

## Open IACS: first steps in using geodata from agricultural administrative registers

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ministero delle politiche agricole alimentari e forestali GEI Global Evaluation Initiative



## Agenda



- The need for data in the EU policy landscape
- Open IACS: opening, (re)using, linking and building applications
- Computing CAP indicators with geospatial administrative data
- Challenges and opportunities











## The need for (IACS) data in EU

### DG AGRI

agricultural statistics (i.e. context indicators), greening (crop diversification, ecological focus area, etc.), Carbon Cycle Modelling, estimates of arable crop production, ...

### **DG CLIMA**

better evaluation of agricultural greenhouse emission (LULUCF Regulation, beneficial for national environmental administrations)

### DG ENV

agro-systems assessment, farming practices, impact evaluation for RD measures (beneficial for national environmental administrations), ...

#### "Open Data Directive" Directive (EU) 2019/1024

- Opening data, re-using of public sector information with common rules for a European market for government-held data

2021

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- High value datasets: re-usesable data with important benefits for the society and economy (e.g. geospatial)

### **DG ESTAT**

improvement of agricultural statistics with comparison/integration of Structure Statistics, ..., (beneficial

other initiatives: LUCAS, Farm for National Statistical Institutes)

### **DG GROW**

consolidation of data from **Copernicus Land Monitoring** Service, (beneficial for Copernicus Forum Users)

### EEA

assessment of agricultural land in Natura 2000 areas, assessment related to the Water Framework Directive, (beneficial for National Reference Centers)

RETERURALE NAZIONALE

**FAIR** Guiding Principles for scientific data management and stewardship

- to improve the Findability, Accessibility, **Interoperability**, and **Reuse** of digital assets - machine-actionability: computational support to deal with data as a result of the increase in volume, complexity, and creation speed of data.









• EU project financed by CEF Telecom /4 M€ Euro/10 partner

#### **Objectives:**

- To design a common semantic model to represent and harmonize the data of agricultural paying agencies required to manage CAP and to develop interoperable Linked Open Data for the IACS domain
- To develop services for agri-environmental indicators calculations
- To exploit HPC capabilities for computing indicators and solution for agrienvironmental data integration and increasing HPC and data capacities of European Data Infrastructure

**Keywords: CAP** – Common Agricultural Policy; **IACS** - Integrated Administration and Control System; **LPIS** - Land Parcel Idendification System; **GSSA** - GeoSpatial Aid Application; **HPC** - High Performance Computing; **LOD** – Linked Open Data











### Partners



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### Architecture



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#### 3 use cases

- 1. Information services for citizens, farmers and policy makers to support farmer activities
- 2. Agri-environmental Policy evaluation
- 3. Climate Change Impact Evaluation

### **Expected outcomes**

- Indicators for performance monitoring (CAP)
- Integration between agricultural and environmental datasets ->agri-env. analysis
- Inputs for statistical data production
- Tools for decision making/monitoring/evaluation
- High Performance Computing -> handling Big data and complex modelling







## Linked Open Data (LOD)





Designing principles for sharing machine-readable interlinked data on the Web.

Handling & linking huge datasets from disparate sources

Boosting knowledge discovery and efficient data-driven analytics.



# Indicators (1/3)



Tools to measure the achievement of an objective defined in accordance with the **RACER CRITERIA** (Relevant/Accepted/Credible/Easy/Robust)

#### REFERENCES

Indicators considered comes from the new **Performance Monitoring and Evaluation Framework (PMEF)** and to *COM(2018) 392 final* defined by EU to assess CAP performances and efficiency.

#### TYPOLOGY

- Context [general contextual trends]
- Impact [outcome of intervention beyond immediate effects]
- **Output** [activities directly realised by interventions]
- Result [direct and immediate effect of interventions]















has

## Indicators (2/3)

#### **INDICATOR** code -1:1 1:1 name 1:1 definition objectives 1:n 1:1 unit of measurement 1:n data sources ---1:n variables algorithms 1:n frequency \_\_\_\_\_ 1:n 1:1 delay data collection levels 1:n caveats/issues 1:n

\*\*\* can be improved with IACS data



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Utilized Agricultural Area (UUA)

The total utilized agricultural area in absolute terms expressed in hectares

Provides the context to the policy for on the "Agricultural land" domain

Hectares

C.18 (PMEF)

Eurostat crop production statistics

Arable land, Permanent grassland, Permanent crops, Kitchen gardens

Sum of the crops area belonging to the four crop groups

<mark>Annual</mark>

#### <mark>1 year</mark>

National (Nuts 0), regional (NUTS 1/2), municipal





# Indicators (3/3)



 Citizens/Farms/private companies/Researchers (data analysts)/Advisory services/Paying Agencies/Policy makers (Ministries, public entities), European Commission DGs, Eurostat

#### Spatial detail for reporting the indicators is a function of:

- type of data and indicators
- access restrictions
- Options for reporting and visualization
- spatial format with thematic maps and in tabular format
- spatial resolution (administrative unit municipality (LAU 2) or finer)
- structure of the spatial data: polygons and/or grids (1 km grid or finer)















# Utilized Agricultural Area (UUA)



### Process

- 1. Retreiving geospatial data from IACS (LPIS and GSSA)
- 2. Pre-processing (handling attributes and geometry issues)
- 3. Ontology generation and harmonization
- 4. Semantic analysis and attribute matching (IACS <-> Eurostat)
  - Classification of geospatial units (parcels) into 4 crops categories: Arable Land, Permanent Grassland, Permanent Crops and Kitchen Gardens.
- 5. Creation of new geospatial layer containing the parcel with the Eurostat classification
- 6. Computation of spatialized context indicators (UAA) reported for administrative units (municipality, province, region, country)











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## Data sorces: LPIS and GSSA



- LPIS and GSAA: the geospatial datasets supporting IACS in the identification and management of aid applications under the CAP.
- LPIS (Land Parcel Identification System): georeferenced agricultural areas (potentially eligible for EU aids) digitized from ortho-imagery.
  Frequency 33% of Italy/year.
- GSAA (**GeoSpatial Aid Application**): georeferenced agricultural parcels for which an aid is requested.
  - Digitized on-screen by the applicant farmer and may be modified/updated by paying agencies by controls to ensure accurate data.
  - Frequency: 1 year.









## Geospatial data from LPIS





Foggia province (7000 kmq= 2% of Italy)



LPIS (Refresh) and municipalities (226k land use polygons)

Expected data volume for Italy: > 11M land use polygons



zoom-in land use polygons and orthoimagery





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# Crops matching (LPIS-EUROSTAT)



Semantic analysis of IACS/LPIS and Eurostat Annual Crop Statistics

Matching LPIS land use codes with Eurostat crops

Assessing the rate of correspondence and weight generation for adjusting areas

LPIS land use 🗾	Eurostat crop 🗾	Eurostat crop group 🗾	Purity 🗾
LU 1	Crop 1	Arable land	100
LU 2	Crop 1	Arable land	100
LU 3	Crop 1	Arable land	80







## Tools: Geospatial Web Browser



- Indicators reported at municipality (atomic level)
- Aggregation is possible for the administrative hierarchy (province/region/country)



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## Tools: Queries with LOD

What is the value of the indicator Y (e.g. UAA) for the municipality X?

What are the GHG emissions index in Italy where corn is cultivated in protected areas?

What are the highest level of pesticides residues in water in the provinces with the highest share of arable crops?





#### We are facing great opportunities in..

- Accessing IACS spatial/non. spatial data are relevant dataset: best maintained administrative information systems with uniform content, data structure and regulated update cycles across EU
- Re-using existing data for computing indicators and to develop spatial knowledge (decision making tools/policy evaluation/...) also through integration from disparate data sources (e.g. environmental data)
- Improving indicators for CAP monitoring and evaluation (e.g. higher spatial/temporal resolution)
- Reducing burden in data collection and providing better transparency and accountability

#### But strategies are needed for...

- Fostering open data initiatives
- Dealing with the "data deluge" of spatial/non-s. datasets -> we need computing infrastructures and novel data management approaches
- Understanding the complex system of data production and performing ad-hoc pre-processing
- Streamlining cooperation among different data custodians
- Working toward cross-border/cross-theme data harmonisation and interoperability











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