



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

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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

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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), ...

DG ESTAT

improvement of agricultural statistics with comparison/integration of other initiatives: LUCAS, Farm Structure Statistics, ..., (beneficial 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)

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

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.

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- 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 agri-environmental 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 Identification System; **GSSA** - GeoSpatial Aid Application; **HPC** - High Performance Computing; **LOD** – Linked Open Data

Partners

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Paying Entities and Agriculture Innovation Entities



HPC Infrastructure Providers



Research institutions

Leader



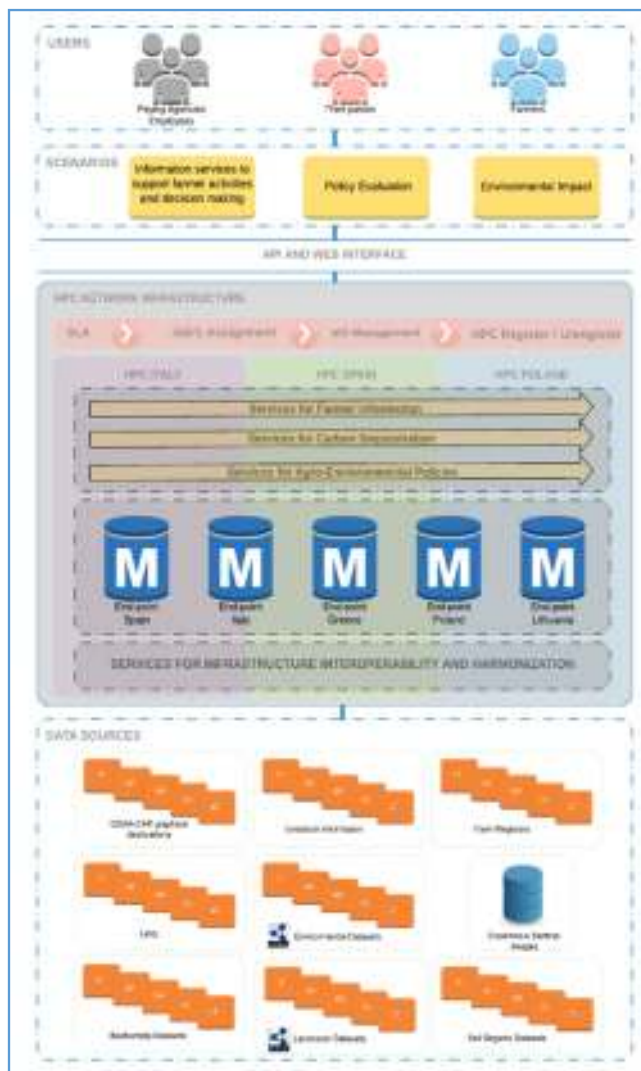
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Architecture



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)

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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)

CONCEPTS

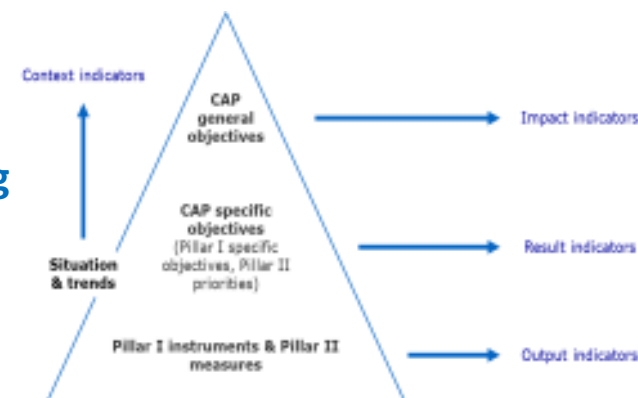
Tools to measure the achievement of an objective defined in accordance with the **RACER CRITERIA**
(**R**elevant/**A**ccepted/**C**redible/**E**asy/**R**obust)

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.

TPOLOGY

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



Indicators (2/3)

INDICATOR	
1:1	code
1:1	name
1:1	definition
1:n	objectives
1:1	unit of measurement
has 1:n	data sources
1:n	variables
1:n	algorithms
1:n	frequency
1:1	delay
1:n	data collection levels
1:n	caveats/issues

C.18 (PMEF)

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

Eurostat crop production statistics

Arable land, Permanent grassland, Permanent crops, Kitchen gardens

Sum of the crops area belonging to the four crop groups

Annual

1 year

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

*** can be improved with IACS data

Indicators (3/3)

Different Type of users

- 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)

Different **access restrictions**
according to data sharing policies:
atomic vs. **aggregated** data and
indicators

Utilized Agricultural Area (UUA)

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Process

1. Retrieving 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)

Data sources: LPIS and GSAA

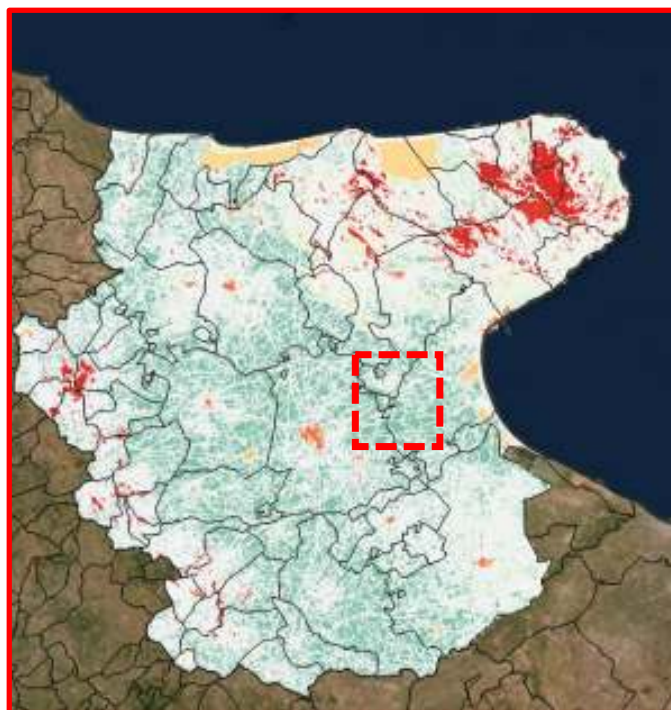
- LPIS and GSAA: the geospatial datasets supporting IACS in the identification and management of aid applications under the CAP.
- LPIS (**Land Parcel Identification System**): georeferenced agricultural areas (potentially eligible for EU aids) digitized from ortho-imagery.
 - Frequency 33% of Italy/year.
- 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

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Foggia province
(7000 kmq= 2% of Italy)



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



zoom-in land use polygons and
orthoimagery

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



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Crops matching (LPIS-EUROSTAT)

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Semantic analysis of IACS/LPIS and Eurostat Annual Crop Statistics

Matching LPIS land use codes with Eurostat crops

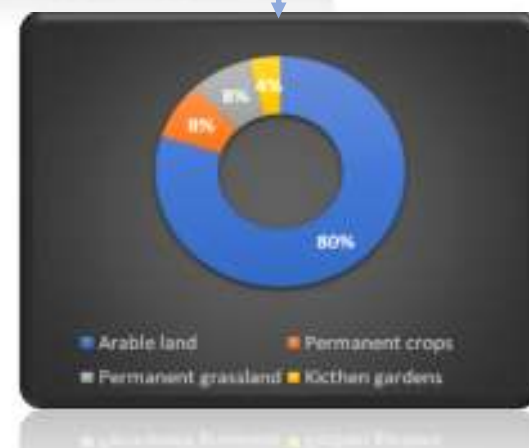
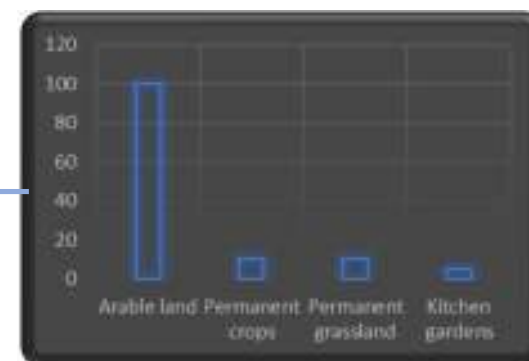
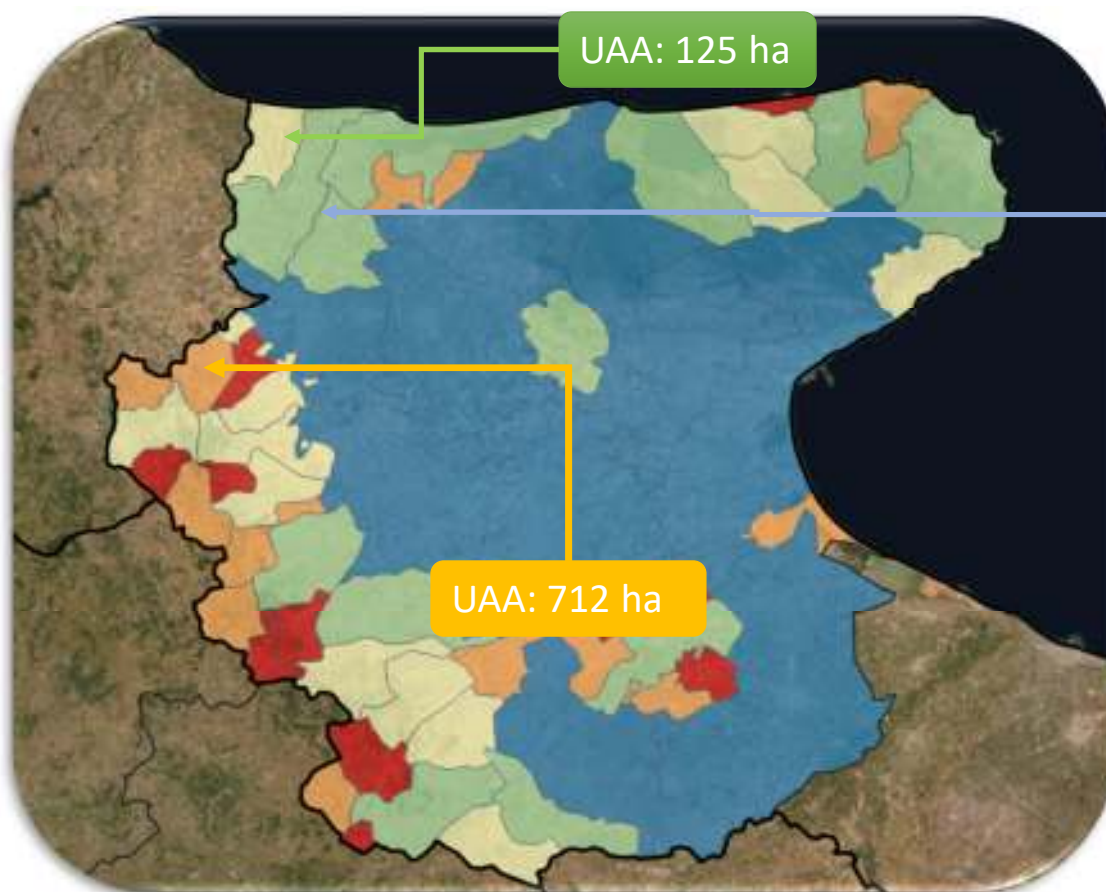
Assessing the rate of correspondence and weight generation for adjusting areas

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)

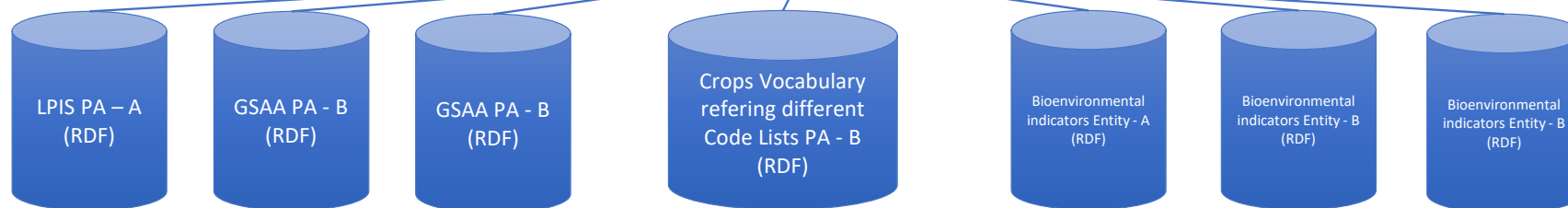




Tools: Queries with LOD

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- ? 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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Thank
you



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