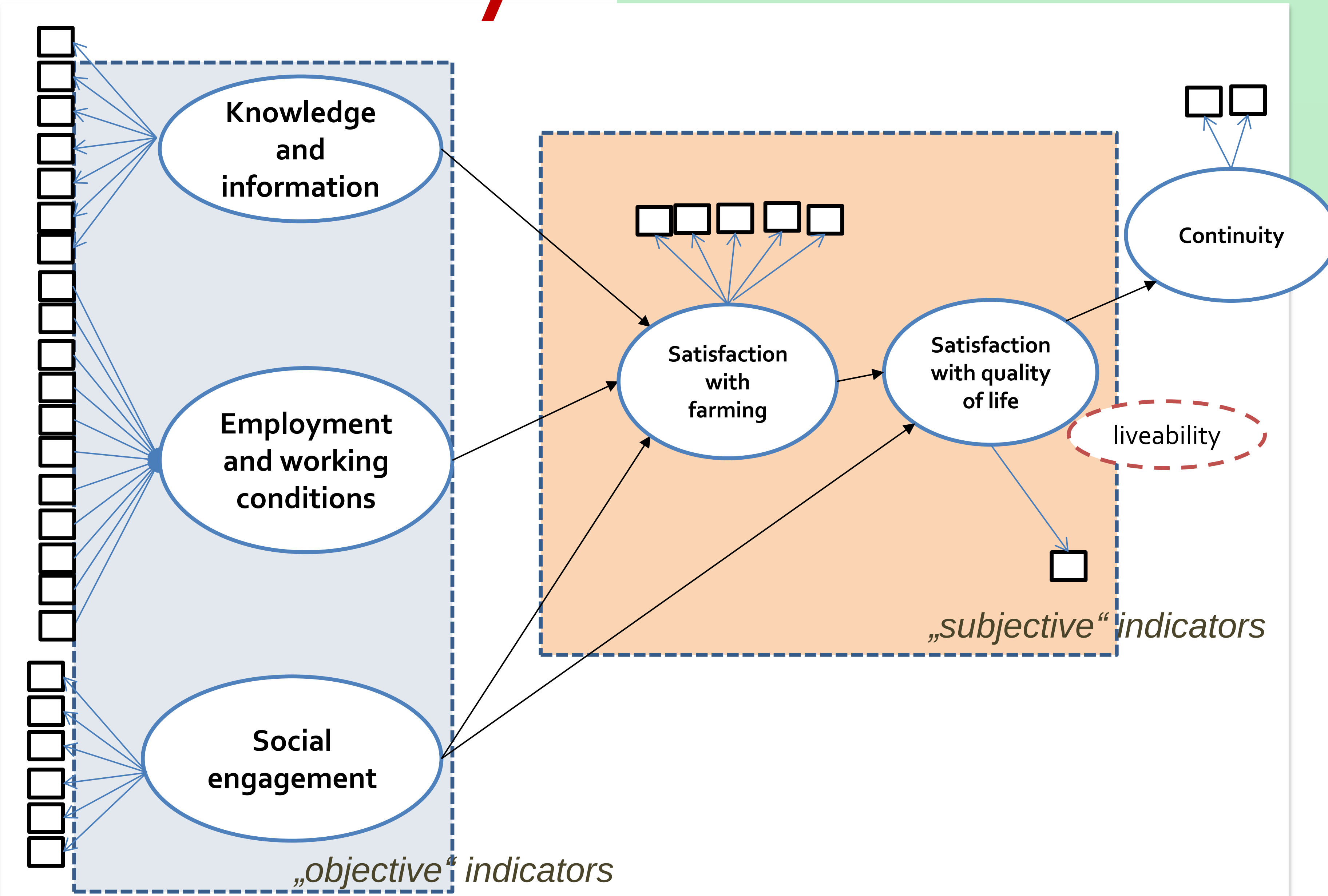
1. Social indicators in FLINT

- **Starting point: operationalize measurement of the social dimension of sustainability at farm level.**
- **FLINT tested 7 topics: advisory services; training; ownership/management; social engagement; working conditions; quality of life; social diversification.**
- **Questions of the case study**
  - To what extent the selected indicators tested reflect the concept of quality of life? → Validity and reliability of observables variables (objective and subjective).
  - Do the tested social indicators represent "social sustainability" and therefore should be included in a farm monitoring system such as FADN?

2. Analysis framework



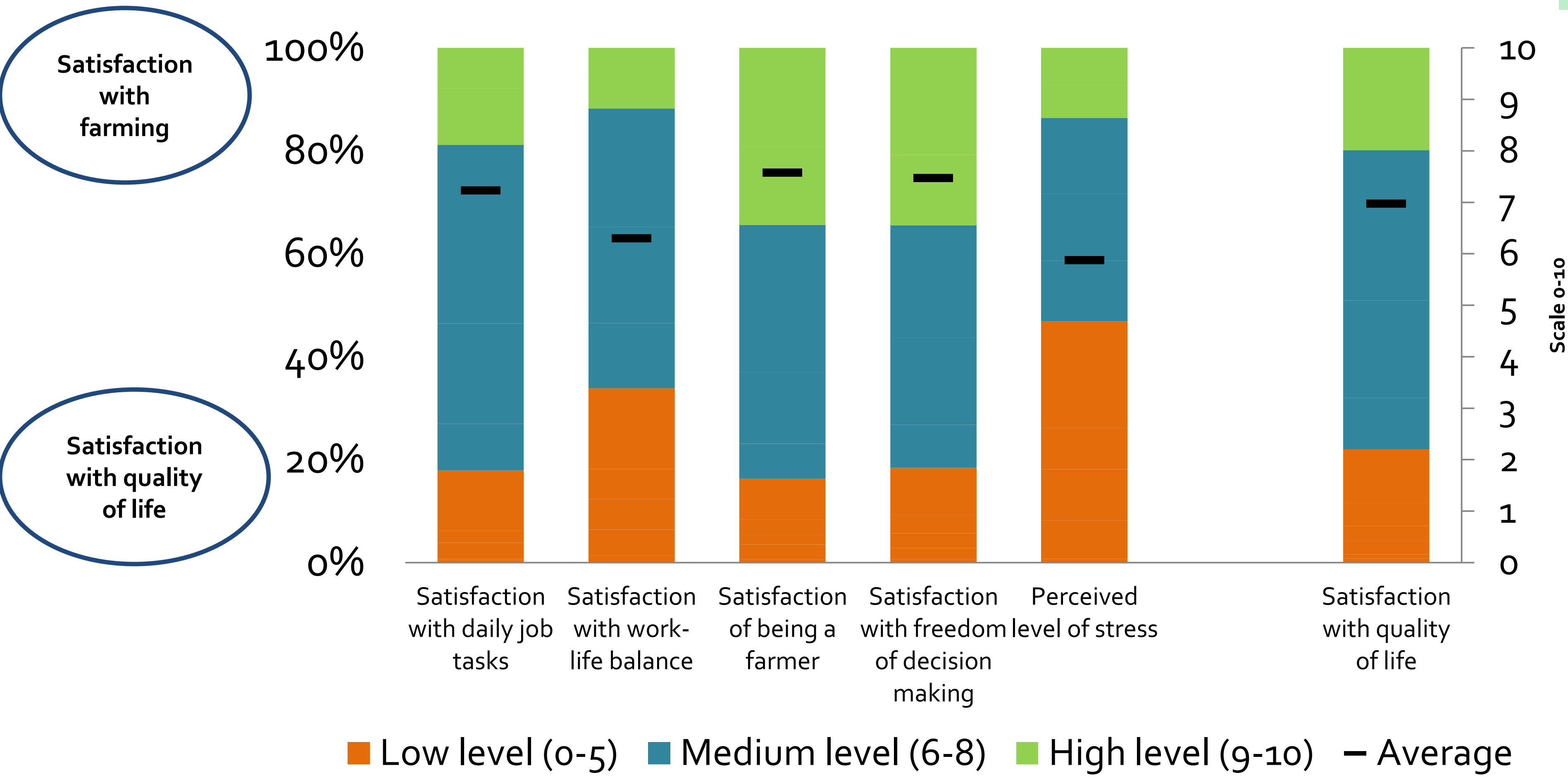
3. Results

		N	Mean
Knowledge and information	Number of providers of advisory services	1099	**2.5**
	Years of experience as manager	880	**28.2**
	Number of total contacts of advisory service per year	1044	**29.9**
Employment and working conditions	Holiday days (days)	1014	**19.0**
	Free days per week (days)	938	**0.8**
	Unpaid labour input in working units (AWU)*	1099	**1.5**
	Average weekly working hours of manager (hours)	924	**34.8**
	Average day working hours during peak season (hours)	1062	**11.6**
	Average age of machinery (years)	1077	**14.1**
	Average age of agricultural buildings (years)	1018	**22.9**
	Farm Net Value Added per AWU (1000 EUR)*	1099	**23.3**
	Total assets value: fixed assets + current assets (1000 EUR)*	1099	**1023.1**
	Expenditure for the accounting year (the holding's capacity for saving and self-financing) (1000 EUR)*	1099	**120.5**
Social engagement	Number of organizations and local events in which the farm takes part (number).	1099	**2.9**

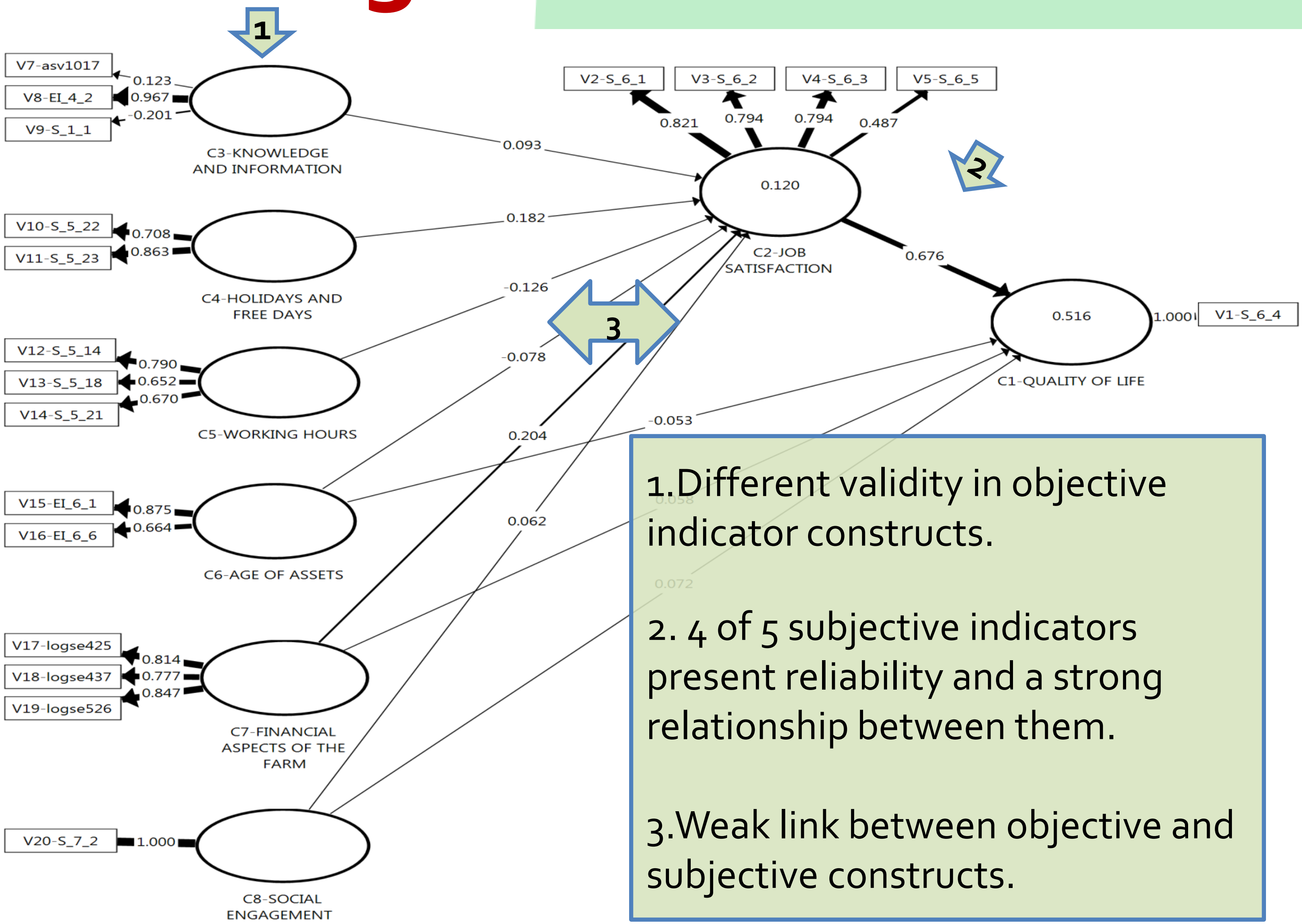
Note: Flint data in [shaded] and FADN data with *

3. Results

Distribution of farms according to levels of:



3.Results



1.Different validity in objective indicator constructs.

2. 4 of 5 subjective indicators present reliability and a strong relationship between them.

3.Weak link between objective and subjective constructs.

4. Concluding remarks

- **If policy makers are interested in knowing farmers' quality of life, then it should be asked directly to the farmers.**

- ***Use of "subjective" indicators*: one question of perceived satisfaction with quality of life could represent the multiple dimensions explored in FLINT.**

- ***Use of " objective" indicators*: need to further investigate each construct separately. Beyond the analytical framework used in this case, explore the links with other sustainability dimensions.**

4. Concluding remarks

About social indicators and the added value of information

- **The case study provides an example of an analytical framework to operationalise social sustainability concept at farm level using different sources of information (FLINT+FADN).**

- **The collection of information in different years would enable to control for influencing factors affecting social sustainability (farming systems, heterogeneity).**

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Adoption of innovation in European agriculture

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SEVENTH FRAMEWORK PROGRAMME

Question and method

- **Objective**

Who innovates? Effect of subsidies?

- **Available information in FLINT**

Yes/no at farm level indicating innovation in the last three years

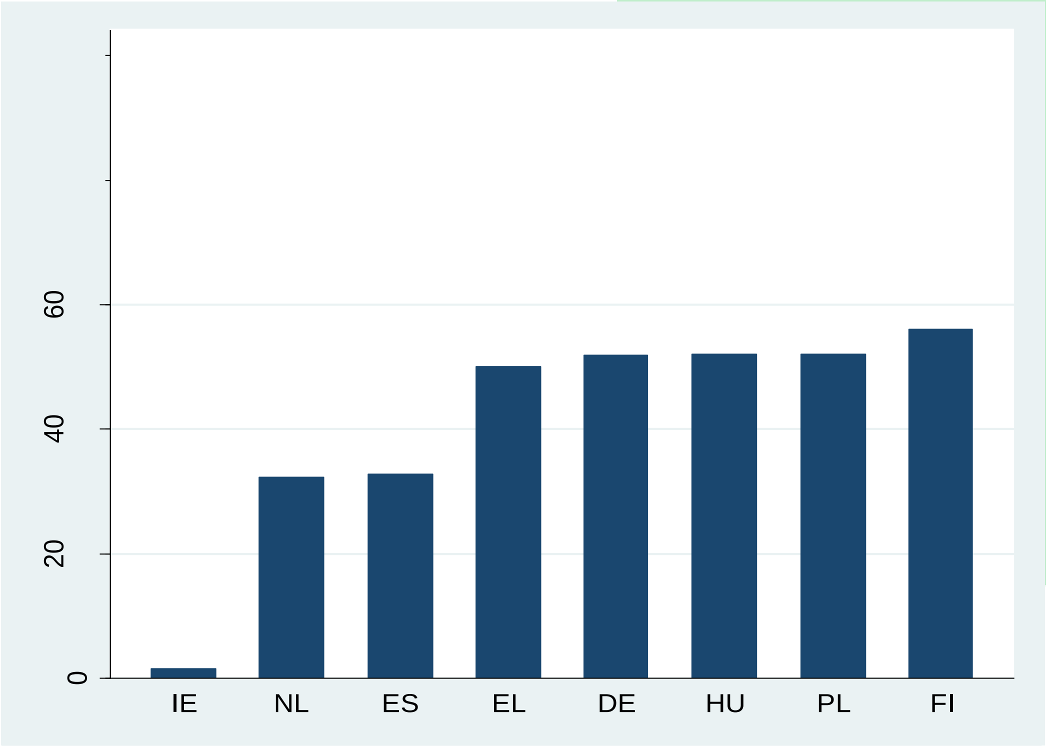
  - Product not new for the market (but new for the company)
  - Product new for the market (and new for the company)
  - Process not new for the market (but new for the company)
  - Process new for the market (and new for the company)
  - Market or organisational innovation

- **Method**

Explaining innovation with FADN variables

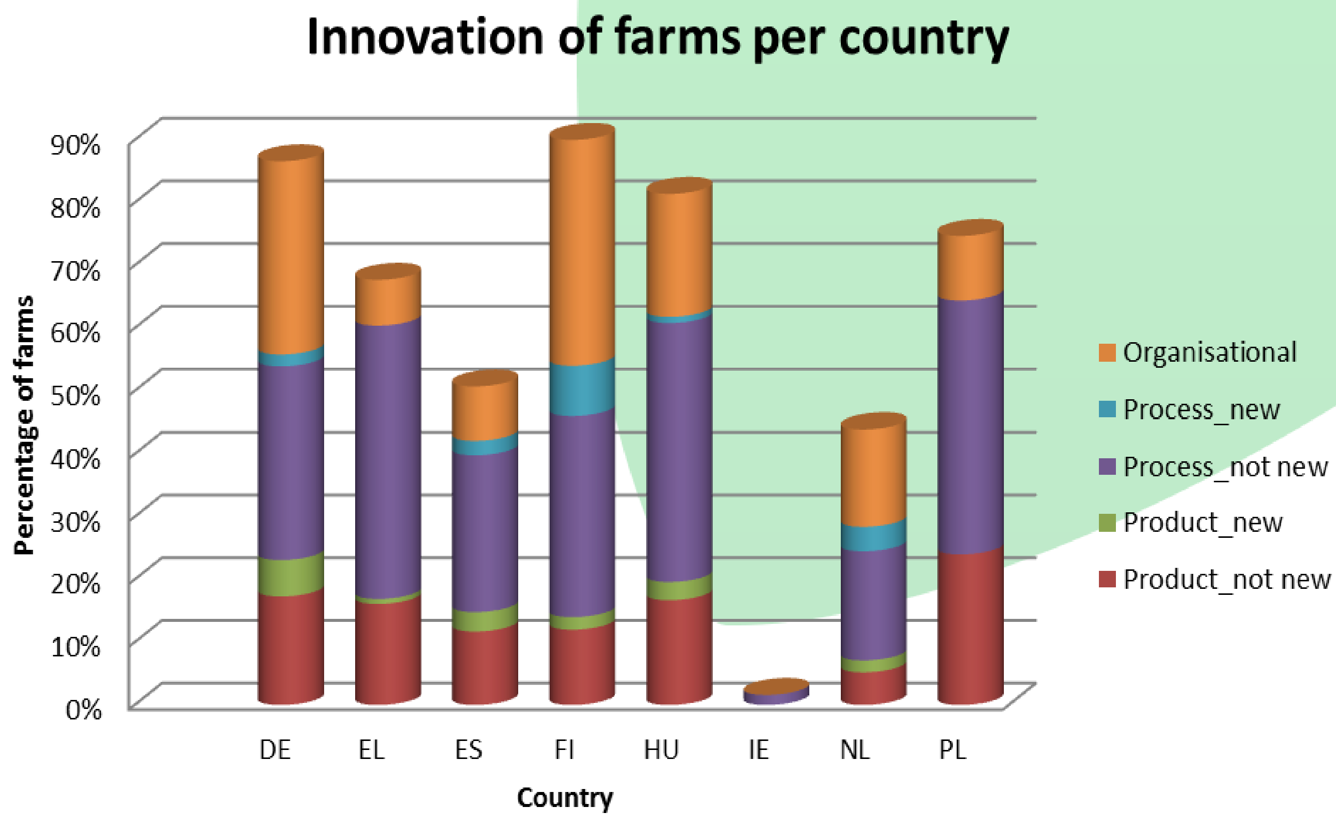
FLINT

Adoption of innovation per country (shares of farms having innovated)



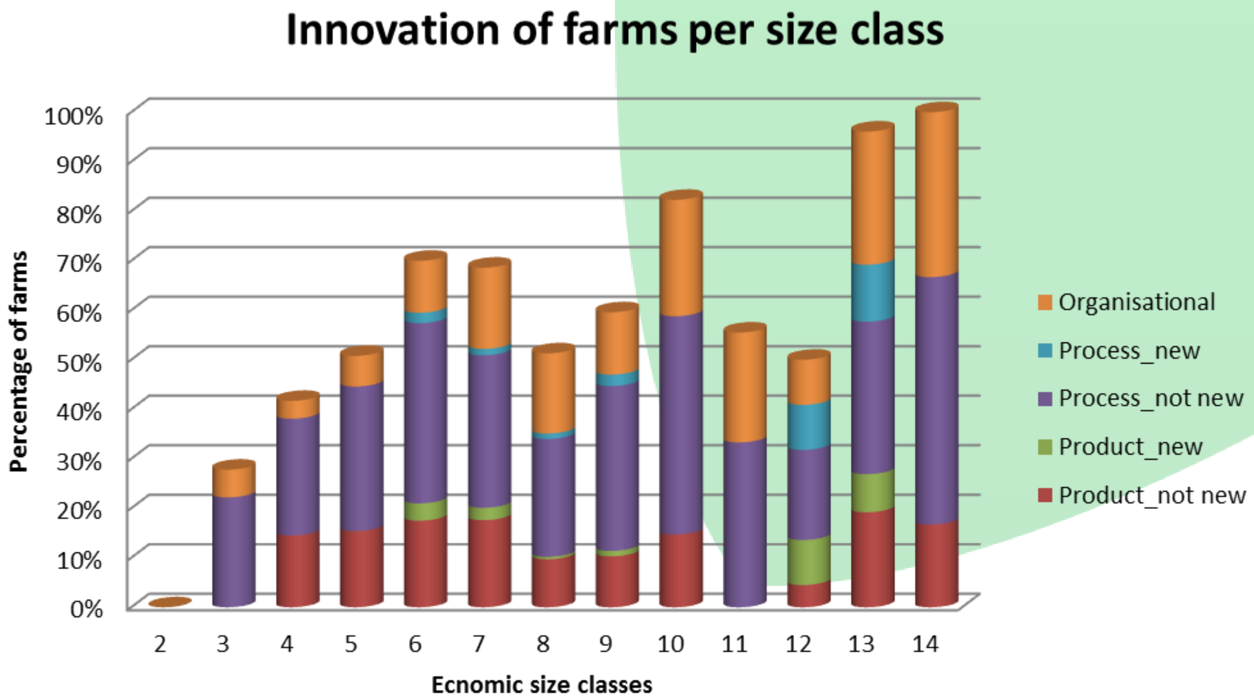
Percentage of farms having innovated: varies from 2% in IE to 56% in FI

Type of innovation adopted per country



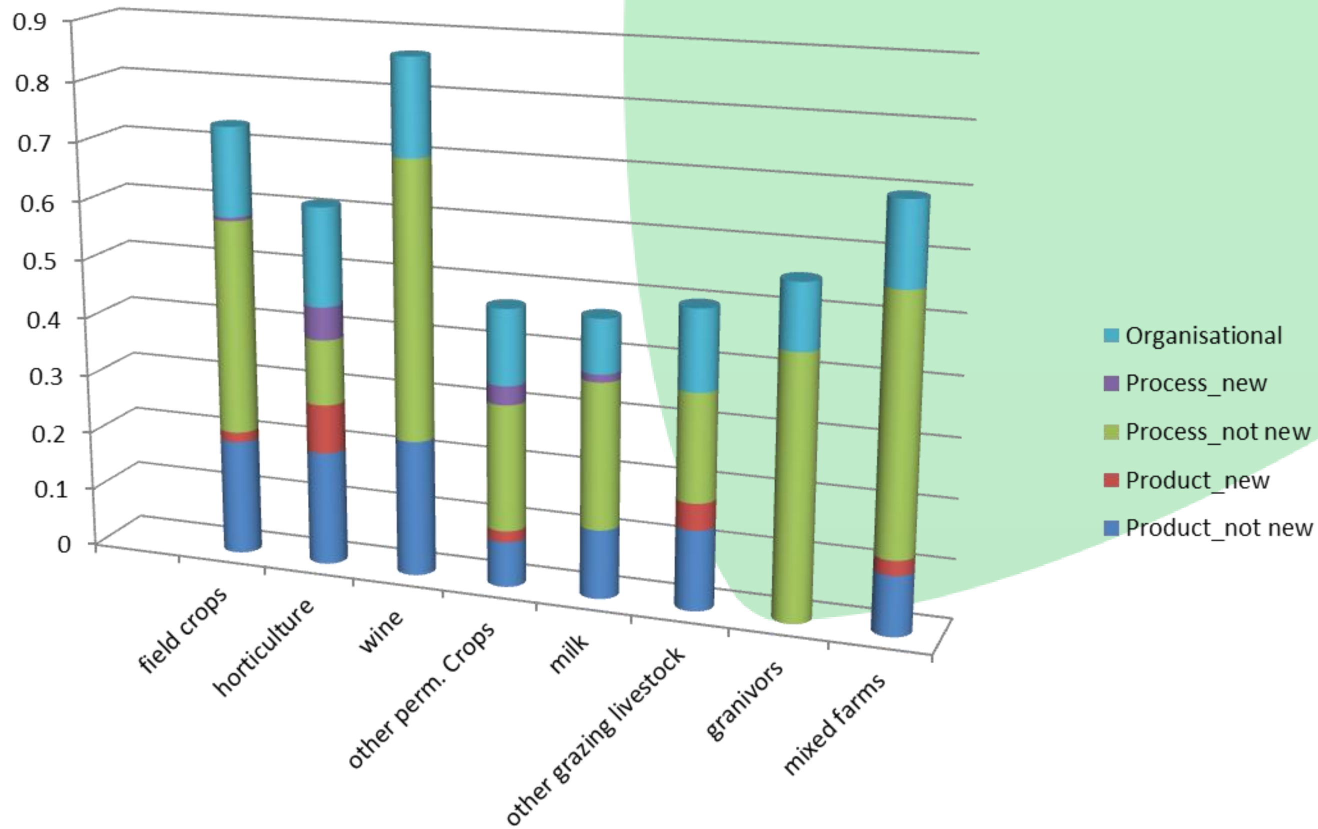
Major part of innovations adopted: innovations that are 'not new' (for the market)

Type of innovation adopted per farm size class (shares of farms having innovated)



Most innovations are on larger farms

Type of innovation adopted per type of farming (average number of innovations per farm)



Most innovations in wine sector

More product innovations in vegetable farm types

Results: econometric models of the probability of innovation

Explanatory variables	Product not new to market	Product new to market	Process not new to market	Process new to market	Organisational innovation
Economic size class			+		+
Farm net income	+				+
Total subsidies			+	+	
Total liabilities					
Total assets					
Cash flow	-				-
Age	-		-	-	-
Advisory			+		
Member State					
Type of farming	+				

Note: empty cells indicate non-significant effects

Conclusions

- Comparison between countries difficult (some countries are already advanced in terms of technologies; subjectivity of concepts)
- But the case study highlights potential to investigate the adoption rates, the determinants and the role on productivity/profitability/sustainability
- Such indicators could help policy monitoring and targeting:
  - » EU: current Rural Development Programme (2014-2020) offers Member States the opportunity to promote innovative farm technologies
  - » OECD: in pilot countries, reviews on innovation in food and agriculture, and the role of government and private sector

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