Contents

ICT-AGRI-Food Summit Projects

2024 ICT-AGRI-FOOD Joint Call:

Towards transformation of Agri-Food Systems for the Benefit of Planetary health, Consumers and other Stakeholders along the Food Value Chain using Data-Based Systems and ICT Technologies

CAgriLab (2024) - Consolidated virtual living lab platform for knowledge sharing and adaption in regenerative agriculture

The project aims to develop a decentralized digital twin (DT) platform to promote regenerative agriculture through knowledge sharing and best practices. The platform will enable farmers and living labs to create and manage DTs with multimodal field data and tailored practices, such as reduced tillage and cover cropping. It will also support monetization, analytics, and trusted collaboration between farms and labs.

Low-cost, AI-driven tools will measure soil health indicators, leveraging sensors like smartphones, NPK sensors, and drone cameras. These tools will localize regenerative practices to specific agroecological contexts, fostering evidence-based adoption.

A standardized, interoperable framework will improve knowledge exchange by establishing common vocabularies, data formats, and protocols. This will ensure seamless data integration and sharing, supported by robust APIs aligned with global standards.

Pilot projects in Poland, Finland, and Ireland will apply these technologies in practice, engaging stakeholders to create farm-specific digital twins.

Participating countries: IE, PL, FI.

HOLOSEU (2024) - A Comprehensive Digital Platform for Land Use Planning, Carbon Footprinting, and Decision Making in European Agriculture

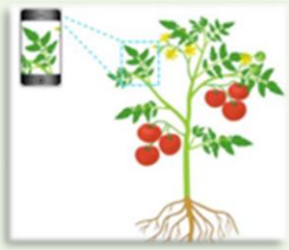
The European Council's goal to reduce GHG emissions by 80–95% by 2050 emphasizes the need for climate-resilient agriculture. Current assessments face challenges due to variability, technological gaps, and measurement issues. The HOLOSEU project addresses these by creating a cutting-edge decision-support platform for sustainable farming and future scenario planning, aligned with UN SDGs and the EU Climate Action Plan.

Building on the HOLOS-IE model, HOLOSEU integrates agrobiodiversity and circularity modules, using FAIR data from soil, climate, drones, and satellites. Its open-source HOLOS-IE V3.0 tool provides dynamic soil and weather mapping, real-time data, and user-friendly interfaces to optimize resource use, production economics, and sustainability. Key features include GHG quantification, carbon footprinting, and climate simulation.

Through workshops, training, and publications, the project promotes best practices and explores carbon credit potential. Collaboration with European partners ensures the platform's adaptability to diverse agricultural contexts, fostering sustainable and competitive agriculture across Europe.

Participating countries: IE, FI, EE, PL, TR, RO, DE.

HEALTHYTOMATO (2024) - Development of tomato disease development risk warning system



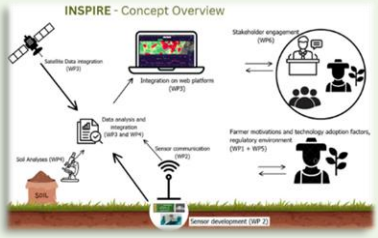
Greenhouse tomato diseases significantly impact yield and quality, causing global economic losses. While large greenhouses have access to advanced technologies like environmental sensors, visioning systems, and expert agronomists to mitigate disease risks, smaller greenhouses often lack the financial and human resources for such solutions. This project aims to develop an affordable and effective system to help small and medium-sized tomato growers reduce disease risks.

The proposed Greenhouse Tomato Disease Risk Warning and Detection System will consist of two models: one to evaluate the risk of disease spread using data from greenhouse sensors, MS cameras, RGB cameras, and manual inputs, and another to detect specific diseases from images of diseased leaves.

Over three years, data will be collected in scientific and commercial greenhouses. Scientific trials will include disease inoculation and controlled environment testing, while commercial trials will focus on model evaluation and non-diseased plant measurements. This system promises accessible, cost-effective disease management for smaller greenhouses.

Participating countries: LV, EE, TR.

INSPIRE (2024) - Integrating High-Resolution Sensors and AI Decision Tools for Enhancing Agricultural Efficiency



The main objective of INSPIRE is to improve nutrient use efficiency in agriculture by innovative technology capable of measuring nutrient contents in soils and incorporating this data into state-of-the-art decision support tools for farmers.

This will be enabled by the development and deployment of novel nutrient sensors, which can be incorporated in agricultural soils and produce high-resolution data on current nutrient levels.

The project will explore the best ways to incorporate this data into a cloud-based decision support tool and the effectiveness of the derived fertilization strategies in terms of environmental and economic performance.

Connected to this, the project will study farmers' willingness to accept novel technologies and data sharing among themselves and with other value chain stakeholders. Furthermore, training materials will be produced that help farmers understand preconditions, opportunities, and challenges of novel technologies such as AI in farming.

Participating countries: DE, FI, IE, TR, PL.

AI-CROPBREED (2024) - Empowering Sustainable Food Crop Breeding Through Smart Selection

The AI-CROPBREED project leverages artificial intelligence (AI) and image processing to revolutionize plant breeding, focusing on predicting early bolting in carrots (*Daucus carota L.*), a critical trait for sustainable food production. Traditional breeding methods are slow, costly, and influenced by environmental and genetic factors. AI-CROPBREED addresses these challenges by developing software that uses machine learning (ML) algorithms and high-quality image data to accurately estimate early bolting tendencies.

The project's methodology includes acquiring diverse carrot genotype images, pre-processing them, and integrating ML algorithms with bolting data and gene expression information. This tool is hosted on an interactive website, empowering breeders with data-driven decision-making to select optimal genotypes.

Additionally, the project evaluates the benefits and risks of big data in agriculture, offering practical insights for sustainable practices. By fostering collaboration and aligning stakeholders, AI-CROPBREED enhances breeding efficiency, crop resilience, and food security, showcasing the transformative potential of AI in agriculture.

Participating countries: TR, PL, RO.

DIGI-GROW (2024) - Empowering Agri-Food Sustainability: A Data-Driven Approach to Agrivoltaics Management

The DIGI-GROW project aims to develop an integrated platform for agrivoltaic (APV) systems.
APV systems combine agricultural production and photovoltaic (PV) energy generation on the same piece of land. By doing so, these systems maximize land use efficiency, significantly increasing farmers' revenues while simultaneously contributing to the creation of a sustainable and resilient food system. This dual-use of land reduces dependence on fossil fuels and decreases the need for irrigation, which directly addresses issues related to climate change and enhances food security.

Effective operation of APV systems requires careful management of both agricultural and PV aspects. To this end, the use of digital tools can greatly enhance efficiency and profitability by facilitating data-driven decision-making processes.

DIGI-GROW focuses on optimizing resource use by carefully addressing energy consumption and water needs. In essence, the goal of the project is to create a comprehensive management application for APV systems that leverages digital technologies to increase farmers' profitability while improving the sustainability and resilience of the agri-food sector.

Participating countries: DE, ES, FI, TR.

SENSOR-PP (2024) - Sensor based ENvironmental Surveillance and Observation with Realtime data in Pig and Poultry houses

The SENSORS PP project addresses challenges in poultry and pig farming by developing advanced monitoring systems to improve animal welfare, productivity, and environmental management. With EU production of poultry and pig meat reaching 13 million and 22.1 million tons respectively in 2022, the sector faces issues such as high stocking densities, antibiotic reduction, and environmental impacts. Current technologies often lack integration and actionable insights due to limited synergy between developers and animal health experts.

The project focuses on real-time monitoring using negative pressure sensors, digitized stable cards, and image analysis algorithms to track animal activity and welfare. By building a robust database of environmental and behavioural indicators across various farm conditions, SENSORS PP refines target values for optimal housing. An IoT platform will aggregate diverse sensor data, weather conditions, and production parameters, offering actionable insights via an interactive decision-support system.

This comprehensive approach enhances farm management efficiency, reduces costs, and supports sustainable livestock farming practices.

Participating countries: BE, DE, HU.

ICT-AGRI-Food Summit Projects

Projects from 1st and 3rd RoundTable Sessions:

TailBiteAdvice (2019) - An ICT-based real-time advisory tool to minimise tail biting in fattening pigs

Tail biting is a significant welfare, economic, and ethical issue in pig farming, exacerbated by stressors like boredom, poor feed availability, and suboptimal environments. This project aims to develop a data-driven decision-support tool to help farmers reduce tail biting incidents, focusing on behaviour-based variables monitored remotely during production. Despite 77% of EU farms docking tails to mitigate this issue, tail biting prevalence remains high. Current monitoring methods, such as abattoir-level detection, provide limited opportunities for on-farm intervention.

Key objectives include optimizing detection algorithms, understanding risk factor relationships, testing the tool in commercial settings, and developing guidelines for implementation.

The project promises substantial benefits, including improved animal welfare, reduced carcass waste and antibiotic use, and support for non-docking policies in the EU. The tool will also aid consultants and inspectors in welfare audits, enable farmers to benchmark practices, and help retailers enhance labelling and production standards.

Participating countries: BE, IE, DK.

LivestockSense (2019) - Enhancing environmental sustainability of livestock farms by removing barriers for adopting ICT technologies

The LivestockSense project aims to enhance the economic and environmental viability of livestock farms through advanced information and communication technologies (ICT) and address social barriers to technology adoption. By equipping farms across five European regions with Precision Livestock Farming (PLF) tools, the project investigates farmers' attitudes toward these technologies, identifying obstacles to adoption. It engages stakeholders, including technology developers and policymakers, to explore future expectations and provide recommendations for overcoming barriers.

ICT tools are crucial for achieving the EU's climate neutrality goals under the Green Deal. However, adoption in animal husbandry remains limited due to socio-economic and cultural challenges and a lack of understanding about ICT benefits.

LivestockSense addresses these issues by documenting farmers' information needs, assessing decision-making processes, and supporting adaptation through workshops, mentoring, and an open API web platform. The project also highlights the economic and environmental benefits of PLF, fostering sustainable and inclusive animal production systems.

Participating countries: HU, EE, AT, IL, PL, DK, SE.

Mushnomics (2019) - Unlocking data-driven innovation for improving productivity and data sharing in mushroom value chain

The MUSHNOMICS project aims to revolutionize mushroom production through dynamic, data-driven analytics to optimize yield, reduce costs, and enhance economic viability. By integrating IoT devices, AI algorithms, and ICT platforms, it ensures real-time data collection and analytics across the mushroom value chain, from production to valorisation of by-products like spent mushroom substrate. Trials in commercial settings will refine best practices and develop sustainable business models, including retrofitted production modules for year-round urban farming.

MUSHNOMICS emphasizes stakeholder collaboration, engaging farmers, researchers, policymakers, and consumers through a digital platform for knowledge exchange and decision-making. It supports food security by offering a sustainable protein alternative with a low environmental footprint.

By addressing socio-economic barriers, it promotes innovation, job creation, and rural development. With a focus on health and sustainability, MUSHNOMICS contributes to the EU Green Deal's goals, ensuring long-term accessibility of results and fostering a resilient agri-food sector.

Participating countries: RO, DK, HU, IE

ADDFerti (2019) - A Data-Driven Platform for Site-Specific Fertigation

The ADDFerti project aims to develop a fully automated, ICT-based platform for variable rate fertigation (VRFI) to optimize crop yields while reducing resource use and environmental impact. This innovative solution integrates soil sensing technologies, hose-reel fertigation systems, ICT infrastructure, algorithms, and decision-support tools to tailor nutrient and water application. Advanced data fusion tools will provide precise VRFI recommendations, addressing all yield-limiting factors.

By enabling more efficient use of nitrogen, phosphorus, potassium, and water, ADDFerti is expected to enhance farmers' income through increased yields while conserving resources. It also reduces agrochemical leaching into soil and water, promoting sustainability and ensuring more freshwater availability for human consumption.

The project addresses challenges such as rising food demand, water scarcity, and climate change. Its innovative approach replaces homogeneous input application with precise, site-specific management, advancing precision agriculture and fostering sustainable farming practices.

Participating countries: BE, GR, TR, CH.

TOP4HoneyChains (2022) - Trustable and Sustainable Open Platform for Smart Honey Value Chains

The TOP4HoneyChains project aims to create a transparent and sustainable digital platform for smart honey value chains in Türkiye and Argentina, addressing global challenges such as honey fraud, climate change, and market pressures. This open data platform will enhance traceability and transparency, enabling stakeholders like beekeepers, cooperatives, and consumers to access and share critical information, such as honey quality tests and production practices.

The project addresses challenges identified in surveys, where beekeepers struggled with marketing and pricing, and consumers sought trustworthy honey sources. TOP4HoneyChains will design innovative digital ecosystems and employ state-of-the-art technologies like dynamic data collection, semantic integration, and scalable microservices.

Expected impacts include improved sustainability for beekeepers, consumer confidence in honey quality, and the promotion of youth and women in beekeeping. By fostering transnational collaboration, the project showcases a model for transparent food systems, contributing to environmental, economic, and societal progress globally.

Participating countries: TR, PL, AR, LV.

ICT-AGRI-Food Summit Projects

Projects from 2nd and 4th RoundTable Sessions:

ReLive (2021) - Back to the Future: Reintegrating Land and Livestock for Greenhouse Gas Mitigation and Circularity

The ReLive project explores the sustainable reintegration of livestock and crop systems to promote a circular agricultural economy, enhancing resource recycling and reducing waste. This approach could improve biodiversity, soil health, and reduce dependency on synthetic fertilizers. However, challenges include potential increases in greenhouse gas (GHG) emissions, environmental pollution from organic manure, land degradation, and economic barriers for farmers. ReLive examines strategies like alternative livestock diets to reduce methane emissions, improved manure management, agroforestry, and decision support tools for sustainable farming practices.

Initial findings highlight variations in soil methane absorption, emission reduction from manure management, and the economic impacts of farming practices. Modelling tools, like a farm-wide GHG calculator, and data collection from surveys and remote sensing are being developed to inform sustainability strategies. ReLive emphasizes practical dissemination of results to policymakers, stakeholders, and farmers, ensuring viable business models and effective implementation for long-term sustainability in agriculture.

Participating countries: IE, FR, NL, DE, ES, FI, PL, EE, NZ, CL

DairyMix (2021) - Multi-Criteria Assessment, Decision Support and Management Tools for Sustainable Circular Mixed Farming Systems for Dairy Production

The DairyMix project advances sustainable circular dairy production systems in Europe and Latin America by optimizing feed autonomy, nutrient utilization, and agroforestry practices. Aiming to reduce external inputs like concentrate feeds and mineral fertilizers, DairyMix employs case studies, statistical analysis, and machine learning to assess current practices and model carbon and nutrient flows. This research informs strategies to mitigate greenhouse gas emissions and nutrient losses, promoting regional and whole-farm circular models.

DairyMix also evaluates the environmental, economic, and social sustainability of dairy farming using multicriteria assessments. A key output is the MilKey/DairyMix multi-actor platform, which serves as a decision support tool for farmers and educates consumers on circular farming systems.

Early progress includes the selection of case studies, development of a sustainability indicator framework, and initiation of on-farm data collection. Workshops and collaboration among project partners have fostered alignment and facilitated knowledge sharing for impactful, context-specific solutions in mixed dairy systems.

Participating countries: DE, IE, IT, PL, FR, NO, BE, AR.

ET4D (2022) - Development of a practical data management system with embedded sensors for improved environmental management and transparency of dairy farming

The project aims to enhance the flow of information within the dairy farming sector by developing a digital data management system that connects dairy farms, consumers, and other stakeholders in the milk value chain. It will expand an existing system with embedded environmental sensors and explore incorporating external sensor data, as well as creating a reduced system for small farms.

The project will test this system across multiple countries with varying technological, climatological, and socioeconomic conditions. The system will help farmers by improving data connectivity, addressing expectations from various data users, and creating a modular web application tailored to different interest groups. It will enable farmers to better understand the impact of their decisions on animal welfare, the environment, and food security.

Additionally, the project will improve product quality, marketing, and economic performance by fostering data transparency and incentivizing the sharing of relevant information across the milk value chain.

Participating countries: DE, HU, DK, EE, IL, PL, TR, FI.

OENOTRACE (2022) - From vineyard to bottle – trace sustainable practices in wine-growing under full transparency

Oenotrace aims to enhance the competitiveness of European wine producers while addressing the environmental impact of wine production.

The project focuses on using digital tools and advanced algorithms to track sustainable viticulture practices with full transparency. It begins by identifying sustainability indicators with strong stakeholder involvement and establishes an IoT network in Germany to trace steps in the wine value chain.

Using data from experimental sites in Germany and Italy, agronomic algorithms will provide recommendations for irrigation and spraying. Environmental models will be used to quantify water and greenhouse gas footprints. A data platform will integrate all data streams, offering transparency and insights on sustainability to various stakeholders. This system may lead to new incentive programs rewarding sustainable practices.

Ultimately, Oenotrace aims to improve operational and environmental performance, satisfy consumer demand for transparency, and generate higher revenues for winegrowers, while supporting the development of targeted subsidy programs.

Participating countries: DE, IE, IT, RO, DK.

STAR (2022) - Giving Smell sense To Agricultural Robotics

The project focuses on precision farming by developing a unified framework to integrate various sensor modalities, including RGB-D cameras and novel gas sensors, to monitor plant health and optimize agricultural practices.

The system aims to reduce the use of fertilizers, pesticides, and herbicides by applying them only when needed, thus reducing costs and environmental impact while boosting yields and profitability. It incorporates robotics and sensor technologies into the agricultural workflow, allowing farmers to use data within their existing digital systems.

The STAR platform will feature an autonomous robot that uses a unique GMOS gas sensing system to assess fruit freshness and health in vineyards. This robot will monitor plant health, perform yield mapping, and forecast crop production.

The data will be processed through AI-driven decision support systems to create application maps for plant protection, helping farmers make informed decisions and reduce food waste across the supply chain.

Participating countries: IT, IL, DE.

ICT-AGRI-Food Summit Projects

Projects from 5th and 6th RoundTable Sessions:

HALY.ID (2019) - HALYomorpha halys IDentification: Innovative ICT tools for targeted monitoring and sustainable management of the brown marmorated stink bug and other pests

This project aims to develop an autonomous and innovative monitoring system for detecting and managing the Brown Marmorated Stink Bug (*Halyomorpha halys, HH*), a significant pest impacting European agriculture.

The system, which integrates drones, vision sensors, IoT devices, and machine learning, will promptly detect HH presence and monitor the effectiveness of countermeasures. Beyond pest detection, it will assess internal damage to fruits undetectable by the naked eye, improving food quality.

The system aims to reduce chemical treatments, thus minimizing environmental impact and enhancing consumer confidence. It will replace traditional, time-consuming monitoring methods, like visual sampling and traps, which are ineffective and costly.

The project will also create crop infestation models and a logbook system to track data throughout the food chain. Ultimately, the system could be adapted for other pests, providing a reliable, cost-effective solution for monitoring and managing crop health across different regions.

Participating countries: IT, IE, DE, RO, GR, NL

POSHMyCo (2019) - Potential of selective harvest based on mycotoxins content assessment in cereal crops

POSHMyCo aims to reduce mycotoxin contamination in wheat and barley grains by using smart farming technologies. The project will develop a system to forecast and detect the spatial distribution of Fusarium Head Blight (FHB), a primary cause of mycotoxin contamination. It will recommend site-specific spraying of Fusarium fungicide (PSSS) combined with selective harvest, reducing contamination risks and improving food safety.

The selective harvest will sort grains into three categories—healthy, slightly/moderately contaminated, and contaminated—allowing them to be used for human food, animal feed, and bioenergy, respectively. This approach enhances farm profitability by maximizing yield price while minimizing health risks. The PSSS also reduces environmental impact by decreasing agrochemical use.

The project will integrate sensors, modelling, and control technologies, providing farmers with actionable data through a user-friendly platform. Ultimately, POSHMyCo aims to improve food safety, reduce environmental footprint, and support sustainable farming practices.

Participating countries: BE, GR, SE, LT, ES

SPECTROFOOD (2019) - Information Agrifood quality estimation using hyperspectral techniques

SPECTROFOOD aims to tackle food insecurity and reduce food waste by developing digital technology solutions for the agri-food value chain. By combining innovative Hyperspectral Imaging Systems (HIS), Artificial Intelligence (AI), and data analytics, the project seeks to optimize food quality assessment and production inputs.

SPECTROFOOD will demonstrate its solutions across four use cases focused on high-value crops: apples, broccoli, leek, and mushrooms. Current food quality inspection methods are often destructive, labour-intensive, and costly, with limited accuracy and efficiency.

This project will offer non-destructive, rapid, and precise techniques to monitor product quality at various stages of the supply chain, from production to consumer.

Key activities include using HIS to collect quality-related data, deploying AI algorithms for quality indices, and creating a digital platform to track product traceability and suggest improvements for both pre- and post-harvest treatments. The goal is to promote sustainable practices and reduce food waste while ensuring high-quality production.

Participating countries: GR, IE, DE, BE.

APP4FARM (2022) - Artificial Intelligence application for Farming

APP4FARM aims to improve nitrogen management in agriculture by developing an ICT infrastructure that helps farmers monitor nitrogen loss and manage nitrogen-based fertilizers efficiently.

This system will track meteorological data and nitrogen emission levels, providing forecasts up to three days in advance. The data will be integrated into a Decision Support System (DSS), helping farmers optimize fertilizer use and reduce nitrogen oxide emissions, improving both greenhouse gas (GHG) levels and local air quality.

The system will enhance transparency in food production, ensuring traceability and environmental impact assessment across the supply chain. Key activities include developing a dashboard for DSS, machine learning forecasting models, sensors to monitor soil and environmental health, and virtual sensors to link environmental variables with nitrogen-related microbial activity.

The project's expected social impact includes better food traceability, reduced emissions, and the potential for a "green labelling" initiative, promoting sustainable, healthy food production.

Participating countries: IT, DE, IE.

SusPot (2022) - Transparency and sustainability in the potato processing chain from F2F through innovative data sharing

The SusPot project focuses on developing and implementing data-sharing technologies across the entire potato value chain, from production to consumption, to promote data-driven decision-making and enhance sustainability.

With increasing consumer demand for detailed sustainability data, the project aims to provide accurate, specific data on the environmental impact of potato products, rather than relying on general statistics.

The project will research data-sharing models and explore business strategies to ensure effective transmission of sustainability data among all stakeholders. By implementing these innovations, the project seeks to make the potato processing chain more transparent, efficient, and sustainable at a European scale.

Key goals include reducing energy consumption, water usage, and waste in both production and processing, while optimizing operations through data-driven approaches. The expected social impact involves improved sustainability practices in the food industry, helping processors reduce their environmental footprint and meet strict regulatory standards, contributing to a more sustainable food system.

Participating countries: BE, TR, PL.