EUROPEAN BIG DATA VALUE FORUM
2-4 OCT | BUDAPEST - HUNGARY

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AgridataValue

Accelerating smart farming digital transformation via big satellite data

Francisco J., Lacueva-Pérez
02/10/2024, 9:15-9:45

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R&D Project Manager at Instituto Tecnológico de Aragón.

BDVA-Agrifood TF Coleader.

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Project Identity Card

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Smart Farm and Agri-environmental Big Data Value

Grant Number:	101086461
Type of action:	HORIZON RIA
	HORIZON-CL6-2022-GOVERNANCE-01-11
Starting date:	1 February 2023
Project duration:	72 months (3 + 3 years)
Budget:	€ 7 145 500,38

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AgriDataValue concept

- Achieve smart farming digital transformation through agri-environmental monitoring
  - Increase the smart farming capacity
  - Incentivize competitiveness and fair income
  - Support sustainable farming/protection of the environment
- Leverage on:
  - State of the art big data and dataspaces' technologies **Data**
  - Agricultural understanding and agri-environment policies **Policies**
  - New business models **Innovation**

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Project partners & geographical coverage

- 30 partners
- 14 countries
  - 23 pilots in 9 of them
- 1,810 ha/25 crop types
- 2,000 animals / 5 types
- 9TB Open Data
  - Satellite
  - Drones
  - IoT
- 4,500 new IoT Sensors/RFIDS

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Seven Use Case Clusters

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- Cluster #1 ⇢ Arable crops
  - Poland, Netherlands, Latvia, Greece
- Cluster #2 ⇢ Vegetables
  - Belgium, Spain
- Cluster #3 ⇢ Permanent crops
  - Netherlands, Spain, Greece, France, Italy, Romania
- Cluster #4 ⇢ Livestock
  - Belgium, Latvia, Greece

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Seven Use Case Clusters

- Cluster #5 ⇢ Cross Sector
  - Greece, France, Latvia
  - fruit, vineyards, livestock, milk, oil, biogas, manure, energy
  - Circular economy and traceability
- Cluster #6 ⇢ CAP Realization
- Cluster #7 ⇢ Climate Monitoring

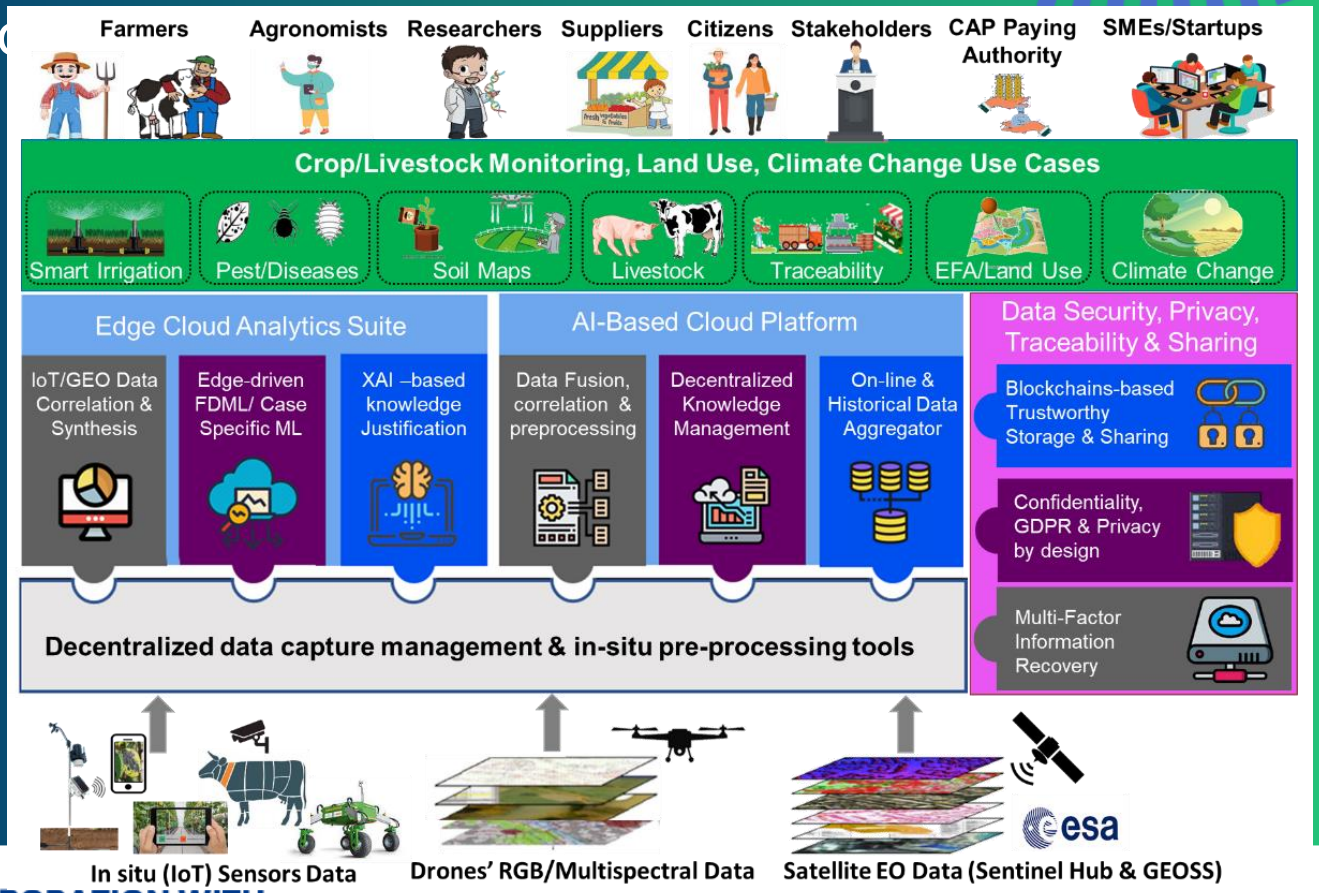
Agri – Data – Value

- Key data of interest

Satellite / Drones	IoT
Normalized Difference Vegetation Index (NDVI) Normalized Difference Moisture Index (NDMI) Normalized Difference Water Index (NDWI) Normalized difference red edge (NDRE) Enhanced Vegetation Index (EVI) Green Normalized Difference Vegetation Index (GNDVI) Chlorophyll Vegetation Index (CVI) Altitudes / Slopes	Weather conditions Air quality Soil Moisture Soil Electric Conductivity / Salinity Leaf wetness

Data governance

- AgriDataValue ⇢ Data and DataSpac
- Open Source / Open Data



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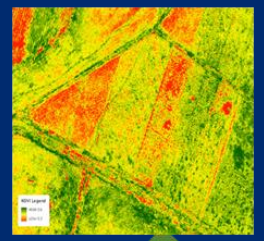
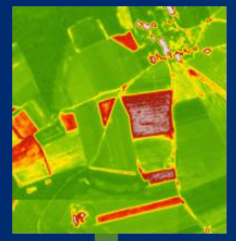
Smart Farming 4.0

Drones



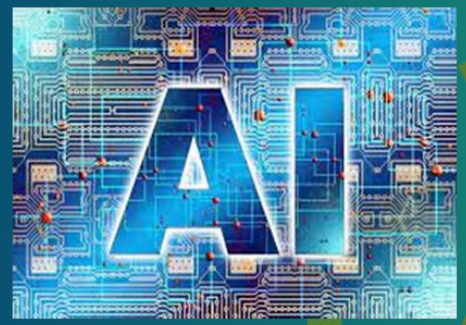
Satellites



IoT

Big Data

Farmer



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Aragonese Use Case

Javier, Sancho
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Javier Sancho Royo

R&D Project Manager at SARGA.

Evaluator European projects

- **The Aragon Company of Agri-environmental Management S.L.U (SARGA)** is a public company of the Government of Aragon that implements a wide range of agri-environmental projects and services addressed to improve the rural affairs and the environment in Aragon region.
- The company employs approximately 1,200 highly qualified people that develop over 12 services in the agriculture, farming, rural, environmental and forestry fields, as well as in sustainable development , new technologies applied to rural areas . Sarga has also a strategic projects area based in research, European projects etc
- The organizational chart of Sarga is divided into 6 areas: Livestock, Forest services, Environmental services, Forest services , Environmental services; Strategic Projects

ARAGON USE CASE

Sarga manages from the agricultural and technical point of view the use case of Aragon together with the ITA

Pest Control on Mediterranean Fruit Fly: *Ceratitis capitata*, known as the Mediterranean fruit fly is one of the most destructive fruit pests in the world, infecting more than 200 fruits types. We plan to install IoT. AI and automated capture traps to detect existence and built models to predict pest tracking/mitigation.

WHY THIS USE CASE ????

- The useful agricultural area in Spain presents serious levels of degradation, the result of excessive and irresponsible use of available natural resources. One of the environmental problems that can cause this degradation is the excessive use of biochemical inputs, and among them, the use of pesticides.
- To this we must add the high costs of treatments due to the increase in costs.

REGULATORY FRAMEWORK

- Royal Decree 1311/2012 introduces Integrated Pest Management (IPM), defined as the careful examination of all available plant protection methods
- Regulation 1107/2009/EC concerning the placing of plant protection products on the market has led to the ban on many pesticides used in the control of pests
- The texts provide a strong foundation for the development of an AI-powered tool to predict stone fruit phenology. It highlights the following key points

1. **Environmental concerns:** The text emphasizes the need for more sustainable agricultural practices, driven by concerns about environmental degradation and the excessive use of pesticides
2. **Regulatory framework** promote integrated pest management and limit the use of pesticides.
3. **Purpose of the tool:** The goal is to develop a tool using AI and machine learning to predict stone fruit phenology and pest risks, which could help optimize pesticide application and reduce environmental impact

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TOOLS & APPLICATIONS

- The potential applications of the AI/IOT based tool will be

1. **Optimized pesticide application:** By predicting when pests are most likely to appear, farmers can apply pesticides more precisely, reducing their overall use.
2. **Improved crop management:** The tool can help farmers make better decisions about irrigation, fertilization, and harvesting.
3. **Climate change adaptation:** It can be used to assess the impacts of climate change on stone fruit production and develop adaptation strategies.
4. **Research and development:** The tool can support research on stone fruit genetics, physiology, and ecology

Tools that can be replicated in other crops. Professionalization of agricultural farms. Cost reduction. Improvement of the environment and health

EUROPEAN BIG DATA VALUE FORUM

PREDICTIVE MODELS

- Through a quantitative description of the relationships between host, pathogen and climate, it is possible to predict the effect of the evolution of the disease or pest
- the parameters related to the environment are climatic, those related to the host are varietal susceptibility and phenology, and those related to the pathogen are the quantity and availability of the pathogenn, as well as its virulence
- The implementation of crop phenological evolution models based on machine learning / AI can be a first step for their subsequent use in the prediction
- Though Integrated Pest Management is widely implemented, there are still diseases that, due to their characteristics, require preventive chemical control to prevent their appearance

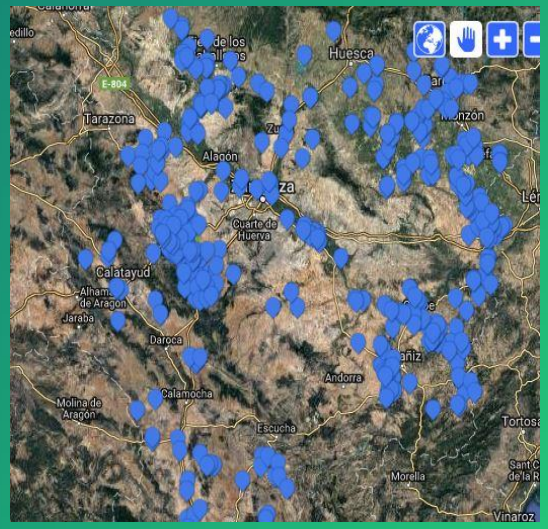
EUROPEAN BIG DATA VALUE FORUM

PREDICTIVE MODELS

- The implementation of predictive methods would allow the number of phytosanitary applications that must be carried out to be considerably reduced
- We are talking about using a scientific method for the application of pesticides and phytoncides (not a method based on intuition).
- Development of predictive methods applied to the biological and phenological evolution of crops, through field validation, including the use of machine learning models and the use of Big Data to improve the prediction obtained, allowing its adjustment with the variables existing in our territory.

DATA SOURCES /INSTRUMENTS USED

- **RedFara**
- The Plant Health Surveillance Network of Aragon (RedFAra) is a cooperation group made up of nearly 90 members, including ATRIAs, CITA
- The Network operates in five areas: herbaceous crops, horticultural crops, olive trees, grapevines and fruit trees
- Field notebook



DATA SOURCES /INSTRUMENTS USED

Weather stations

- The network consists of a network of stations that group together the SIAR and AEMET stations.
- The incorporation of other possible sources of weather and climate information will also be studied, as well as other variables that could be of interest for analysis during the project.

Classical models of phenological evolution

- All observable biological changes in plants are directly or indirectly related to the time of year, weather and climate conditions

Copernicus Sentinel-2 Pictures derived NDVI.

- NDVI is an indicator that allows us to estimate the vigor of vegetation in a satellite image.
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Replace with Participant Logo

SARGA

Javier Sancho /Project manager

Kick-off Meeting Madrid

AgriDataValue receives funding from the EU Horizon Europe R&I Programme under Grant Agreement No. 101086461

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- .

PREDICTIVE MODELS

- Implementation of phenological evolution models of crops based on machine learning/AI to be able to evaluate their evolution based on climatic parameters this can be applied :
  - Evaluate the influence of the phenological state of the crop on the incidence of diseases.
  - Prediction of the state of ripening of different crops based on climatic conditions.
  - Definition of risk patterns in the face of climatic factors (frosts) based on the phenological state of the crop and climatic conditions
  - Use of climatic and biological evolution forecasts in the medium-short term (7-15 days) to be able to establish scenarios of incidence of pests and diseases in the medium-short term.
- Establish a comparative analysis on the applicability and results of the different existing predictive models for pests and diseases.
- Definition and implementation of a REST API that allows the integration of results into third-party platforms, for example, into RedFara.

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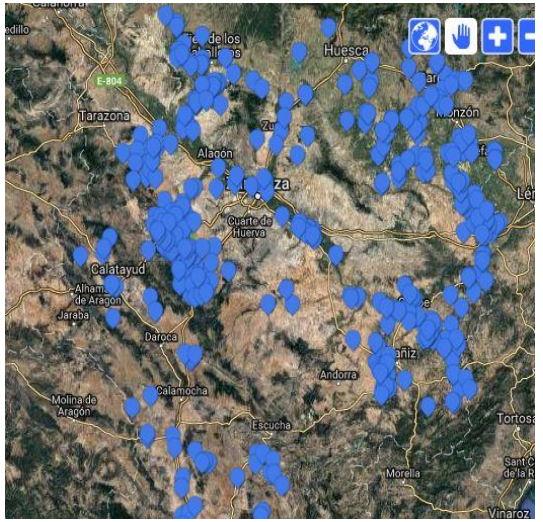

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