demeter

PILOT
PROJECTS

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ABOUT
DEMETER

DEMETER is a Horizon 2020 project which aims to lead the digital transformation of Europe's agri-food sector through the rapid adoption of advanced Internet of Things (IoT) technologies, data science and smart farming, ensuring its long-term viability and sustainability. The project seeks to create a secure and sustainable European IoT technology and business ecosystem. DEMETER will demonstrate the real-life potential of advanced, standards-based, interoperability between IoT technologies by adapting and extending existing standards into an overarching Agricultural Information Model.

For more information visit:
WWW.H2020-DEMETER.EU

KEY FACTS

FUNDING SCHEME:

Horizon 2020 Industrial Leadership, ICT-08-2019

CONTRIBUTION OF THE EUROPEAN UNION:

€15 million

TOTAL BUDGET:

€17.5 million

DURATION:

3 ½ years (Sept 2019-Feb 2023)

CONSORTIUM:

60 partners

5 PILOT CLUSTERS:

Arable crops, Precision farming, Fruits and vegetables, Livestock and Supply chain

USE CASES:

20 use cases in 18 EU countries

DEMETER OVERVIEW

18 Countries

13 member states

60 Partners

318k hectares of land

Working with

5.7k Farmers

29k Sensors used across **80** sites

20 Pilots

5 Agri Sectors

9.2k Devices

& **131** Large Machinery

Global Outreach:

69 farming associations

47 Countries

1.5 Billion People

Multi-Actor Approach

Using Practical **skills** & **knowledge** to target real life needs, problems & opportunities.

DEMETER **OBJECTIVES**

The overall DEMETER goal is to empower farmers and farmer cooperatives to use their existing platforms and machinery to extract new knowledge to improve their decision making. Equally, we aim to ease the farmer's acquisition, evolution and updating of platforms, machinery, and sensors by focusing their investments where they are needed.

EMPOWER FARMERS AND FARMER COOPERATIVES

SIX KEY OBJECTIVES ARE DEFINED:

INFORMATION MODELLING

Analyse, adopt and enhance existing and, if necessary, introduce new Information Models in the agri-food sector. This will ease data sharing and interoperability across multiple IoT technologies, Farming Management Information Systems (FMIS) and associated technologies.

DATA OWNERSHIP

Empower the farmer, as a prosumer, to gain control in the data food chain by identifying and demonstrating a series of new IoT-based, data-driven, business models for profit, collaboration and co-production for farmers and across the value chain.

USER ORIENTATED SOLUTIONS

Reverse the relationship with suppliers, through an innovative model in which suppliers are responsible for ensuring that a final solution is optimal to the farmer's existing context and expressed needs.

BENCHMARKING

Establish a benchmarking mechanism for agriculture solutions and business, targeting end-goals in terms of productivity and sustainability performance of farms, services, technologies and practices.

REAL WORLD IMPACT

Demonstrate the impact of digital innovations across a variety of sectors and at European level.

KNOWLEDGE EXCHANGE MECHANISMS

Build knowledge exchange mechanisms, delivering an Interoperability Space for the agri-food domain using a core set of open standards.

BOOSTING INTERACTIVE & DEMAND-DRIVEN INNOVATION

MULTI-ACTOR **APPROACH**

DEMETER uses a multi-actor approach (MAA) which aims to make innovation fully demand-driven, involving various actors such as farmers/farmers' organisations, advisors, businesses, etc. during the whole cycle.

DEMETER implements this multi-actor approach across the full chain, from farmers to service advisors and suppliers. In this MAA, suppliers cover the full diversity of providers of useful digital and digitally connected components including ICT, data sources, machinery, knowledge, software and hardware providers.

SUPPORTING **INTEROPERABILITY**

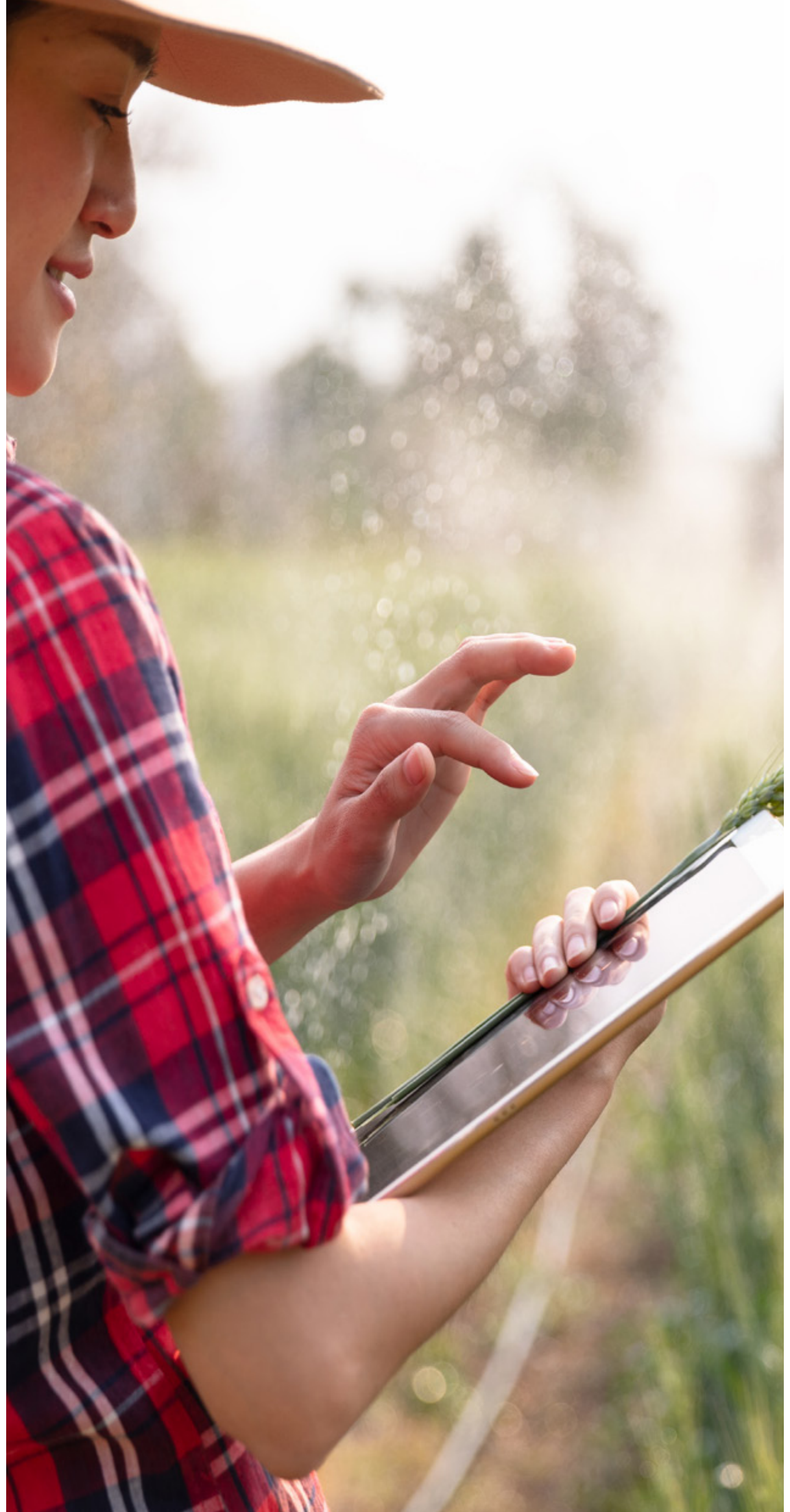
As data interoperability is of critical importance, DEMETER uses an overarching approach which integrates various technologies, platforms, services and applications while supporting fluid data exchange across the entire agri-food chain. DEMETER has developed a reference architecture that facilitates this interoperability, enabling secure integration of different platforms as well as data sets. The reference architecture also supports open innovation, where different standards can be combined for interoperable solutions. This, in turn, will not only increase the uptake of smart agriculture technologies for farmers, but will also open opportunities for SMEs to develop new technologies.

DEMETER **CONSORTIUM**

The DEMETER consortium consists of 60 partners bringing together farmers and farmers' organisations, academic institutions, and small and large public and private organisations representing demand and supply sides. Led by project coordinator TSSG (Telecommunications Software and Systems Group), the partners deliver a significant outreach capability globally, to cover a representative sample of the stakeholders needs and demands, thereby answering market potential and innovation enablement aspects.

60 PARTNERS REPRESENTING THE DEMAND AND SUPPLY SIDE TO DELIVER A SIGNIFICANT GLOBAL OUTREACH.

MIMIRO	Fede Connected to agriculture	OdinS Let us invent Smart Solutions	tracelabs origintrail Core Developers
IFA	PROBOT	PSNC	iniav National Institute for Agrarian and Veterinary Research
ITC Inovacijsko Tehnološki Grozd Innovation Technology Cluster / AGRIFOOD Digital Innovation Hub	ρTechnology	Georgian Farmers' Association	tecnalia Inspiring Business
Tyndall National Institute Institiúid Náisiúnta	SREM - FRUŠKA GORA	UDG	WODR
appr Asociația Producătorilor de Porumb din România	Universidad Politécnica de Madrid	vicomtech your R&D partner for smart digital solutions	vito remote sensing
Trøndelag Forskning og Utvikling Trøndelag R & D Institute	Gospodarstwo Rolne Ryszard Napierala	Gospodarstwo Rolne Frackowiak Maciej	zoetis



PROJECT **STRUCTURE**

DEMETER is structured into seven Work Packages to enable the project to meet the defined objectives.

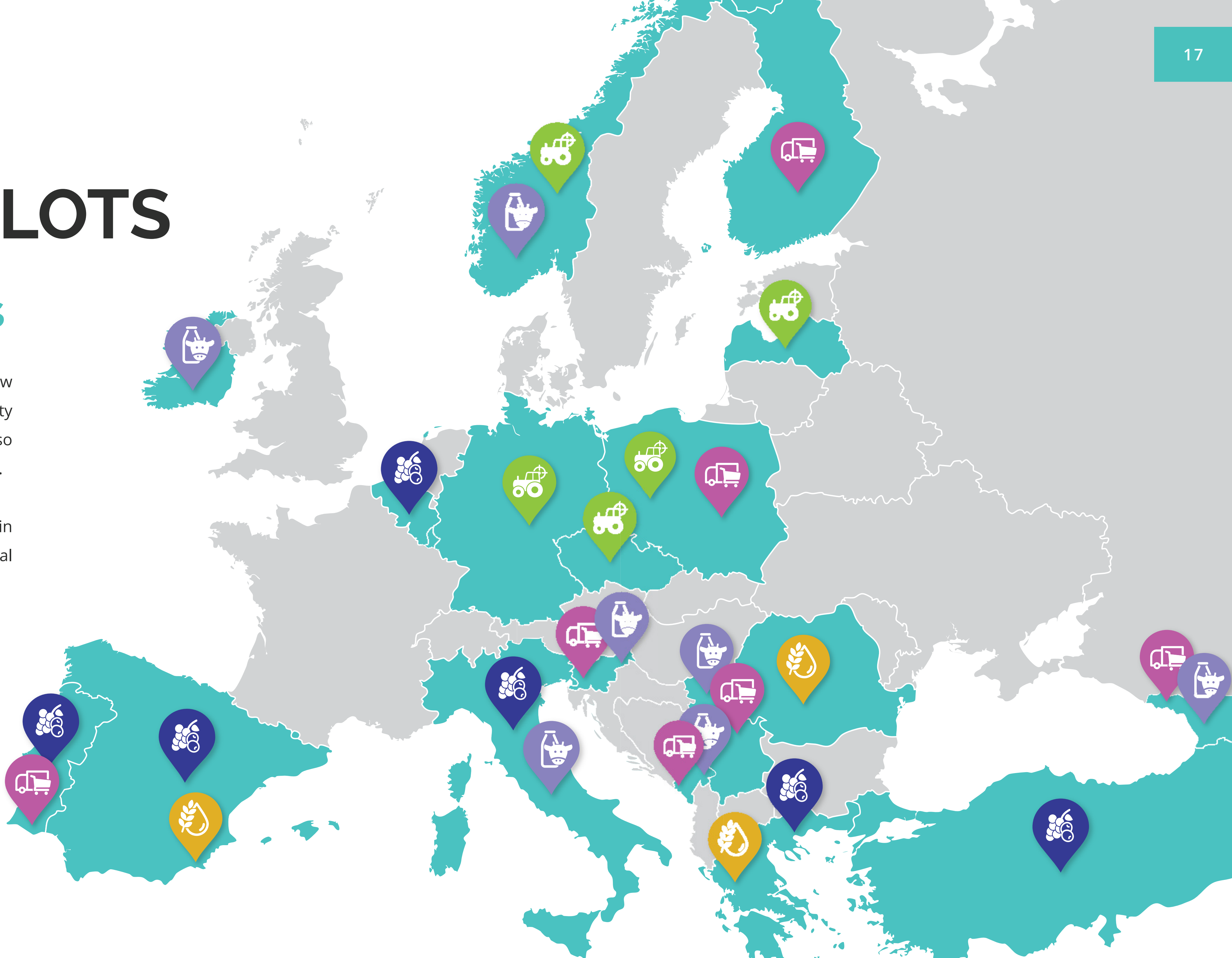
1. **Project Coordination**
2. **Data and Knowledge**
3. **Technology Integration**
4. **Performance Indicator Monitoring, Benchmarking and Decision Support**
5. **Pilot Management**
6. **Business Modelling, Innovation Management, Exploitation and Standardisation**
7. **Multi-Actor Ecosystem Development**

THE DEMETER **PILOTS**

5 Clusters, 20 Use Cases

The DEMETER pilot projects are used to demonstrate and evaluate how innovations and extended capabilities benefit from the interoperability mechanisms. The pilots, running across 18 European countries, are also used to monitor the evolution of the maturity in the stakeholders involved.

The pilots are grouped into 5 clusters: arable crops, precision farming in arable crops, fruit and vegetable production, livestock (poultry, dairy, animal welfare) and the supply chain.



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DEMETER **CLUSTER ONE**

ARABLE CROPS

ARABLE **CROPS**

FOCUS:

Water and Energy Management.

This cluster focuses on an efficient, integrated management of water and energy, from sources to end users, to optimise both the quality and quantity of the resources in irrigation systems applied to irrigated and arable crops. The pilots involve different technologies such as IoT sensor networks, satellite imagery and advanced farming platforms.

LOCATION

Spain

PARTNERS

1.1 & 1.2

Water and Energy Savings in Irrigated Crops

CHALLENGE

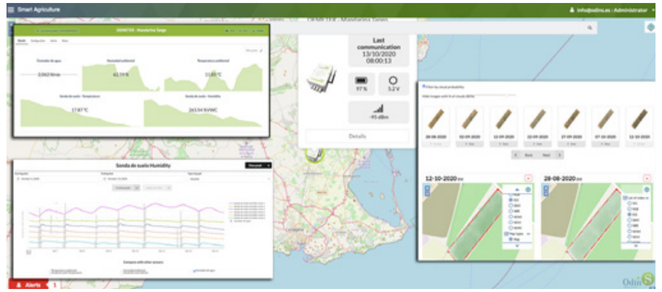
With the impact of climate change being felt by farmers across the EU, the need for irrigation has become an increasing issue. Water saving and energy saving are also key challenges for farmers. Many of the national modernised irrigation systems are closed solutions, limiting their interoperability and extension mechanisms.

AIM

This pilot aims to optimise the irrigation of arable crops by improving the automation of irrigation zones. By using open and standards-based technologies, it will allow irrigation communities to choose and combine hardware and software from different providers ensuring interoperability.

HOW

Using interoperable remote-control systems and robust management systems, inputs from both soil sensors and meteorological stations, as well as satellite images, will optimise the irrigation system. The use of real-time monitoring and control of water supply, in combination with energy efficiency improvements, is based on informed decisions from farm to fork. The adoption of standards and open protocols makes it easy to integrate IoT devices which are standard compliant.



BENEFIT

The implementation of standards-based and interoperable elements will facilitate the exploitation and maintenance of irrigation systems achieving greater efficiencies in water and energy savings. This adds a level of long-term investment security.

LOCATION

Central Macedonia region in Greece

PARTNERS

1.3

Smart Irrigation Service in Rice & Maize Cultivation

CHALLENGE

Rice is a high-input cultivation, especially in terms of irrigated water needs. Rice farmers frequently crop-rotate with maize, which also has substantial needs for irrigated water during the cultivation season. Current irrigation systems, especially for rice, are mainly based on farmers' experience and make suboptimal use of water, increasing the cultivation's cost, energy consumption particularly and the environmental footprint.

AIM

This pilot aims to maximise water use efficiency in the rice–maize crop rotation system, through the deployment of appropriate sensor systems and science-based decision making. Since irrigation is tightly linked to fertilisation, a nitrogen fertilisation advisory service is also provided by the pilot. This will lead to optimisation of the spatial distribution of nitrogen application based on the real needs of the field.

HOW

Customised in-field sensors are used for determining rice irrigation needs and remotely-controlled water electrical valves are employed for automatically optimising the irrigation. Additionally, remote sensing imagery and inputs from meteorological stations are used for determining the irrigation needs of maize crops. Sub-parcel nitrogen fertilisation needs are estimated through UAV and satellite imagery, leading to optimal fertiliser use via variable rate application machinery.

BENEFIT

The pilot will achieve increased, or standardised, crop production and improve the efficiency in the water and nitrogen fertilisation savings. This will decrease the carbon and, in general, the environmental footprint of both crops. Apart from the immediate benefits, this also adds a level of long-term investment security, especially in view of probable changes in water use strategies/policies due to the impact of climate change.

LOCATION

Romania

PARTNERS

1.4

IoT Corn Management & Decision Support Platform

CHALLENGE

Inefficient fertiliser practices and the demand for irrigation water contribute to environmental impacts, such as rising greenhouse gas emissions (GHG) and poor water quality, driving business risks in corn production. Efforts are necessary to limit GHG and handle environmental threats by promoting environmentally-friendly production technologies, practices and products and encouraging investments in green technologies. Scouting and monitoring of fields is required to identify any problems early, such as plant emergence issues, nitrogen shortages, insect build-ups, disease outbreaks, weed problems and moisture stress effects.

AIM

This pilot aims to implement an IoT Corn Decision Support System Platform for farmers to improve water management, including water quality, save energy and reduce greenhouse gas emissions. This will be done via an integrated platform, INOVAGRIA, that gives the farmer access to data at physical block level (as recorded in the National Paying Agency APIA) throughout Romania. This will assist the farmer in making informed and robust decisions regarding the technical mix to be employed in the production process.

HOW

Local weather stations and soil sensors installed in farms, together with estimations based on calculation algorithms for data collected from other weather forecast services and data provided by weather satellites, will be the basis for platform integration and decision support for corn farm management. This enables efficient collaboration and information exchange in a short local chain. The platform will allow and encourage enrolment of compliant IoT devices through open protocols and interoperable elements.

BENEFIT

The use of the platform will provide the users with appropriate risk management tools for adapting farms to climate change. This will allow them to respond to the current CAP greening requirements by changing their agronomic practices, while being able to access both Pillar 1 eco-schemes funding and Pillar 2 investment support. The results generated during the project implementation will be shared with the Romanian corn producers as well as their counterparts from Europe. This will provide stakeholders with access to project knowledge, regarding agriculture and ICT-related technologies.

DEMETER **CLUSTER TWO**

PRECISION FARMING

PRECISION **FARMING**

FOCUS:

Agricultural Machinery,
Precision Farming.

This cluster also focuses on arable crops but specifically on the usage of agricultural machinery and the establishment of precision farming. The pilots concentrate on monitoring arable crops through sensors and their documentation, while decision support systems will be developed for live support of agricultural process in a secure and trusted way. The data will reuse existing platforms and services and link the results to the DEMETER platform.

LOCATION

Germany

PARTNERS

Fraunhofer IESE

John Deere

2.1

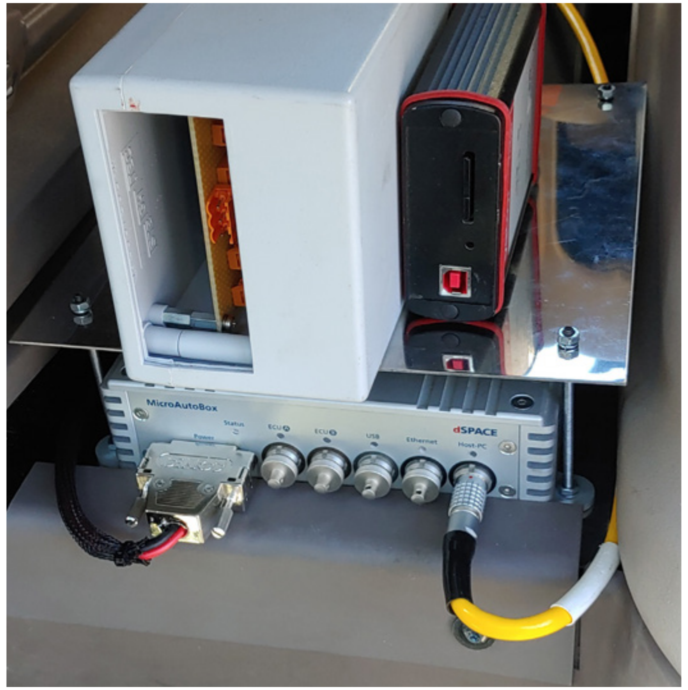
In-Service Condition Monitoring of Agricultural Machinery

CHALLENGE

Using onboard sensors for in-service monitoring of engine data as well as data of the exhaust gas after treatment decreases the need for PEMS (Portable Emissions Measurement System). Storing and analysing selected data as well as providing defined information to legal institutions helps to monitor that machines follow the regulations and offers the possibility to use the collected data for further improvements (e.g. optimising machine and simplify maintenance).

AIM

This pilot aims at demonstrating the potential application of onboard sensors for in-service monitoring, as well as testing the legal applicability of existing After Treatment (AT) sensors as an alternative to PEMS, while considering aspects of data management, privacy and integrity.



HOW

Using data from existing sensors, algorithmically ensuring high quality of continuous data streams, and analysing the data in real-time by making use of the most appropriate algorithms and technologies, will allow monitoring, documentation, and the use of the analysed results for further actions.

BENEFIT

Using the collected data will result in better knowledge of machine and engine conditions. On the one hand this can be used to simplify maintenance and thus reduce costs and machine down time. On the other hand, when in-service condition monitoring is mandatory this approach helps to fulfil regulations.

LOCATION

Germany

PARTNERS

2.2

Automated Documentation of Arable Crop Farming Processes

CHALLENGE

Today, agricultural processes are often documented with a considerable time lag after they are carried out, leading to inaccuracies. In addition, the cost of a job depends on various factors like the fuel consumption of a machine, labour time, and the efficiency of the job with regard to the weather conditions. Due to these influences, and others, occurring over a period of several months, farmers and contractors cannot assess the total cost of a job. Most farmers mainly rely on themselves and their resources for documentation, impairing the quality and quantity of the outcome.

AIM

This pilot will develop an automated job identification and documentation, and job cost calculation for fertilisation, tillage, seeding, and spraying applications. This will largely eliminate the need for manual documentation.

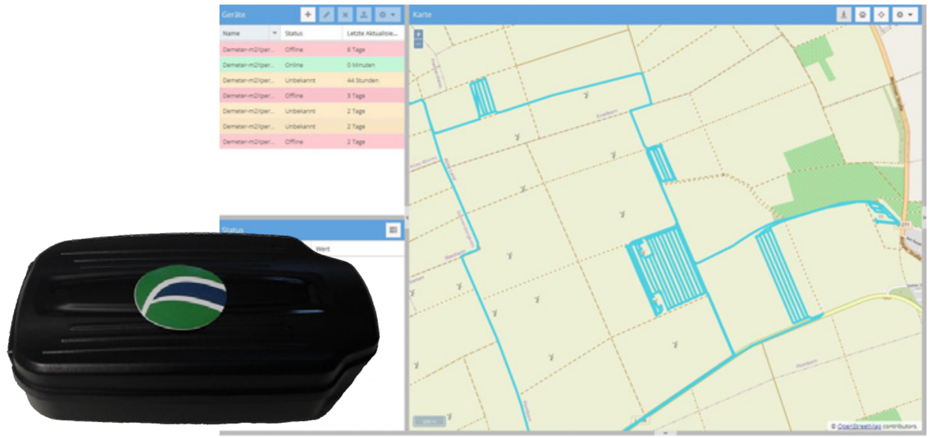
HOW

The focus of the job cost calculation element of the pilot will be on fertilisation and spraying applications for winter wheat. These jobs are done several times in the year and will therefore deliver more data than seeding or harvesting, which are only executed once per field.

For the development of an automated documentation tool, the detection of the difference between fertilisation spraying, tillage and seeding jobs will be the most challenging part of job identification. It is based on sensor data from machines and external sensors such as satellites (e.g. sentinel) and on data from weather stations.

Position and movement data are analysed for automatic process identification. Other external data like the seasonal date of measurement for estimating the relevant process season and weather data or satellite images for checking the plausibility of processes are added. This system is to make process forecasts for automated documentation.

Furthermore, this pilot will make use of data quality assessments to support the development, and to further increase the quality, of these data-driven services.



BENEFIT

Given the many factors influencing a profitable job application, the abovementioned approach delivers three major benefits. On one hand, job cost prediction has the potential to increase farmers' and contractors' productivity. In addition, the automated job documentation and collected weather information will improve decision support. Finally, automated documentation will help in terms of time efficiency and precision of the process.

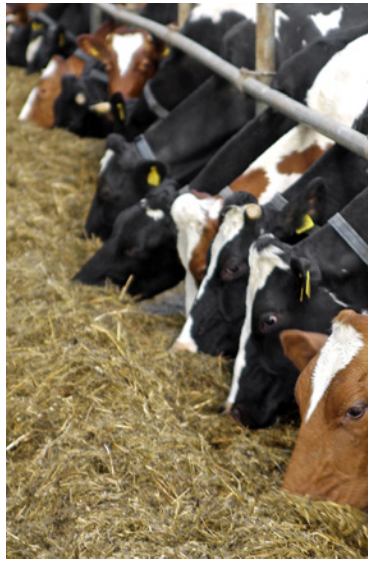
LOCATION

Czech Republic, Poland, Latvia and Norway

PARTNERS

2.3

Data Brokerage Service and Decision Support System for Farm Management



CHALLENGE

Farming related data is produced by several suppliers, using different systems, data models and APIs. This data varies from machinery data, satellite data, meteorological data, land parcel information systems, water bodies data, erosion data, soil data and more. For farmers, it is important to have access to the complete data to help decision-making, which is currently not available. The challenge is to integrate this data allowing analysis and visualisation applications for a Decision Support System.

AIM

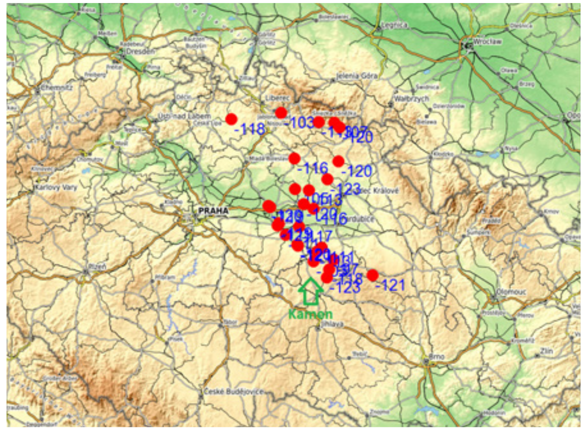
This pilot will establish a trust-based and compliant data market for agricultural enterprise data that sits between the owners and operators of agricultural data clouds and the farmer. This will include both a technical platform and advisory services that will ensure easy adoption of data and technology by farmers.

HOW

Pilot farms will implement relevant data generated in the process of managing their farm, as well as indicating expectations and comments regarding the functionality of the system. Three main groups of input information are used. First, data from precise online and long-term measurements on the farm (e.g. meteorologic stations, IoT sensors on the farm etc.). Next, external data specific to the farm such as satellite picture and information, external weather forecasts etc. Finally, data from other sources used at the farm (e.g. governmental regulations, subsidy calculation, work planning information). This data is combined and adjusted to a format that will describe all inputs in one application. Visualisations using a combination of charts and meteograms/multi-charts for sensor and meteorological data will be developed. This more effective utilisation of the data provides support for the decision-making process. Furthermore, a mobile application will provide alarms and warnings with information about suitable/ unsuitable conditions for defined interventions.

BENEFIT

Using the Data Brokerage Service and Decision Support System will enable farmers to have access to complete and integrated data, providing support for decision-making; something currently not available. This will have a positive influence increasing efficiency, reducing time and effort, and delivering cost savings.



LOCATION

Poland

PARTNERS

2.4

Benchmarking at Farm Level Decision Support System

CHALLENGE

There are several different data sets for agriculture, but many of them are rarely used in practice. Farmers often have challenges with the practical use of data when making decisions on the farm, especially in management. Data interoperability is a problem and furthermore, the data does not indicate how their farm performs against others of similar economic size. ICT systems are available, but time is needed to learn how to use these technologies, when the farmer is needed in-field.

AIM

This pilot aims at developing services to support benchmarking on the productivity and sustainability performance of farms, leveraging and extending existing Decision Support Systems (DSS) for farmers. This will involve monitoring different conditions and parameters affecting such indicators, collecting the data and integrating it in a unified layer accessible by the DSS.

HOW

This pilot will provide a simple to use benchmarking system that allows the use of ICT and IoT technologies in practical management and decision support, with a focus on data integration. The system will be developed on a layer of decision support based on modelling and data processing from many sources and structures like local data, public data, Farm Accountancy Data Network, and market information. This will be complemented with security mechanisms and implement computational benchmarking models with interfaces that reuse/ extend existing decision support and farm management systems (as an added value feature).

The system contains farm management interfaces for the farmer and their advisor alongside data exchange with external and internal systems, e.g. DSS and benchmarking methods on many levels of data. The main functionalities will be a calculation of the economic size of the farm based on dedicated algorithms and instructions, the presentation of graphs showing the current and historical state of affairs for farms of similar economic size and the presentation of information on prices of agricultural products and materials needed for production in previous years. The benchmarking system will be complementary with existing advisory systems such as Electronic Platform of Services for Users (EPSU) and the polish national advisory project, eDWIN.

BENEFIT

Facilitation of farm management at various levels of production volumes and types is expected to help with decision making for farmers by using a broad spectrum of data. This will also improve farmers' access to comparable data from his/her own farm with others. Data will be aggregated at the farm advisory system level. All activities are also aimed at increasing the knowledge of farmers and the accessibility of digital skills.

DEMETER **CLUSTER THREE**

FRUIT & VEGETABLE PRODUCTION

FRUIT & VEGETABLE **PRODUCTION**

FOCUS:

Health and high-quality crops.

This cluster focuses on supporting farmers in protecting the health and the quality of production, focusing on several fruit and vegetables crops in several European countries. The pilots involve the integration of several technologies: existing farming digital platforms, IoT sensor networks, model and Decision Support Systems, remote sensing data and advanced data analysis tools.

LOCATION

Italy and Greece

PARTNERS

3.1

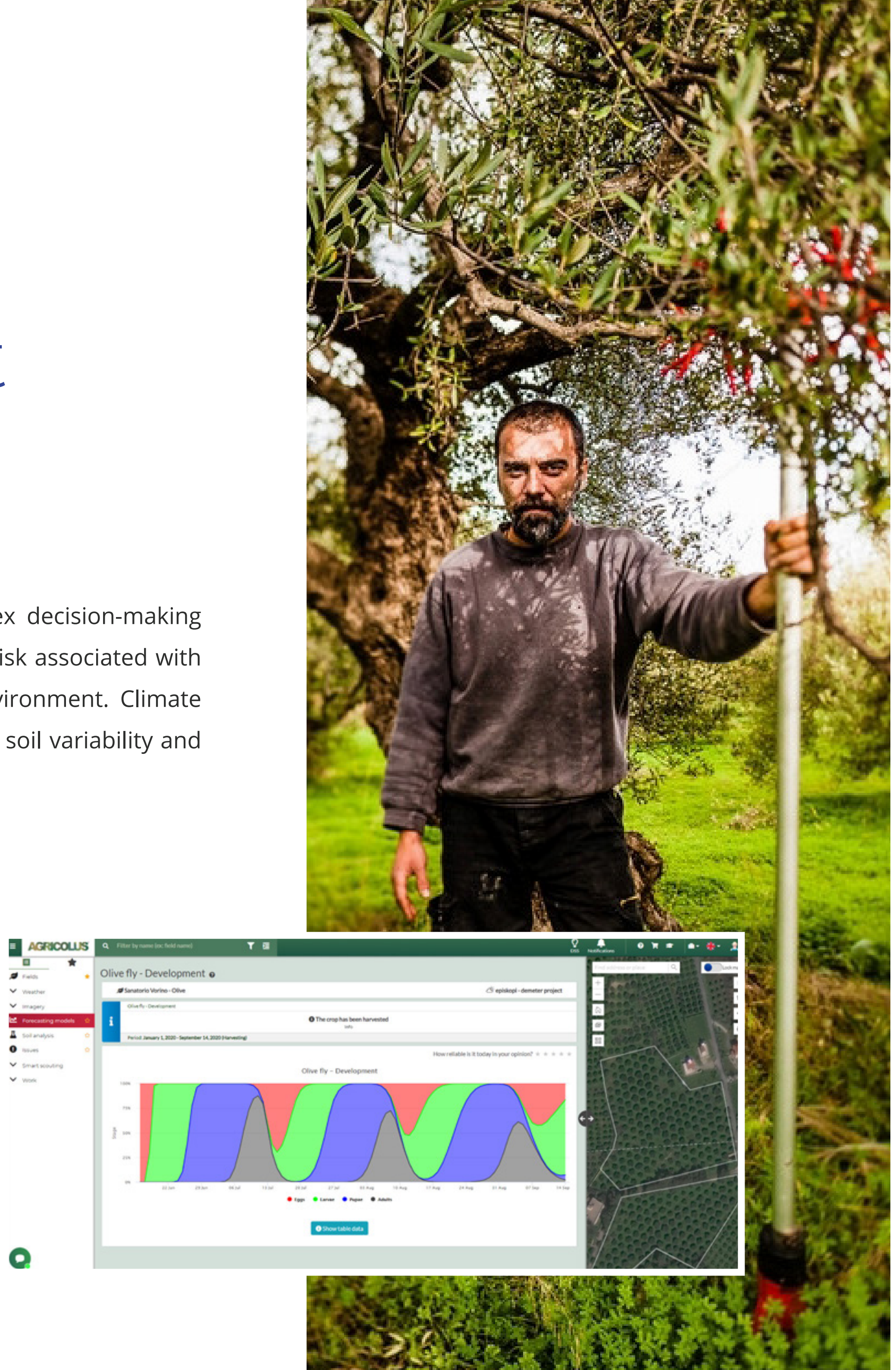
Decision Support System to Support Olive Growers

CHALLENGE

The efficient management of olive orchards requires complex decision-making processes. This is because of the increasing uncertainty and risk associated with olive fruit and olive oil production in a rapidly changing environment. Climate change is adding to erratic Mediterranean weather conditions, soil variability and pest outbreaks.

AIM

The aim of this pilot is to develop and demonstrate a Decision Support System (DSS) for olive tree growers, advisers and agri-food processors to address common issues associated with olive tree growing and olive oil production, including fertilisation, irrigation and integrated pest management (IPM). The DSS integrates in-field sensor data, remotely sensed data, a modelling platform, and a farm management system, combining weather patterns and soil information with crop traits, to foster the sustainable production of olive tree orchards.



HOW

An integrated solution, Agricolus© OLIWES, will be configured and deployed in selected olive tree farms to address different climatic and farming conditions. OLIWES is a cloud ecosystem, which provides the most modern technologies of data collection, analysis, and visualisation, delivered with a user-friendly interface. The functional features of OLIWES include the following areas: i) orchard management; ii) field scouting; iii) forecasting models; iv) Decision Support System. Open protocols and standards facilitate the integration of IoT sensors, interoperability, and data exchange.

BENEFIT

The expected benefits are the following: optimisation of water and nutrient management with data-driven decisions, implementation of IPM solutions and preventive measures through forecasting models, time series analysis of long-term data records and comparison of farmer performances to achieve sustainable crop production and protection.

LOCATION

Portugal

PARTNERS

3.2

Precision Farming for Mediterranean Woody Crops

CHALLENGE

Mediterranean Woody Crops have been severally affected by several challenges such as climate change (water scarcity), pests and diseases. Most of the farms specialising in these crops are small, low on profit and technology, and face high labour costs. Furthermore, Mediterranean Woody Crops owned by medium/small farmers have limited access to technology, due to the associated costs, and the low levels of systems interoperability. These farmers need simple, intuitive, and cost-effective technologies to help them overcome the challenges outlined and become more profitable by maximising the use of smart and precision agriculture.

AIM

This pilot aims at promoting technology, methods and IoT solutions to optimise precision farming practices of Mediterranean Woody Crops (Apple, Olive and Grape), considering the small farmers' economic constraints. The proposed solutions (IoT and Ground Robots) will enable a more efficient usage of inputs such as water, energy, macro-nutrients, and pesticides, thus increasing the profits of small farmers and reducing their environmental impact.

HOW

This pilot will promote the use of open-source, plug-and-play, cost-effective and modular technology that can be considered by small holder farmers. The pilot will demonstrate real-time monitoring and control of plants, water supply and nutrients, using IoT sensors and Agricultural Robots on the field for phenotyping. This will also enable precision-spraying and use satellite/aerial imagery for yield potential estimation.

BENEFIT

The implementation of standards-based and interoperable elements will facilitate the exploitation and maintenance of irrigation systems achieving greater efficiencies in water, nutrients and energy savings, with cost effective solutions that can be acquired by small holder farmers.

LOCATION

Spain

PARTNERS

Tragsa

Atos

3.3

Pest Management Control on Fruit Fly

CHALLENGE

The Mediterranean fruit fly (Ceratitis capitata) is a dangerous pest for a wide range of distribution and host plants. A key challenge is how to deal with agricultural pests like fruit flies while reducing the use of chemical treatments. Currently traps are used and serviced manually each week. Captures are classified individually in the lab into sterile and wild flies. Sterile male flies are then released into the field to mate with wild females. No progeny will be produced and the wild population will decrease after several generation. However, the manual work involved is costly and time-consuming.

AIM

This pilot aims to optimise the release strategy of sterile male fruit flies by collecting enough field data in an efficient way.

HOW

The pilot will test the use of automatic traps that capture the fruit flies and sensors that detect when insects are inside the trap. The automatic trap will take real-time images of the captures. These images are sent to a server and based on machine learning approaches, the captures will be counted and identified as wild and sterile.

BENEFIT

The main benefit of this pilot project is achieving a more precise method to manage fruit fly control programs. Real-time capture data will allow improvements to be made to the release strategy of sterile males, thus reducing the occurrence of the pest over time. The automatic counting traps will result in a reduction in time, effort and cost associated with servicing the traps. Furthermore, real-time data will be sent to farmer relating to the status of the pest in the field.

LOCATION

Belgium

PARTNERS

3.4

Open Platform for Improved Crop Monitoring in Potato Farms

CHALLENGE

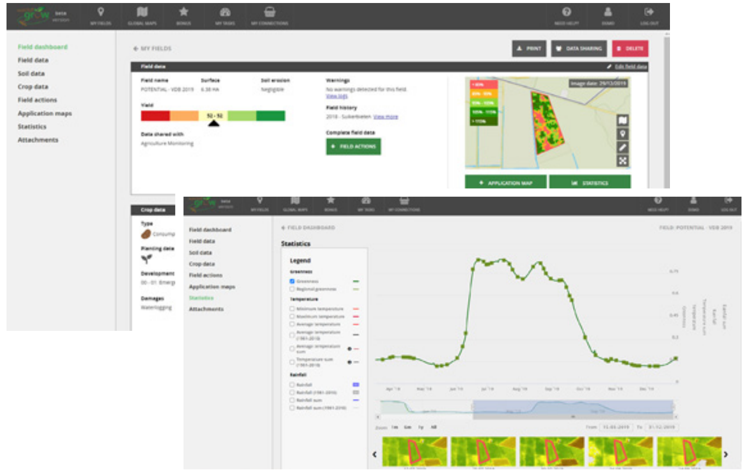
Farmers with large areas of potato fields, spread out geographically over several communities, often suffer from lack of sufficient ground truth data (measured yields, crop variety, exact planting date). This hampers the calibration and validation of crop growth models and the provision of specific advice on field management practices. Early identification of the fields that need extra activities (irrigation, fertilisation) to boost production, and estimating the expected crop yield as a result of these activities, can optimise the farmer's revenues. At the same time, an estimation of crop yield is important for the downstream potato processing industry, securing storage facilities, and accepting purchase orders. However, this data is not always readily available.

AIM

This pilot aims to integrate field machinery data from AVR potato harvesters with remote sensing, meteorological and soil data into the WatchITgrow (WIG, watchitgrow.be) platform, to increase ground truth data. Using detailed data from the machinery in the field (detailed yield information, planting dates), the manually fine-tuned physical crop model can be replaced by a purely data-driven approach using machine learning (ML) techniques.

HOW

AVR Connect is the recently started IoT cloud platform that collects data from the AVR field machinery (potato planters, yield sensors on the potato harvesters) using 4G communication and makes the data available to third parties. Geotagged yield data are collected at a frequency 1Hz, which leads to very detailed yield maps. The data collected via AVR will be used as training data for machine learning models that predict yield based on satellite imagery (Sentinel 1 and 2, Copernicus program), weather and soil data.



BENEFIT

Physical crop growth models need to be manually fine-tuned for every crop type and variety, using ground truth data. The increase in ground truth data (AVR harvesting machines) is expected to lead to better crop growth and yield prediction models, while the conformance to DEMETER standards ensures that the data is discoverable and accessible to third parties that might want to develop their own algorithms.

DEMETER **CLUSTER FOUR**

LIVESTOCK

LIVE**STOCK**

FOCUS:

Animal Health, High Quality & Optimal Management of Animal Products.

This cluster focuses on supporting farmers for livestock animal health and high-quality production of animal products using farmers' dashboards with AI-based prediction and decision support for animal health and animal products.

LOCATION

Norway

PARTNERS

4.1

Dairy Farmers' Dashboard for the Entire Milk and Meat Production Value Chain

CHALLENGE

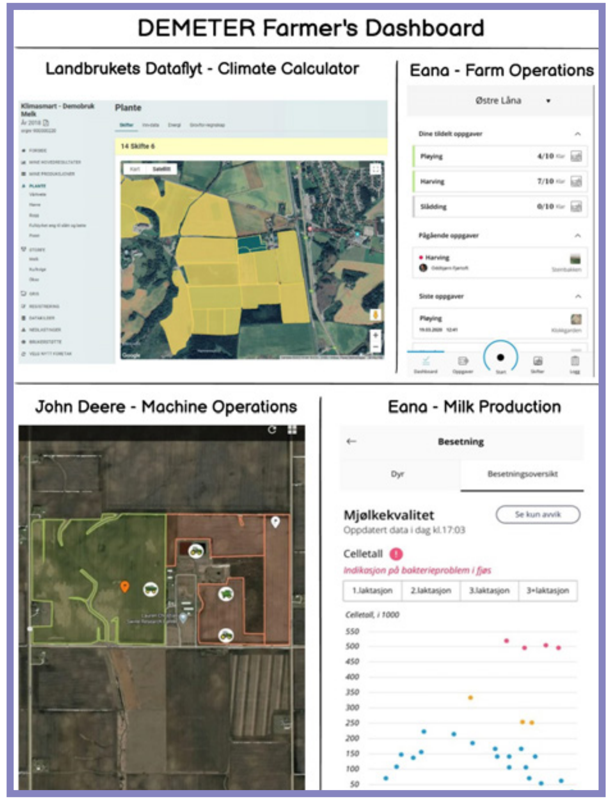
Farmers have to handle an increasing number of digital systems and solutions that affect their daily work as well as production and investment decisions. Today's digital solutions do not communicate or integrate well enough together and are not largely based on the needs of the farmer. In addition, administrative and production systems produce different types of data that is difficult to use for decision support. Thus, the dataflow for farmers is a big challenge and equally an opportunity for business development in the sector.

AIM

The main aim of this pilot is to develop a farmer's digital dashboard delivering a better view or outlook of the farm activities and the farmer's cooperation with both private and public actors. This will ensure a more efficient use of digital tools by the farmer and a better and more customised decision support. In addition over time, the pilot aims to develop a new system for data collection, modelling and calculation of greenhouse gas emissions on farm level, and a new model for milk prognosis that are essential to optimise production in economic terms, animal numbers, milk quality and feed production.

HOW

With regard to the farmers' dashboard element of the pilot, Agricultural Dataflow, pilot partner, will build data infrastructure and models of farmers' dashboard for external suppliers, researchers, farmers and advisors. These are based on the existing dataflow infrastructure that 14,000 farmers use and the systems that are developed in technical parts of DEMETER. In the development process, farmers and related partners and industries in Norway will be involved. New apps and solutions for Norwegian farmers will be launched with easier registration and insight to continuously improve production. The focus from pilot partner, Mimiro is to use data from more than 500 dairy farms with automatic milking systems and apply machine learning techniques to develop algorithms for milk yield forecasting and culling strategy.



BENEFIT

The main benefits of developing a farmer's dashboard are more efficient production and better investment decisions. In addition, there are benefits for related partners with data access and solutions that optimise their production and activities. The pilot is expected to share knowledge and solutions regarding the main decision variables for each farmer and how these variables can be presented in one overall dashboard. It will also give information on how to get system suppliers and partners of the farmers to cooperate and interact, sharing data and web-interfaces. The cost-benefit for the farmer, related businesses and society will be detailed and what business models can be used for the developed tools in the pilot will be outlined.

LOCATION

Italy

PARTNERS

4.2

Consumer Awareness: Milk Quality and Animal Welfare Tracking Management

CHALLENGE

Many farmers already monitor their animals by using different smart devices which collect data in a scattered way. However, they often miss an overall vision of the most important animal welfare and milk yield indicators. In addition, processing companies are interested in data relating to the milk's quality levels while consumers want more transparency regarding the food they eat. However, data is not exchanged between actors in the supply chain. The challenge is therefore to optimise the flow of this information.

AIM

The pilot aims to integrate the data collected from the breeding farm and from the processing company in order to optimise the flow of information between the actors within the milk value chain. By using open and standard-based technologies, it will allow actors of the milk value chain to get an overview of animal welfare and insights on the quality of milk, that is strictly connected to the health of the animal. The data collected will be acquired by a traceability system, to improve communication between actors right up to the consumer, increasing food liability and trust.

HOW

New wearable devices for animals will be installed and their data will be integrated with data coming from sensors already existing on the pilot farm in order to implement an information flow optimisation and optimise processes. Devices will be installed to allow automatic milk composition analysis and to guarantee the traceability of milk collected. Deployed solutions will adopt standards protocols and DEMETER data formats to enable interoperability.

BENEFIT

The implementation of standards-based and interoperable elements will enrich the overview of the animal welfare and milk yield indicators, easing the extension of the information flow to new data sources and optimising the availability of scattered data in a single access point. This will result in a higher quality of milk and a fairer price for producers. It will lead to greater transparency on milk production and animal health for farmers and processors. For consumers, it will deliver improved transparency on product nutritional values, origins and animal welfare.

LOCATION

Ireland

PARTNERS

Teagasc

Tyndall National Institute

zoetis

INTRASOFT International

4.3

Proactive Milk Quality Control

CHALLENGE

Traditional farming involved management systems based on direct observation of animals and intuitive decision making by the farmer. Larger animal numbers and reduced available time of the farmer have necessitated changes, potentially resulting in less available time to observe and detect welfare and health issues of individual animals. At the same time, societal expectations are increasing in terms of animal well-being and animal health. Thus, it is necessary to develop alternative mechanisms to predict welfare and health issues.

AIM

This pilot aims to integrate animal behaviour and physiological data into a welfare and health scoring framework with progression to a reference system to increase animal wellbeing standards on dairy cow farms.

HOW

The use of different indicators and technological sensors will enable a large number of measured variables to be recorded, the integration of which information will allow very strong robust prediction models to be established. Biochemical tests will also be conducted to confirm health status. Thus the IoT will be used in establishing a farming system that will (a) predict when an animal is not "functioning" properly; (b) establish a target that e.g. 95% of cows had no significant issue throughout their lactation; and (c) satisfy claims of the wellbeing of animals.

BENEFIT

The development of such a system using precision technologies will provide real benefits in profitability and an improved system by providing informed, real-time solutions to the farmer. Such solutions will be delivered in ways that are comprehensible to the farmer. The pilot will result in improved dairy cow health and well-being through an early warning system, meaning early intervention during health/welfare challenges. Documentation, enabled by data capture, analysis and record keeping developed in the pilot will allow transparency in animal health and welfare status and management on-farm. It will also help achieve national objectives around continuous quality assurance and better welfare standards for cattle.

LOCATION

Serbia, Slovenia and Montenegro

PARTNERS

DNET Labs

UDG

AGROPRODUKT ŠINKOVIĆ

4.4
Optimal Chicken Farm Management

CHALLENGE

Growing food demand has increased the need for animal protein. This need currently exceeds the demand by 1.7% per year, resulting in global annual poultry production reaching over 103.5 million tons (Foreign Agricultural Service/USDA, Livestock and Poultry: World Markets and Trade). To meet growing demands, poultry producers need to improve production to allow them to produce enough high-quality meat while respecting animal welfare.

Chicken farms in general do not have integrated farm management systems that can provide a holistic view of the farm activities. In many cases, partial solutions exist, enabling farmers to see raw measurements indicating the current temperature, humidity etc. using sensors provided by vendors of the farm equipment (e.g. Big Dutchman, Fancom, etc.). Usually, these measurements are available on-site only, thus limiting their usability. Additionally, rather frequent infrastructure problems, especially on smaller farms in rural areas, are a source of potentially huge losses for the farmer. These problems include ventilation not working, feeders not running, electricity issues, etc.

AIM

This pilot focuses on poultry farm management, from providing guidance and support regarding biosafety and feed mixture preparation to continuous monitoring of environmental conditions, operations and animal welfare. It also focuses on creating a transparent supply chain sharing information about animal wellbeing and the resources used during production.

HOW

DNET's poultryNET platform is used as a basis for achieving the main functionalities for the pilot. A number of IoT devices are installed and integrated with already existing sensors on the pilot farms. These include IoT devices for measuring environmental conditions (air temperature, air humidity, CO_2/NH_3 level) and for recording chicken behaviour and vocalisation. The devices collect the data, that are later processed and analysed on the cloud to provide real-time alerts and instructions to farmers. These include advice on activities to be undertaken in order to optimise growing conditions and early-detect stress issues, created by using expert modules and analysis. The deployed solution is improved and extended using DEMETER defined APIs and data formats to enable interoperability with other DEMETER components, services as well as 3rd party systems.

BENEFIT

The pilot will deliver a complete insight into the whole poultry production process such as production costs optimisation, better product quality and improved animal welfare.

DEMETER **CLUSTER FIVE**

SUPPLY CHAIN

SUPPLY **CHAIN**

FOCUS:

Full supply chain,
Interoperability.

The goal of this cluster is to run pilots across several sectors (fruit, vineyards, cattle, poultry) and to address both supply and demand sides of the supply chain. Such an approach will enable validation of the interoperability of platforms and solutions used in different sectors as well as to validate interoperability of platforms used for management of on-farm and post-farm (supply chain) activities.

LOCATION

Serbia, Montenegro, Georgia and Slovenia

PARTNERS

InData

5.1

Disease prediction and supply chain transparency for orchards/vineyards

CHALLENGE

Pest and disease appearance as well as their spread is one of the main problems in fruit and grape production. Disease control is usually based on experience instead of hard facts, although prediction models are available. However, these models often provide only general instructions instead of precise advice for each user. Additionally, there is a lack of easily accessible traceability data for consumers who would like to know which pesticides and other products their food has been treated with.

AIM

This pilot focuses on complete farm management in vineyards and orchards, providing pest and disease management tools to optimise pesticide usage and increase crop quality. Furthermore, pesticide usage data is collected and stored to enable a transparent supply chain.

HOW

The DNET agroNET platform is used to provide decision support in pest and disease management to farmers, as well as collecting data through the whole supply chain and providing the relevant information to each stakeholder. agroNET gathers information about pesticide usage from Pulverizadores Fede cloud-connected smart sprayers, thus being able to provide the data to be incorporated into the product passport.

IoT devices are deployed and information from Pulverizadores Fede sprayers is integrated to collect knowledge about the environment, spraying cycles, and data directly from field and machines. Throughout the pilot, data are collected, processed and insights generated, providing instructions for farmers in real-time. A blockchain-based data exchange protocol (OriginTrail) is used to ensure trust and transparency between actors and the integrity of the data exchanged in the value chain. The service provides pest and disease control in orchards and vineyards in different regions by using digitised prediction models and cloud connected sprayers.

BENEFIT

The pilot will result in pesticide usage optimisation, leading to a decrease in costs and an increase in the quality of the various fruits and grapes. It will also deliver a trustworthy supply chain based on collected information from all stakeholders.

LOCATION

Finland and Spain

PARTNERS

Universidad Politécnica de Madrid

Tragsa

PROBOT

Centria

tecnalia

Codan

5.2

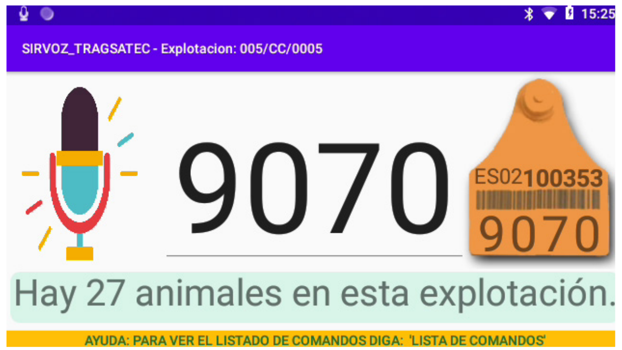
Farm of Things in Extensive Cattle Holdings

CHALLENGE

Current production environments for dairy and related products suffer from problems in relation to the lack of information from farms about animal well-being, crop and soil properties, inaccuracy of animal details such as animal identification and lack of transparent production processes.

AIM

This pilot focuses on improving animals' well-being and health in dairy farms, and how this can affect the quality and information of processed products, also considering cereals and eggs as raw materials. This pilot also considers the collaboration of farmers and end-user involvement in quality testing and feedback provision.



HOW

The problem is approached from the following perspectives: (i) ensuring the optimal feeding of cows by managing animal wellness and measuring crops and soil properties (irrigation, need for fertilising), (ii) improving the production management in a livestock farm integrating new technologies into the daily operations, (iii) integrating data brokering solutions in current production systems of dairy products and pastries, and (iv) end-user feedback management. New technologies such as sensor and surveillance systems as well as new software on smart glasses and a smart watch will be implemented.

BENEFIT

The project will result in production costs optimisation, better product quality, improved animal welfare, better farm work organisation and reliable traceability through animal identification and livestock management. Also, it will increase end-user involvement by allowing feedback on items such as recipes, ingredients and more.

LOCATION

Poland

PARTNERS

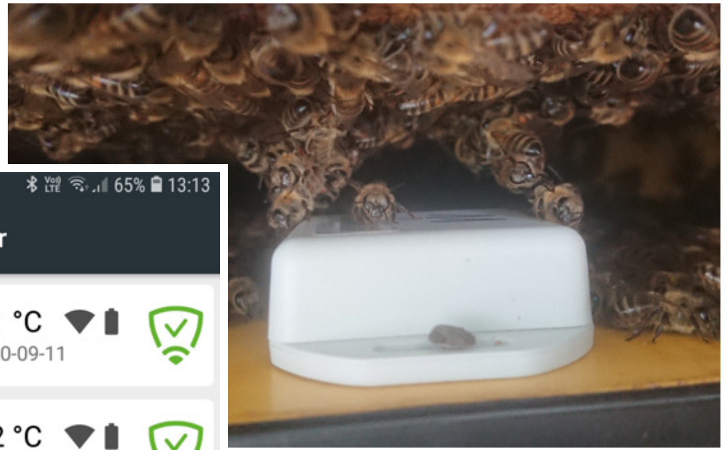
5.3
Pollination Optimisation in Apiculture

CHALLENGE

Honeybees, mainly Apis mellifera, remain the most economically valuable pollinators of crop monocultures worldwide. Yields of some fruit, seed and nut crops decrease by more than 90% without these pollinators (Klein, 2007). Thus, pollination is the highest agriculture contributor to yields worldwide, contributing far beyond any other management practice (Why bees matter, FAO, 2018). The challenge is to protect the honeybee to ensure pollination services for crop production. However, there is a lack of detailed information regarding the field saturation of pollinators and a lack of integrated control on pollination.

AIM

This pilot aims to develop and provide a service for pollination optimisation. The service will connect farm management systems and apiary management systems with advisory and decision support services. The goal of the integration of different agriculture systems is to enable better communication between farmers and beekeepers, to protect bees and to optimise pollination of crops with the aim of improving their yields.



HOW

In this pilot, the eDWIN[1] Virtual Farm is connected with the apiary management system, ControlBee, to manage beekeeping information, including apiaries and farming activities like planned sprayings (based on the information from farmers). Existing systems will be improved with new functionality, enabling collaboration without needing to use a new system. Moreover, as part of the project, existing sensors will be improved, and new apiary sensors are developed to allow remote monitoring of mobile apiaries.

BENEFIT

Benefits will include improved yield and quality of crops for farmers and better gains for beekeepers. It will also deliver better control and management of pollinators and result in better communication between farmers and beekeepers (e.g. notification of the start of flowering of plants). Using DEMETER enhanced services will enable easy integration of the apiary management system with multiple and potentially different farm management systems.

[1] eDWIN is a nation-wide farm management IT system for plant protection, being developed as part of a national project in Poland.

LOCATION

Serbia, Slovenia and Montenegro

PARTNERS

5.4

Transparent Supply Chain in the Poultry Industry

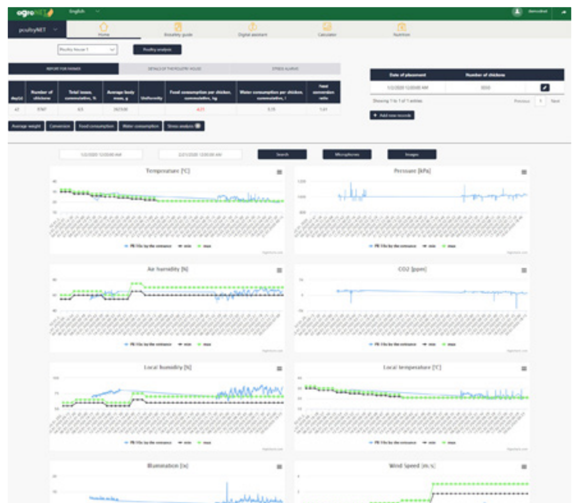
CHALLENGE

The supply chain in the poultry industry is well developed with several stakeholders involved. However, there is a lack of information about chicken wellbeing, medical treatment, feeding patterns etc., which is required by stakeholders, especially consumers. Even if some of this information is available, it is isolated and lacks an integrated overview of the complete supply chain, from the breeding process to retail and consumers.

Providing insights into the whole meat production process including information from all the involved stakeholders is a key challenge. Information about each step of chicken production, from feed intake, medical treatments, conditions provided during the production, resources used, feed origin etc. must be collected and recorded, enabling a transparent supply chain.

AIM

This pilot focuses on the supply part of the poultry industry. It will enable information sharing about animal wellbeing and resources used during production, thus creating the basis of a transparent supply chain.



HOW

DNET's poultryNET platform will be used for gathering data from the breeding process perspective, including the amount of feed. Inputs and feedback from the farmer will be used to improve and validate the functionality. The outputs of poultryNET will be combined with information provided by fleet management systems from transport companies delivering the feed and transporting chicken.

The pilot will investigate the required granularity of data to be collected, its lifespan, as well as technical implications of processing such potentially large amounts of data. A blockchain-based data exchange protocol (OriginTrail) will be used to ensure trust and transparency between actors and integrity of the data exchanged in the value chain.

BENEFIT

The pilot will deliver increased transparency of the complete supply chain, providing trustworthy information to consumers about the production process.

demeter

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