ICT-AGRI ERA-NET Projects 2010–2015

Highlights of projects funded by the ICT-AGRI ERA-NET (2009-2014) and ICT-AGRI-2 ERA-NET (2014-2015)

ICT-AGRI era-net

This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreements 235460 [ICT-AGRI] and 618123 [ICT-AGRI 2].

Compiled and edited by Antoinette Jordan (Teagasc)

Welcome to ICT-AGRI

ICT-AGRI is funded by the European Commission's ERA-NET scheme under the 7th Framework Programme for Research. The objective of an ERA-NET scheme is to develop and strengthen the European Research Area by facilitating practical initiatives to coordinate regional, national and European research programmes in specific fields.

Niels Gotke

ICT-AGRI-1 began on 1 May 2009 and ran for 65 months until 30 September 2014. The follow-up project ICT-AGRI-2 started on the 1 January 2014 and is scheduled to run for 4 years until the end of 2017.

The overall goal of ICT-AGRI is to strengthen European research within the diverse area of precision farming and develop a common European research agenda concerning ICT and robotics in agriculture, and to follow up with calls based on funds from the participating countries' national research programmes. The purpose is to pool fragmented human and financial resources, in order to improve both the efficiency and the effectiveness of Europe's research efforts.

More **specifically the objectives of the ERA-NET ICT-AGRI** are:

- Mapping and analysis of existing research and future needs
- Development of instruments and procedures for transnational funding activities
- Development of strategic transnational research agenda and programmes
- Establishing and maintaining of international collaborations and networks

The ICT-AGRI-1 Project Consortium comprised 18 partners and 12 observer organisations covering 20 countries.

The underlying rationale of the ICT-AGRI-1 project was that modern agricultural engineering tools (e.g. precision crop and livestock farming tools) are necessary to enable agriculture to meet the global challenges.

During ICT-AGRI-1, three transnational calls were conducted in 2010, 2012 and 2014 (in collaboration with SmartAgriFood2 and supported by the EU project Future Internet PPP). In total 24 projects have been approved for funding.

ICT-AGRI-2 The Project Consortium comprises 23 partners and 4 observer organisations covering 17 countries.

The principal objective of ICT-AGRI-2 is to contribute to the development of an eco-efficient, resource-efficient and competitive agriculture through an enhanced and improved use of ICT and robotics.

ICT-AGRI-2 will pursue this objective within the framework of related European initiatives including Horizon 2020, European Innovation Partnership 'Agricultural Productivity and Sustainability', Common Agricultural Policy, Technological Platforms, Public-Private Partnerships, Joint Programming Initiatives and other ERA-NETs. ICT-AGRI-2 can be seen as an extension, with respect to implementation, to the Joint Programming Initiative FACCE (Agriculture, Food Security and Climate Change).

Equally important is the outreach to the public and private stakeholders engaged in ICT and robotics in agriculture: research and innovation funding agencies, research and development organisations and enterprises, advisory and extension services and other providers of ICT to farmers, public services in environmental and agricultural administration, SMEs in rural areas, farmers, food chains, agricultural supply chains and consumers. The use of ICT and robotics in internal farm operations and in external farm business relations is growing fast, and compatible systems are becoming increasingly full potential of the technology. I welcome you to this compilation of projects which have been funded by the ICT-AGRI ERA-NET.

Niels Gøtke
Danish Agency for Science, Technology and Innovation (DASTI)

Contents

About ICT-AGRI

Transnational calls – a vital instrument for ICT-AGRI

Calls for transnational research, development and innovation projects are a vital instrument for ICT-AGRI. These calls are funded by ICT-AGRI partners and associated national funding agencies, who add funding to a so-called virtual common pot, meaning that funding is restricted to consortium partners from the same country as the country of funding agency. Consortium partners from any other countries, who pay their participation with own funding, are always very welcome.

2010 – Integrated ICT and automation for sustainable agricultural production

The aim of this joint call was to enable joint transnational research projects based on complementarities and sharing of expertise within ICT and Robotics in Agriculture. Projects are expected to apply a systems approach addressing farm level integration of information technology, communication technology, automation and robotics. Projects must have a clear European added value by being carried out on a transnational level.

Seven projects were funded in this call.

2012 – ICT and Automation for a Greener Agriculture

The call aimed at utilizing ICT and automation in primary agriculture for sustainable use of natural resources, reduction of agriculture's environmental footprint, mitigation of climate change while securing farm economy and good working conditions, food supply, quality and security, and animal welfare.

Eight projects are funded in this call.

2014 – Services & Applications for Smart Agriculture

The call is in collaboration with the Future Internet Accelerator project SmartAgrifood. The objective for SmartAgriFood is to accelerate the use of FIWARE internet technologies for smart services and applications, while the purpose of the ICT-AGRI engagement is to contribute with agricultural knowledge and experience.

Fifty projects are funded in this call, of which nine projects were cofunded by ICT-AGRI.

2015 – Enabling Precision Farming

Precision Farming is a key element in sustainable intensification, i.e. increasing food production with smaller environmental footprints. Although Precision Farming has been studied and developed for more than two decades, adoption of the technology in primary agriculture is still behind expectations. There are, therefore, needs for research, development and innovation concerning the adoption of Precision Farming in primary agriculture.

Eight projects are funded in this call

2016 – Farm Management and Information Systems

The focus of the call is on adaptable and compatible Smart Applications for farmers and on the implementation of Smart Applications in Farm Management Systems. The call is implemented as ICT-AGRI Partnerships. An ICT-AGRI Partnership is a collaboration between a number of national/regional projects. Each national/regional project has its own objectives and budget as agreed with the funding agency. The objective for the ICT-AGRI Partnership concerns the common goals as agreed between the national/regional partner projects. Proposals for partnerships will be received until end of 2016.

2017

The call will be launched in 2017

Project contact information

Contact details and updates to the project information can be obtained from the ICT-AGRI website http://ict-agri.eu

2010 Call

Integrated ICT and automation for sustainable agricultural production

The aim of this joint call was to enable joint transnational research projects based on complementarities and sharing of expertise within ICT and Robotics in Agriculture. Projects are expected to apply a systems approach addressing farm level integration of information technology, communication technology, automation and robotics. Projects must have a clear European added value by being carried out on a transnational level.

Seven projects were funded in this call.

Title	Acronym	Countries
Open System for TRAcTOr's autonomouS Operations	STRATOS	LV BE CH IL IT
Integrated robotic and software platform as a support system for farm level business decisions	ROBOFARM	IT GB TR GR
Optimizing performance and welfare of fattening pigs using High Frequent Radio Frequency Identification (HF RFID) and synergistic control on individual level	PIGWISE	DE DK IT BE
Preparing for the EU Soil Framework Directive by optimal use of Information and Communication Technology across Europe	Predictor	DK CH FI NL DE
Geospatial ICT infrastructure for agricultural machines and FMIS in planning and operation of precision farming	GeoWebAgri	FI DE DK
Advanced Monitoring of Tree Crops for Optimized Management – How to Cope With Variability in Soil and Plant Properties	3D-Mosaic	DE IL TR IT CH ES
Ambient Awareness for Autonomous Agricultural Vehicles	QUAD-AV	DK FR DE IT

Open System for TRAcTOr's autonomouS Operations (STRATOS)

Project number:
34703

Project dates:
1 April 2011 to
31 March 2013

Coordinator:

Cesare Fantuzzi,
University of Modena and
Reggio Emilia (Italy)

Collaborating Institutions:

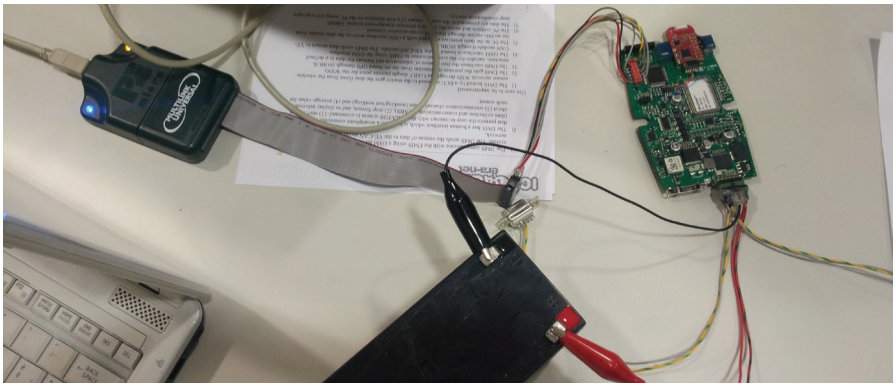
Valerijs Zagurskis, Riga
Technical University
(Latvia)

Marko Boving, E.I.A.
Electronics (Belgium)

Maria Giovanna Sami,
ALaRI Institute
(Switzerland)

Per-Olof Gutman, Technion
– Israel Institute of
Technology (Israel)

Massimiliano Ruggeri,
Universita degli Studi di
Ferrara (Italy)



Impact:

The main objective of the STRATOS project is to develop an open ICT hardware-software infrastructure enabling the partial automation of tractors and at the same time enhancing their operational safety and production efficiency, with the positive effects of reduced accident risk and environmental impact.

Topics:

Soil is a complex, living, changing and dynamic component of the agro-ecosystem. It is subject to alteration, and can be either degraded or wisely managed. A thorough understanding of the ecology of the soil ecosystem is a key part of designing and managing agro-ecosystems in which the long-term fertility and productive capacity of the soil is maintained, or even improved. This understanding begins with knowledge of how soil is formed in a given ecological region, and includes integration of all the components that contribute to the structure and function of the entire soil.

Measurements of soil and terrain parameters, such as pH and soil moisture, soil temperature and bulk density, water holding capacity, etc.; can be obtained by means of the analysis of optical and microwave remote sensing data or by a set of suitable sensors placed on the field. In order to reduce the number of sensors and optimize the agricultural job, the sensors can be placed on board to a tractor which is moving within the area to be monitored. and or carried on the tractor or any other agricultural machine.

Outputs:

- Develop and demonstrate new functions enabled by ISOBUS technology (ISO 11783) that support a substantial improvement of the quality of the farming jobs.
- Develop a technology based on ISOBUS compliant, wireless self-powered sensor network for the real time measurement of soil and harvester conditions.
- Task Controller can optimize the whole tractor and implement operational modes to improve the farming job quality and safety of the overall systems.

Integrated robotic and software platform as a support system for farm level business decisions (ROBOFARM)

Project number:
34754

Project dates:
1 September, 2011 to
31 August, 2013

Coordinator:

Maurizio Canavari, Alma Mater Studiorum - University of Bologna (Italy)

Collaborating Institutions:

Simon Blackmore, Harper Adams University (UK)

Arif Behiç Tekin, Ege University (Turkey)

Ismail Bogrekci, Adnan Menderes University (Turkey)

Spyros Fountas, Centre for Research and Technology Hellas (CERTH)

Impact:

The main objective of the ROBOFARM project is to create a technology platform that integrates and harmonizes existing software and hardware technologies into a single system and makes use of robots equipped with sensors and active vision systems to collect data from the fields automatically, in order to feed a Decision Support System (DSS) for the farm management and considering the agronomical, environmental and food safety aspects.

Topics:

- Decision support system (DSS)
- Farm Management Information System (FMIS)
- Robots
- Sensors

Outputs:

- development of robotic solutions
- a middleware platform
- FMIS with an economic module

The partners presented the results in various international conferences dedicated to different topics, and in a specific workshop organized at the EFITA Conference 2013. Moreover, they are working on a series of papers to be submitted in international peer-reviewed journals. Finally, dissemination activities directed to potential technology adopters had been carried out during the project.

Project number:
34767
Project dates:
1 October, 2011 to
30 September, 2013

Coordinator:

Engel Hessel, University of Göttingen (Germany)

Collaborating Institutions:

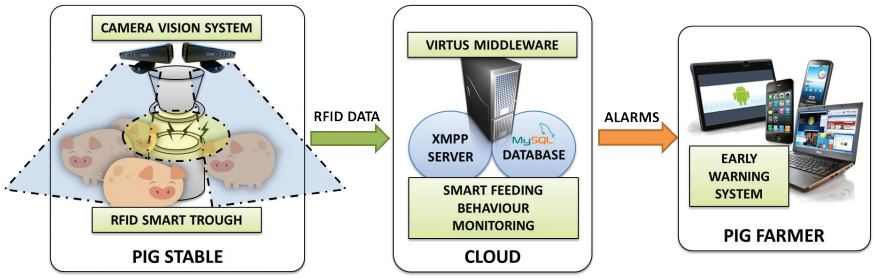
Torben Gregersen, Aarhus University (Denmark)

Paolo Brizzi, Istituto Superiore Mario Boella (Italy)

Kristof Mertens, Porphyrio NV (Belgium)

Annelies Van Nuffel, ILVO (Belgium)

Optimizing performance and welfare of fattening pigs using High Frequent Radio Frequency Identification (HF RFID) and synergistic control on individual level (PIGWISE)



Impact:

The aim of the project is to develop an ICT based tool for performance and welfare monitoring of pigs at the individual level. Warning signs, such as alterations in animal behaviour and some other parameters, enable an early detection of diseases or environmental related problems. Since the routinely gathering behavioural information from animals to evaluate their performance and welfare is very time-consuming for farmers, the new technologies demonstrably aid this task (Wathes et al., 2008), especially with large herds. In PIGWISE, we combine automation techniques applying them to monitor the animal's behaviour. Therefore, the above automated monitoring and decision support will detect problems at early stage preventing bigger economic losses.

Topics:

RFID

Outputs:

- PIGWISE brings a broad approach combining an innovative individual online-monitoring system, based on RFID with passive HF transponders, camera vision technology and software.

Preparing for the EU Soil Framework Directive by optimal use of Information and Communication Technology across Europe (PredICTor)

Impact:

The PredICTor project has two main deliverables, i) an online decision support tool for evaluating an intended field traffic situation for a given soil condition and with given machinery (for farmers and agricultural advisers), and ii) an online tool for creating European-wide maps of the wheel load carrying capacity, which is defined as the maximum wheel load the soil can carry at given soil moisture conditions and for a given tyre and tyre inflation pressure (for authorities / soil protection offices). For both of these ICT applications, we update state-of-the-art models for the soil compaction process and combine them with national and European databases on soil properties and (at national level) meteorological data.

Topics:

- Soil mechanical models and pedotransfer functions
- Preparation of national databases for interactive use by the online tool
- Web-programming of the online decision support tool
- Online wheel load carrying capacity maps of European soils

Outputs:

- An online decision support tool for evaluating an intended field traffic situation for a given soil condition and with given machinery (for farmers and agricultural advisers)
- An online tool for creating European-wide maps of the wheel load carrying capacity

Project number:
34780
Project dates:
22 March, 2011 to
21 March, 2013

Coordinator:

Per Schjønning, Aarhus University (Denmark)

Collaborating Institutions:

Jørgen Pedersen, AgroTech A/S (Denmark)

Thomas Keller, Agroscope Reckenholz-Taenikon Research Station (Switzerland)

Matthias Stettler, ILVO (Switzerland)

Laura Alakukku, University of Helsinki (Finland)

Harri Lilja, VTT Technical Research Centre of Finland (Finland)

Jan J.H. van den Akker, Alterra Wageningen UR (Netherlands)

Henrik Breuning-Madsen, University of Copenhagen (Denmark)

Olaf Christen, University Halle (Germany)

Project number:
34800
Project dates:
1 March, 2011 to
28 February, 2013

Coordinator:

Ilkka Seilonen, Aalto University (Finland)

Collaborating Institutions:

Ralf Bill, Rostock University (Germany)

Sirpa Thessler, MTT Agrifood Research Finland (Finland)

Claus Grøn Sørensen, Aarhus University (Denmark)

Jens Bligaard, Knowledge Centre for Agriculture (Denmark)

Roland Gerhards, University Hohenheim (Germany)

Geospatial ICT infrastructure for agricultural machines and FMIS in planning and operation of precision farming (GeoWebAgri)

Impact:

The overall aim of the GeoWebAgri-project is to analyse and develop an ICT infrastructure for handling geospatial data and knowledge both in agricultural machines and farm management information systems (FMIS) and promote the introduction of this technology in European software and automation products for agriculture. The technology is studied particularly in the context of spatial data infrastructures (SDI) for the planning and operation of precision agriculture in arable farming.

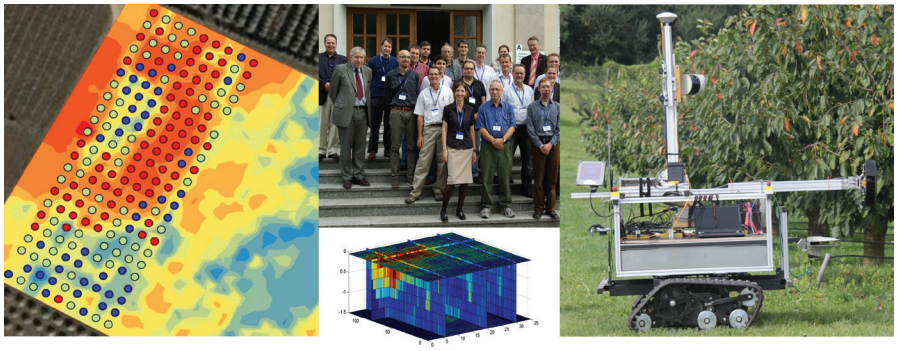
Topics:

Spatial data infrastructures (SDI)

Outputs:

- The first objective is to specify an ICT infrastructure for handling geospatial data both in agricultural machines and FMIS as a continued development of current systems. This specification will be the baseline for subsequent work.
- The second objective is to confirm the viability of the challenging parts of the specified ICT infrastructure with proof of concept implementations.
- The third objective is to evaluate the impact of the possible application of the specified ICT infrastructure on farming objectives. A special focus in the evaluation is on reduced environmental effects through the use of precision agriculture in arable farming.
- The fourth objective is, based on the results of the project, to enhance the knowledge of European software vendors about the applicability and possible benefits of ICT for geospatial applications in agriculture.

Advanced Monitoring of Tree Crops for Optimized Management – How to Cope With Variability in Soil and Plant Properties (3D-Mosaic)



Project number:
34814
Project dates:
1 May, 2011 to
30 April, 2013

Coordinator:

Manuela Zude, Leibniz Institute for Agricultural Engineering, ATB (Germany)

Collaborating Institutions:

Alon Ben-Gal, Gilat Research Center(Israel)

Riza KANBER, University Cucurova (Turkey)

Alessandro Torricelli, Politecnico di Milano (Italy)

Dejan Seatovic, Zurich University of Applied Sciences ZHAW (Switzerland)

Paolo Rozzi, Sinteleia srl (Italy)

Thomas Anken, Agroscope Reckenholz-Taenikon Research Station (Switzerland)

Oliver Hensel, University of Kassel (Germany)

Jose Espinosa, Versas (Spain)

Hans W. Griepentrog, University of Hohenheim (Germany)

Impact:

The target of 3D-Mosaic is to support precision management of orchards by means of a concept for decision support system (DSS) aiming to optimize efficiency of inputs including water and to diminish the environmental footprint of fruit production. The concept has been demonstrated with stakeholders for spatially resolved approach in orchards bringing together robotics, sensors, geo statistics, plant physiologists, and horticulturists. DSS apply information and communication technologies (ICT) for precision management of the economically relevant tree crops that provide different fruit growth behavior, here: citrus and plum. For this purpose, sensors, monitoring strategies, spatially resolved information processing and decision support systems were developed conceptually as well as demonstrated in cooperative field trials. Integration of graduated and undergraduated students resulted in new teaching contents at universities.

Topics:

- Orchards
- Decision support system

Outputs:

- Concept of using robotic platforms, sensors, geo-referenced data base, monitoring strategies, and information processingwas pointed out.
- Results were disseminated to stakeholders: www.atb-potsdam.de/3D-MOSAIC
- Feasibility of the ICT concept was as proved in two field trials .

Project number:
34836
Project dates:
1 July, 2011 to
31 December, 2013

Coordinator:

Michael Nielsen, Danish Technological Institute (Denmark)

Collaborating Institutions:

Raphael Rouveure, National Research Institute of Science and Technology for Environment and Agriculture (France)

Rainer Worst, Fraunhofer Institute for Intelligent Analysis and Information Systems IAIS (Germany)

Giulio Reina, University of Salento (Italy)

Claas (Germany)

Ambient Awareness for Autonomous Agricultural Vehicles (QUAD-AV)

Impact:

The idea of this project is that of using different sensor modalities and multi-algorithm approaches to detect the various kinds of obstacles and to build an obstacle database that can be used for vehicle control. For instance, bearing and distance to the nearest collision can be estimated and used by the path planner to change route or to lower the speed if an obstacle is in close proximity to the vehicle's planned path. Road and cliff edges should be handled as special cases since the consequences to the vehicle of breaching a cliff edge are very severe.

Topics:

- Sensors
- Safety
- Autonous Vehicles

Outputs:

- Identification of how sensors complement each other
- Methods for sensor fusion
- Obstacle classification

2012 Call

ICT and Automation for a Greener Agriculture

The call aimed at utilizing ICT and automation in primary agriculture for sustainable use of natural resources, reduction of agriculture's environmental footprint, mitigation of climate change while securing farm economy and good working conditions, food supply, quality and security, and animal welfare.

Eight projects are funded in this call.

Acronym	Title	Country
ITApic	Application of information technologies in Precision Apiculture	LV TR DE DK
DairyICT	ICT in large and small dairy systems	DK CH GB FR IT IE
ICTGRAZINGTOOLS	Use of ICT tools to capture grass data and optimize grazing management	IE GB FR
USER-PA	USability of Environmentally sound and Reliable techniques in Precision Agriculture	IL DE TR CH GR GB IT DK
SILF	Smart Integrated Livestock Farming: integrating user-centric & ICT-based decision support platform	DK GR IE BE FI
FarmFUSE	Fusion of multi-source and multi-sensor information on soil and crop for optimised crop production system	GB GR DE TR
GrassBots	User-centric adoption of sustainable farming operation involving ICT and robotics – Case: Grassland harvesting operations for biogas and bio refinery plants	DK GB FI
i-LEED	Advanced cattle feeding on pasture through innovative pasture management	DE FR TR

Project number:
14301
Project dates:
1 August, 2013 to
31 July, 2016

Coordinator:

Aleksejs Zacepins, Latvian University of Agriculture (Latvia)

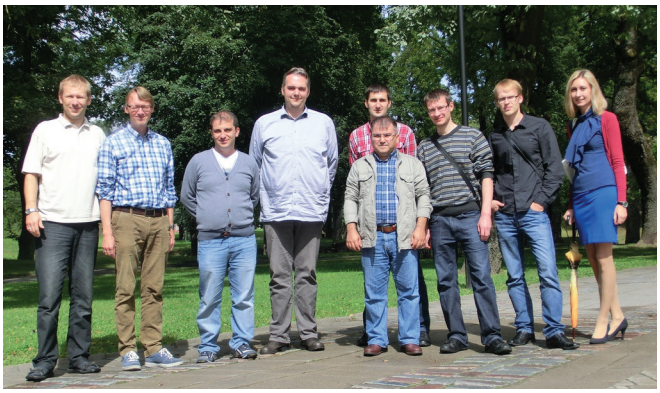
Collaborating Institutions:

Saban Tekin, Gaziosmanpasa University (Turkey)

Uwe Richter, University of Kassel (Germany)

Peter Ahrendt, Aarhus University (Denmark)

Application of information technologies in Precision Apiculture (ITApic)



Impact:

This project proposes implementation of precision agriculture technologies and methods in the beekeeping. Precision agriculture approach is adapted for beekeeping based on the various measurements of individual bee colonies all year around thus detecting different states of colonies and apiaries enabling rapid reaction by the beekeeper in case of necessity. Digital measurements such as temperature, humidity, audio and video can be used to detect several states of a bee colony: swarming, broodless stage, brood rearing, illness. Lots of separated scientific research has been done with this techniques related to bee biology, but they have never been combined to develop a apicultural health observation and warning system.

The main aim of the project is to apply precision agriculture principles in beekeeping utilizing existing industrial resources and newest achievements in information and communication technologies. Precision Apiculture or Precision Beekeeping is an apiary management strategy based on the monitoring of individual bee colonies to minimize resource consumption and maximize the productivity of bees. Project main goal is to identify different states of the bee colony and prevent colony losses.

Topics:

Precision Apiculture (Precision Beekeeping)

Outputs:

- Several bee colony monitoring systems together with data monitoring web systems are developed:
- Novel real-time video system for monitoring and tracking the in-and-out activities of honey bees at the hive entrance in a practical setting. The real-time system is based on the Raspberry Pi.
- Raspberry Pi temperature measurement system together with pc application and web system for data analysis
- Wireless bee colony monitoring system
- Research of bee colony indoor wintering

Smart Integrated Livestock Farming: integrating user-centric & ICT-based decision support platform (SILF)

Project number:
14302
Project dates:
1 March, 2013 to
29 February, 2016

Coordinator:

Claus Grøn Sørensen, Aarhus University (Denmark)

Collaborating Institutions:

Thomas Bartzanas, Centre for Research and Technology Hellas (Greece)

Nicholas Holden, University College Dublin (Ireland)

Annelies Van Nuffel, Institute for Agricultural and Fisheries Research (ILVO) (Belgium)

Kristof Mertens, Porphyrio NV (Belgium)

Mikko Jarvinen, MTT Agrifood Research Finland (Finland)

Ole Green, Agro Intelligence ApS (Denmark)

Impact:

In this project we will develop an evaluation platform that demonstrates through research the potential for an Internet of Things (IoT) enabled FMIS with animal-centric ICT, production databases & best practice standards to assist farmers optimise sustainable livestock production. In this respect, SILF will take an integrated approach to solving issues with environmental impact and animal welfare during livestock production. Previously developed smart farming sensing systems for lameness detection in dairy production will be robustified, validated and evaluated against other available systems in different member states. The commercial/environmental benefit of these systems alongwith 'object-connected ICT' will be realised through specific business-models and lifecycle costing for farming systems. To entice innovation adoption, these benefits will be disseminated through different means, e.g. through the use of simulation.

Topics:

- Internet of Things
- Decision support

Outputs:

- Develop an evaluation platform that demonstrates through research the potential for an Internet of Things (IoT) enabled FMIS with animal-centric ICT, production databases & best practice standards to assist farmers optimise sustainable livestock production.

Project number:
14303
Project dates:
1 March, 2013 to
29 February, 2016

Coordinator:

Abdul Mouazen, Cranfield University (UK)

Collaborating Institutions:

Dimitrios Moshou, Aristotle University of Thessaloniki (Greece)

Ralf Bill, Rostock University (Germany)

Yucel Tekin, Uludag University (Turkey)

Steffen Piecha, tec5 AG (Germany)

Fusion of multi-source and multi-sensor information on soil and crop for optimised crop production system (FarmFUSE)

Impact:

Ignoring the inherited spatial variation in soil properties with traditional sampling methods leads to poor crop management, yield loss and excess use of input. The proposed system of FarmFuse addresses these issues by fuse a set of data on soil and crop together with auxiliary data on topography, land use and weather to delineate management zones for site specific nitrogen fertilisation that leads to sustainable increase in yield at reduced input cost. Site specific N application will reduce amount of fertiliser use and lead to reduce greenhouse gas emission (GHG) and global warming potential (GWP), which have a positive impact on the environment, with reference to the EU framework directive for "A thematic strategy on the sustainable use of pesticides" (COM(2006)372, COM(2006)778).

Topics:

- Variable rate nitrogen fertilisation.
- Proximal soil and crop sensing.
- Data fusion and geospatial analyses.
- Farm management information system.

Outputs:

FarmFuse is based on the following two innovative technologies and approaches:

a) utilising a new and innovative on-line multi-sensor platform for measuring key soil properties at high sampling resolution.

b) Integrating this improved soil data with other information such as vehicle-borne sensing of crop growth, weather data and yield maps, to develop algorithms to determine rules for variable rate N fertilisation.

The following are project output:

- High sampling resolution (> 1000 sample per ha) maps of key soil properties
- Data fusion algorithms based on machine learning and geospatial analysis for variable rate nitrogen fertilisation.
- Soil and crop maps and recommendations for variable rate N fertilisation are integrated into a farm management information system.

User-centric adoption of sustainable farming operation involving ICT and robotics – Case: Grassland harvesting operations for biogas and bio refinery plants (GrassBots)

Project number:
14304
Project dates:
1 March, 2013 to
28 February, 2015

Coordinator:

Claus Grøn Sørensen, Aarhus University (Denmark)

Collaborating Institutions:

Kjeld Jensen, University of Southern Denmark (Denmark)

Richard Green, Harper Adams University College (UK)

Timo Oksanen, Aalto University (Finland)

Claus Mortensen, Agro Business Park (Denmark)

Ole Green, Agro Intelligence ApS (Denmark)

Tom Simonsen, Conpleks Innovation ApS (Denmark)

Jens Hansen, Lynex (Denmark)

Antti Suokannas, MTT Agrifood Research Finland (Finland)

Impact:

Lowland areas and other marginal areas form a huge and currently unused resource of biomass for the biogas and bio refinery industry. Alone for Denmark, it has been estimated that 160-180.000 hectares of unused lowland could be harvested if the appropriate technology was available. This project will develop a novel lightweight, autonomous machine concept for economically and environmentally sound harvest of grass on lowland.

Topics:

- System design, machine implementation
- Operations optimisation
- Autonomous robotic navigation

Outputs:

- The project will adapt an existing commercial mower into an autonomous robot platform, develop implements for cutting, collecting and transporting the harvested material out of the field and develop software to plan, schedule, document and visualize the harvest operation.
- Additional, the concept will be demonstrated in three countries under realistic field conditions, but following all current safety regulations.
- Finally, the project is seen as a stepping-stone towards future autonomous work units coupled with efficient management systems.

Project number:
14305
Project dates:
1 June, 2013 to
31 December, 2016

Coordinator:

Zoltan Gobor, Bayerische Landesanstalt für Landwirtschaft (Germany)

Collaborating Institutions:

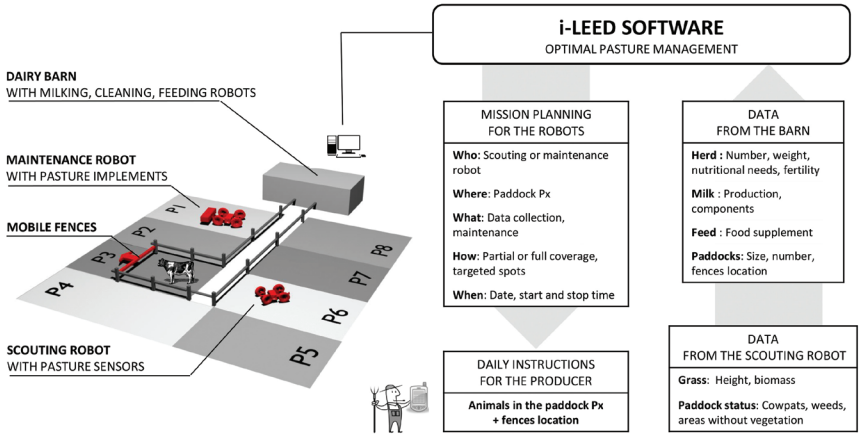
Christophe Cariou, Irstea (France)

Werner Feucker, dsp-Agrosoft GmbH (Germany)

Cedric TESSIER, Effidence (France)

Arif Behiç Tekin, Ege University (Turkey)

Advanced cattle feeding on pasture through innovative pasture management (i-LEED)



Impact:

The main goal is to optimise the feeding strategy for grazing cattle and to improve the methods of pasture management through introduction and fusion of innovative tools.

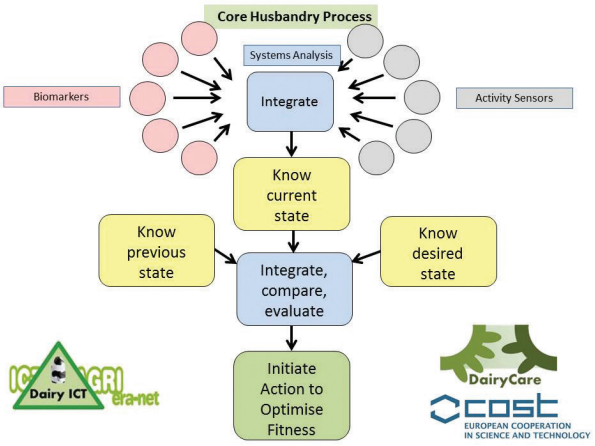
Topics:

- Scouting and pasture robot (autonomous data collection about forage quality and quantity as well as mulching and sowing)
- Analysis of robotic platforms for scouting and pasture robot
- Analysis and development of implements (mulcher and seeder) for pasture robot
- Path planning for scouting and pasture robot
- Online detection of forage quality and quantity
- Detection of cow pats and bare soil
- Herd management software (HMS)
- Interface for communication between the scouting and pasture robot and HMS

Outputs:

- The new i-LEED software will interact with a global Herd Management Software (HMS) and allow the control of the scouting and pasture robot. Furthermore, the calculation of the optimal feeding strategy for cattle as well as suggestions for maintenance of the pasture should be possible in order to provide support for the farm manager for decision making.
- A concept of pasture robot including several variants will be developed based on existing wheeled robotic platforms. The collected data from all relevant sources in the barn and the robot will be combined within the i-LEED software to generate an optimal feeding strategy through allocation of an adequate grazing area size through moving the fences within paddocks.

ICT in large and small dairy systems (DairyICT)



Project number:
14306

Project dates:
1 April, 2013 to
31 March, 2016

Coordinator:

Chris Knight, University of Copenhagen (Denmark)

Collaborating Institutions:

Klaus L. Ingvartsen, Aarhus University (Denmark)

Rupert Bruckmaier, University of Bern (Switzerland)

Ilias Kyriazakis, Newcastle University (UK)

Ivan Andonovic, University of Strathclyde (UK)

Nicolas Friggens, INRA (France)

Paolo Berzaghi, University of Padua (Italy)

David Roberts, SAC (UK)

Riona Sayers, TEAGASC – Agriculture and Food Development Authority (Ireland)

Impact:

This multidisciplinary project seeks to integrate and extend existing state of the art technologies to ensure sustainable and responsible management of dairy units, with focus on cow health, milk quality and reduced emissions. We shall focus on milk metabolomic methods for determination of metabolic health, biomarker technologies for assessment of systemic health and accelerometer collars for measuring various activities including feeding behaviour, and hence intake. We shall also have access to NIR technology for feed quality assessment and rumen-bolus technology for measurement of rumen pH. We have advanced teleonomic technologies that will enable us to integrate these input data into decision support tools. Our technologies will monitor animals and environment, detect deviations from the normal state and either respond automatically to restore the normal state or issue an alert to husbandry staff. We have access to a range of dairy units for evaluation of the technologies.

Topics:

- Dairy
- Sensing
- Data integration
- Smart systems

Outputs:

- Establishment of a COST Action in Dairy Animal Health and Welfare: FA1308 DairyCare www.dairycareaction.org
- Identification of milk-borne biomarkers indicative of rumen dysfunction
- Demonstration of the potential utility of stress biomarker determination in multiple matrices for assessment of acute and chronic stress
- Development of multi-sensor based predictive models linking lameness, feeding behaviour and rumination time

Project number:
14307
Project dates:
1 June, 2013 to
31 May, 2016

Coordinator:

Bernadette O'Brien, Teagasc – Agriculture and Food Development Authority (Ireland)

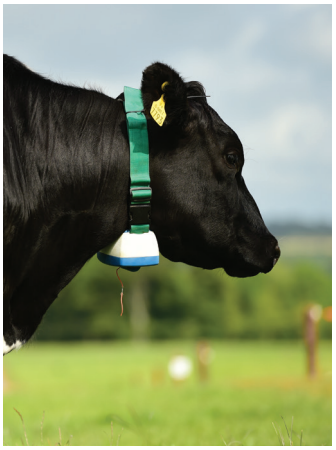
Collaborating Institutions:

Christina Umstatter, Scottish Agricultural College (UK)

Patrick Halton, Forcefield Active Technologies Ltd. (Ireland)

Valérie BROCARD, Institut de l'Elevage (France)

Use of ICT tools to capture grass data and optimize grazing management (ICTGRAZINGTOOLS)



Impact:

Profitability on grass-based systems is driven by degree of grass utilization. This is influenced by increased growth and optimum management of that growth. Frequent measurement of grass parameters, e.g. herbage yield, height, density will facilitate increased herbage production and utilization. However, traditionally such measurement on farms is limited. The potential use of ICT for grass measurement is dramatic.

Topics:

Decision support

Outputs:

- This project will test the potential for linking herbage measurement with a spatial dimension, thus allowing precise allocation of feed using GPS technology to be accomplished through developed ICT tools, a smart phone and a grassland management Decision Support Tool (DST).
- Subsequent integration with 'virtual fence' technology will be evaluated experimentally. This approach will reduce the skill requirement around grass measurement, increase available information, provide an ICT dimension and spatial element to paddock performance and management.

USability of Environmentally sound and Reliable techniques in Precision Agriculture (USER-PA)

Project number:
14308
Project dates:
1 March, 2013 to
28 February, 2015

Coordinator:

Victor Alchanatis, The Volcani Center (Israel)

Collaborating Institutions:

Manuela Zude, Leibniz Institute for Agricultural Engineering (Germany)

Ismail BOGREKCI, Adnan Menderes University (Turkey)

Dominique Fleury, University of Applied Sciences: Western Switzerland (Switzerland)

Spyros Fountas, Center for Research and Technology, Thessaly (Greece)

Simon Blackmore, Harper Adams University College (UK)

Alessandro Torricelli, Politecnico di Milano (Italy)

Soren Marcus Pedersen, University of Copenhagen (Denmark)

Bernd Sumpf, Ferdinand-Braun-Institut, Leibniz-Institut fuer Hoechstfrequenztechnik (Germany)

Impact:

The main objective of the USER-PA project is to develop and demonstrate an integrated and reliable Precision Agriculture solution for orchards and vineyards considering spatial information on irrigation and harvest management.
USER-PA proposes a conceptual framework, an innovative technical architecture, and the enabling technologies that will allow to integrate canopy and fruit sensors with mobile and static data acquisition systems, and farm management information systems, targeting a system that will serve farmers.

Outputs:

- The system will integrate sensing methods, along with an appropriate platform that carries the sensors and gathers the data, and a system that analyses and presents the information prior to irrigation and harvesting during the growth season to the farmer.

2014 Call

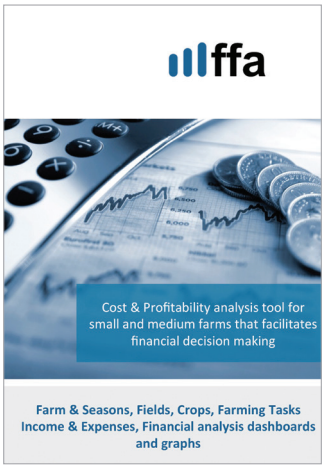
Services & Applications for Smart Agriculture

The call is in collaboration with the Future Internet Accelerator project SmartAgrifood. The objective for SmartAgriFood is to accelerate the use of FIWARE internet technologies for smart services and applications, while the purpose of the ICT-AGRI engagement is to contribute with agricultural knowlegde and experience.

Fifty projects are funded in this call, herof nine projects with ICT-AGRI funded participation

Acronym	Title	Country
ifarma-ffa	Farm Financial Analysis App	GR DE
HappyCow	Connecterra: Project Happy Cow	NL DK FI
Agroptima	Agroptima, "The Internet of Fields": smart & mobile farm management software + IoT devices + big data	ES FI
SSRF-DSS	Sustainable Small Ruminants Farming Decision Support System	GR AT DE
AgriFI	Agriculture meets Future Internet	GR DE FI
FI-ORAMA	Future Internet – Orchards Automated Management System	CY DK DE
Organic-AgriWare	Organic-AgriWare: an application for the organic agriculture community	GR DK
S-GAP	Smart Good Agricultural Practices	TR DK GB
FERIA	Field Readiness Indicator System	DK BE

Services and Applications for Smart Agriculture Farm Financial Analysis App (ifarma-ffa)



Project number:
14591
Project dates:
1 March, 2015 to
31 August, 2015

Coordinator:

Vangelis Vassiliadis,
Agrostis (Greece)

Collaborating Institutions:

Dimitris S. Paraforos,
University of Hohenheim
(Germany)

Impact:

Farmers lack the tools to make informed decisions related to financial management of their business, taking into account cost and profit margins and profitability analysis. While there is a number of Farm Management ERP solutions on the market today these are mainly complete ERP systems, aimed for the big Farm Enterprises are not suitable nor affordable for use by the individual or family farm typical in most European countries.

For most farms, farming activities are not properly logged at least not in a systematic way so that cost analysis can be performed to find out critical cost factors that could be avoided in order to minimize costs and maximize productivity.

Individual farmers need IT tools that will enable them to log and calculate costs, plan ahead and make informed decisions on what crops to plant, what farming activities to execute and what inputs to use, based not only crop and farming requirements but also based on financial considerations.

Such tools should be able to provide a 'good enough' approximation of the cost and profitability analysis using acceptable 'default values' – typical costs per input and activity, in order to compensate for the lack of accurate data logs typical in a small size farm.

Agrostis, develops and markets ifarma, an integrated Farm Management App for both individual farmers and farmer groups. ifarma is provided as Saas both as a native mobile app and as a web-cloud based application. ifarma features a powerful financial analysis module that includes farm profitability analysis and cost analysis at three levels: field, crop and farm.

Topics:

- Financial analysis
- Mobile app

Outputs:

- To make ifarma's financial analysis module available as an App on the FISpace platform utilizing FIWare technologies.

Project number:
14639
Project dates:
1 March, 2015 to
31 August, 2015

Coordinator:

Yasir Khokhar,
Connecterra (Netherlands)

Collaborating Institutions:

Kees Lokhorst,
Wageningen UR
(Netherlands)

Kaarle Jaakkola, Technical
Research Centre of Finland
(Finland)

Frank Oudshoorn, SEGES
P/S (Denmark)

Connecterra: Project Happy Cow (HappyCow)

Impact:

Project Happy Cow will develop hardware and software for a cloud based Estrus detection system for Dairy farms with special focus on organic dairy farms. Our approach is based from the perspective of the internet of things leveraging the FI-Ware platform.

Increase in the cost of production, abolishment of the quota system will put pressure on dairy farmers to find new ways to optimize their farm production. Estrus detection is one of the fundamental optimization points in operations and can save farmers significant amounts of money, up to €250/year per cow. While current detection systems provide adequate accuracy, they are mostly based on algorithms designed for indoor/shed base farms. Furthermore, the business model is based on monolithic implementations based on devices that require fixed capital investments. These systems are usually out of reach of small to medium sized farms. Also, the technology is fixed and cannot be adapted to changing farmer needs and scale.

In the future it is anticipated that farms will need to optimize their facilities for greenhouse emissions, animal welfare and production per cow require systems which not only measure but also provide a scientific basis for prediction and control. Sensor based solutions will be required to scale and adapt to these needs. For farmers, an optimal solution would be to invest in systems that can adapt and morph as the needs change.

Topics:

- Dairy
- FI-Ware

Outputs:

- In order to detect estrus and animal behavior, our solution uses sensors mounted on cows and connected to our cloud services platform providing a unique approach to estrus detection leveraging deep learning, life-time data storage and FI-Ware integration to enable new services based on sensor networks.
- Our approach is transmutable to different scenarios within the farm environment and currently does not have any direct competition.

Agroptima, “The Internet of Fields”: mobile farm management software

Project number:
14894

Project dates:
1 March, 2015 to
31 August, 2015

Coordinator:

Emilia Vila Valls,
Agroptima (Spain)

Collaborating Institutions:

Xavier Bargalló, Agro Igualada SCCL (Spain)

Jussi Nikander, MTT Agrifood Research Finland (Finland)

Impact:

Farmers need a software farm management tool to keep record of their activities on the fields, make better decisions based on real data and manage from one place their fields, machines, products, etc.

The reality is that a lot of farmers want to use such a tool, but the problem is that current software tools have a series of deficiencies: they are not mobile, they are hard to use or they are not based on real data, etc. In addition, the machine generated data from their tractors and other devices gets lost. Therefore, most farmers end up making poor decisions, which are not based on data.

Agroptima is a simple and modern mobile APP and a cloud software tool for farmers, designed with farmers. It will have a simple interface and farmers can work from the fields without internet connection. Agroptima allows the farmer to keep record of his activities, crops and to analyze costs, based on real data he gathers with his smartphone. In addition, the cloud will have an API to connect to the machines so machine generated data can be used for further decision making.

Topics:

Mobile app

Outputs:

The benefits for the farmer:

- Manage their farm efficiently from anywhere
- Save time by keeping records from the field
- Have real data to make better decisions
- Be more competitive, by identifying which crops, fields, machines or workers have better productivity.

Project number:
14906
Project dates:
1 March, 2015 to
31 May, 2015

Coordinator:

Yannis Skourtis, Integrated Information Technology & Digital Communication (Greece)

Collaborating Institutions:

Prof. Marina Fischer-Kowalski, Alpen Adria Universität (Austria)

Prof. Georgios Arsenos, Lab of Animal Husbandry, Faculty of Veterinary Medicine, Aristotle University of Thessaloniki (Greece)

Gus Rose, ZALF-Zentrum für Agrarlanschaftsforschung e.V. (Germany)

Happy Goats: a Sustainable Small Ruminants Farming Decision Support System (SSRF-DSS)

Happy Goats

Impact:

Happy Goats is a model-driven decision support app for sustainable small ruminant (goats & sheep) farming.

Happy Goats has been developed in response to scientific research showing that for the average sheep & goat farmer having fewer animals can cost less be better for the land reduce work and even improve profits. This is accomplished by addressing the problem where farmers are based too much on grants and subsidies and too little on optimizing their production.

The app helps farmers make management planning decisions for each year (herd size costs income production and working hours) and understand their ecological impact in terms of how much pasture can be grazed to keep the farm environmentally sustainable.

The app produces reports with simple easy-to-understand charts and projections which help farmers visualize the impact of their choices and plan for an optimized production.

Topics:

- FI-WARE
- Decision support

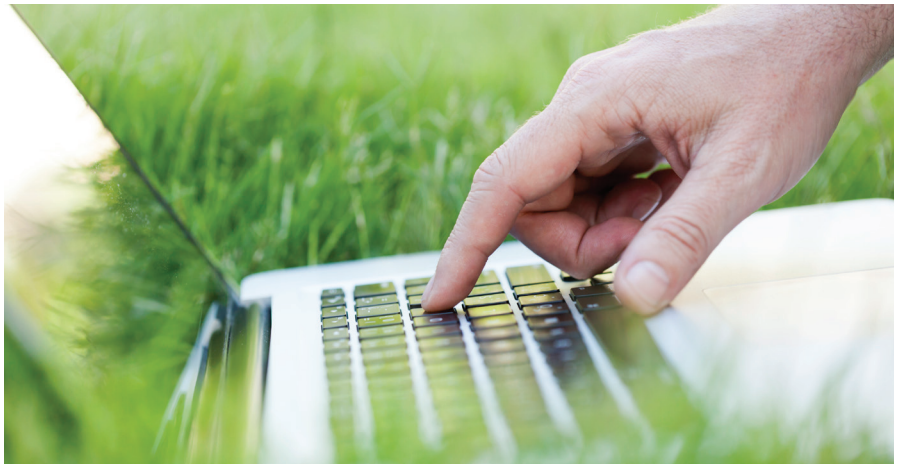
Outputs:

The model (inference engine) assess current farm status and estimates next year's herd size, income, costs, environmental impact and other parameters based on required and optional (default values provided) information about the farm.

The model has two types of input parameters: a) Required data: parameters about the farm livestock and production and b) Optional parameters for which the farmer may either keep the default values or alter them if they know what they're doing. Default values have been selected by our research team based on the findings on more than 120 goat farms which have participated in the EU-funded SOLID (Sustainable and Organic Low Input Dairying www.solidairy.eu) project.

Using these input parameters the app estimates output parameters. From these estimates of milk meat and pasture available the costs income and profit are estimated. The app also calculates the amount of time farmers need to work and the environmental impact based on how much pasture is left at the end of the year.

Agriculture meets Future Internet (AgriFI)



Project number:
15050
Project dates:
1 March, 2015 to
31 August, 2015

Coordinator:

Panos Trakadas,
SYNELIXIS SOLUTIONS
(Greece)

Collaborating Institutions:

Oliver Hensel, University of Kassel (Germany)

Jussi Nikander, MTT Agrifood Research Finland (Finland)

Impact:

AgriFI is a novel, FIWARE-based service, offered through the FIspace platform, that will provide the opportunity to farmers across Europe to:

- get accurate and real-time predictions of possible diseases related to their crops and consequently activate rules and conditions that will trigger specific actions related to diseases,
- get up-to-date information about diseases and nutrition recipes related to their crops and
- capitalize on the FIspace platform to create a pan-European farmers' community, sharing the same problems and discussing possible solutions.
- AgriFI will be realized through the instantiation, adaptation, configuration and utilization of 11 FI-PPP enablers, including the 7 FIspace modules, 2 GEs and 2 SEs.

Topics:

FI-WARE

Outputs:

- AgriFI service will be extensively validated in two key European agricultural countries (Germany and Finland), based on SynField product and already installed external management systems, against a clear set of KPIs.
- Testing and validation of AgriFI will be conducted in the Hessische Staatsdomane Frankenhausen farm (320ha) provided by University of Kassel and the Vakola research farm (150ha) provided by MTT.
- AgriFI service will include disease prediction rules for a variety of crops cultivated across Europe, including cereals (wheat, barley), vineyards, potatoes, tomatoes, carrots, cauliflowers and cherry trees.
- AgriFI will provide additional functionality to the extensible FIspace SaaS platform, enabling the seamless, efficient and effective business collaboration across stakeholders.

Project number:
15198
Project dates:
1 March, 2015 to
31 August, 2015

Coordinator:

Panagiotis Stamatelopoylos, OOB Software LTD (Cyprus)

Collaborating Institutions:

Claus Grøn Sørensen, Aarhus University (Denmark)

Manuela Zude, Leibniz Institute for Agricultural Engineering (Germany)

Future Internet – Orchards Automated Management System (FI-ORAMA)

Impact:

FI-ORAMA (Future Internet – Orchards Automated Management) will use a range of FI-WARE enablers to develop a Farm Management information System (FMIS) for applying precision agriculture management at orchards and vineyards. It will be applied for collect all data generated in the field at site-specific level and this information will be collected and stored in a manner to be used for further purposes, such as certification or traceability. FI-ORAMA allows orchard growers and vine growers to collect and analyze data in multiple levels of aggregation.

Data will be collected automatically from sensors in the field (i.e. soil moisture sensors) or obtained externally (i.e. local weather station) where possible but due to having individual trees and hand-picking of fruit, the system will automate the process of data to be manually entered into a portable device in the field.

Topics:

FI-WARE

Outputs:

The system provides a mobile app that facilitates data collection and displays simple reports, the data is stored in the cloud. Storage and processing is powered by FIWARE generic enablers described below. Detailed reporting and advanced data manipulation will be possible via web interface.

The system functionalities are listed below:

- Real time reports
- Automatic data collection from sensors and external providers
- Manual data collection assisted by the mobile application
- Activity calendar that records all operations
- Precision farming capabilities for generation of yield, quality and soil maps
- Spatial data storage like field boundaries, tree positions, tree variables (manual and automatic entries) and area variables such as soil humidity etc.
- Ability to connect farmer and agricultural advisors

Organic-AgriWare: an application for the organic agriculture community (Organic-AgriWare)

Project number:
15341

Project dates:
1 March, 2015 to
31 August, 2015

Coordinator:

PMO Department,
Agro-Know (Greece)

Collaborating Institutions:

Ilse Rasmussen,
International Centre for Research in Organic Food Systems (ICROFS, Denmark)

Tomas Norfelt, Knowledge Centre for Agriculture (Danish Agricultural Advisory Service, DAAS, Denmark)

Impact:

Organic agriculture stakeholders, whether in Denmark or Greece and elsewhere, are faced with the same practical problems and obstacles when it comes to organic agriculture. These stakeholders, namely farmers and advisors need context-related information to support their long-term and short-term planning. They need to be able to acquire this knowledge without access restrictions to scientific publications. The problem is that all this information is currently dispersed at different online and off-line locations/media, making access to the already acquired knowledge difficult. Collecting the necessary context-related information is therefore currently a challenging task.

To this end, we propose the implementation of Organic-AgriWare that will combine organic agricultural research knowledge with other available practical information, maximizing the practical benefits for organic agriculture stakeholders. It will be a cross-platform application with responsive design that will provide a mashup with unique and context-aware access to the Organic Eprints resources and information from both relevant FIspace apps and other useful resources for the users, determined after a relevant use-case study.

Topics:

FI-SPACE

Outputs:

Organic-AgriWare's implementation is based on a strategic partnership spanning two European countries, Denmark and Greece, between Agro-Know, ICROFS, and DAAS. The end application could be used by anyone interested in organic agriculture. However, the targeted customer segments are agricultural advisors and organic farmers. It will operate under a freemium revenue model, it will capitalize on already existing and future collaborations with other FIspace application providers, and it is expected to have a high early adoption rate.

Project number:
16174

Project dates:
1 March, 2015 to
31 August, 2015

Coordinator:

Magda Krokida, KPAD Ltd (UK)

Collaborating Institutions:

Bahattin Akdemir, Namik Kemal University (Turkey)

Claus Grøn Sørensen, Aarhus University (Denmark)

Smart Good Agricultural Practices (S-GAP)

Impact:

Although most people can see the benefits of using a more precise approach to manage crops with additional information, the tools provided by precision agriculture and other information technologies have not yet moved into mainstream agricultural management. The increased complexity of the systems inhibits easy adoption and makes calculations as to the economic benefits uncertain.

Smart Good Agricultural Practices (S-GAP) is a management information system which combines precision agriculture applications into the three levels of the decision making process (strategic, tactical, operational) together with automated compliance to standards. The developed farm management information system automatically stores all relevant precision agriculture data together with documentation data in the form of instructions to operators, data forms for cross compliance and standards, which can be generated more easily than with the current paper-based systems.

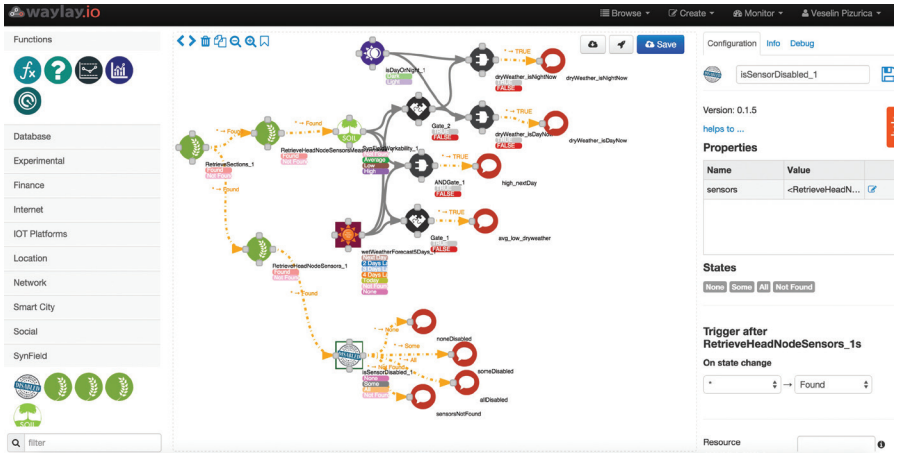
Topics:

FI-WARE

Outputs:

- S-GAP has been developed for the six major field operations carried out in the field during the growing season: tillage, seeding, fertilizing, spraying, irrigations and harvesting
- For each field operation, the decisions to be taken have been formed in a structured way, so as a farmer has to follow sequential steps, which have been computerized.
- The decisions for each operation have been accompanied with organic farming rules that the farmer has to follow for each of the above-mentioned six field operations.

Field Readiness Indicator System (FERIA)



Project number:
16178

Project dates:
1 March, 2015 to
31 August, 2015

Coordinator:

Veselin Pizurica, waylay (Belgium)

Collaborating Institutions:

Claus Grøn Sørensen, Aarhus University (Denmark)

Impact:

Field operations require the use of heavy vehicles and equipment on unpaved agricultural fields. When soil conditions are wet, equipment can cause substantial damage, leaving deep furrows. In extreme cases, implements can sink and become stuck in the mud, causing considerable delays and expenses to extricate the equipment. Farm managers and machinery operators, who are often not located close to the fields, cannot assess the fields before allocating equipment and inputs, causing considerable difficulty in assessing conditions of countless sites with reliability and high frequency. It is a common practice that farmers often have to drive tens of kilometers each day to assess the overall status of various tracts of their fields. Such an approach is labour intensive and can be inaccurate because of the quality of observations made from the road.

Topics:

- Mobile app
- FI-WARE
- Trafficability

Outputs:

- The purpose of FERIA is to develop, test and exploit a probabilistic mobile app assessing trafficability / workability estimates and predictions for agricultural field operations.
- This system will have great influence in organic farming due to many field operations especially for mechanical weeding, as chemical herbicides are forbidden.

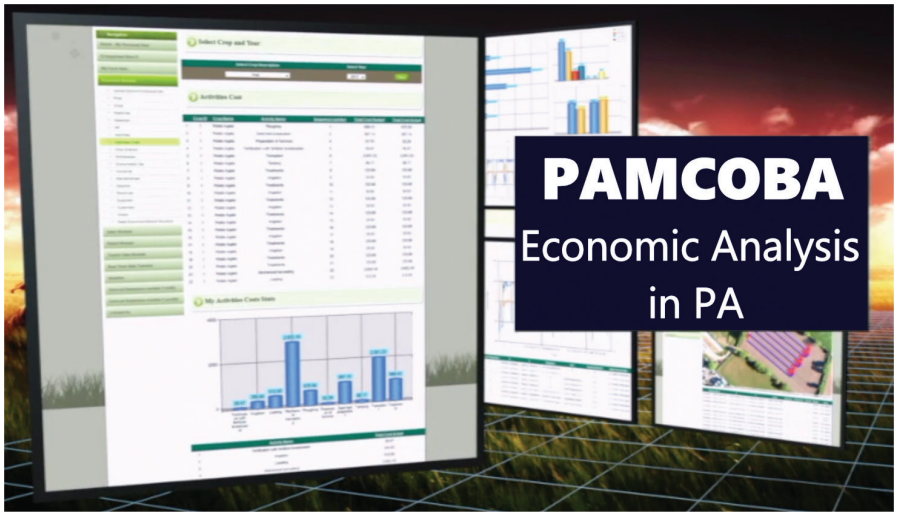
2015 Call

Enabling Precision Farming

Precision Farming is a key element in sustainable intensification, i.e. increasing food production with smaller environmental footprints. Although Precision Farming has been studied and developed for more than two decades, adoption of the technology in primary agriculture is still behind expectations. There are, therefore, needs for research, development and innovation concerning the adoption of Precision Farming in primary agriculture.

Acronym	Title	Country
S3CAV	Simultaneous Safety and Surveying for Collaborative Agricultural Vehicles	DK IT DE CH
PAMCoBA	Precision Agriculture – Methodologies for Cost benefit analysis	DK CH IT
GeoWebAgri II	Geospatial ICT infrastructure for Precision Farming operations management	FI DK DE GB
Targ_App	Putting sensors to work – Targeted application of nutrients and pesticides	DK FI SE IE
VAROS	Variable Rate Operations for Orchards	DK CH ES IT TR
DockWeeder	The DockWeeder robot enables organic dairy farming by controlling grassland weeds	CH FR NL DK
CTF-OptiMove	Mainstreaming Controlled Traffic Techniques and Optimization of Movements	PL DK NL BE IE
GrassQ	Development of ground based and Remote Sensing, automated 'real-time' grass quality measurement techniques to enhance grassland management information platforms	DK IE FI CH

Precision Agriculture – Methodologies for Cost benefit analysis (PAMCoBA)



Project number:
29743

Project dates:
1 January, 2016 to
31 December, 2018

Coordinator:

Søren Marcus Pedersen, University of Copenhagen, Department of Food and Resource Economics (Denmark)

Collaborating Institutions:

Martin Holpp, Agroscope, Agricultural System Engineering (Switzerland)

Maurizio Canavari, University of Bologna, Department of Agricultural Sciences (Italy)

Impact:

Precision farming systems have a wide ranging potential such as improving the utilization of crop nutrients, improvement of crop quality, reduced overlaps and better production economy. Although Precision Agriculture has the potential to improve the profit on many farms, the adoption of Precision Agriculture technologies remains low in Europe. The reason could lie in a reduced perception of the benefits of certain Precision Agriculture technologies along with relative high investment costs. This project is designing and testing a comprehensive methodology to support cost benefit analysis related to PA, which will facilitate the understanding of initial investments, cost and benefits and can offer the chance to significantly improve the level of adoption of the most suitable PA technologies.

Topics:

- Methodologies for transnational Precision Farming solutions
- Social and environmental impact
- Cost and benefits of PF systems

Outputs:

- A Web-portal tool to support cost benefit analysis related to Precision Agriculture

Project number:
29839
Project dates:
1 January, 2016 to
31 December, 2018

Coordinator:

Michael Nielsen, Danish Technological Institute (Denmark)

Collaborating Institutions:

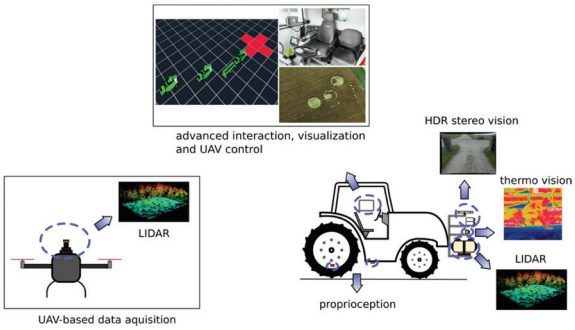
Giulio Reina, University of Salento (Italy)

Stefan Rilling, Fraunhofer Institute for Intelligent Analysis and Information Systems IAIS (Germany)

Annalisa Milella, Institute of Intelligent Systems for Automation (Italy)

Peter Fröhlich, AgriCircle AG (Switzerland)

Simultaneous Safety and Surveying for Collaborative Agricultural Vehicles (S3CAV)



Impact:

Precision farming relies on the ability to accurately locate the crops or leaves with problems and to accurately apply a local remedy without wasting resources or contaminating the environment. This project develops a unifying framework allowing incorporation of many different types of sensor data, methods for creating 3D maps and maximising map accuracy to facilitate operations on a narrow scale with a smaller environment footprint, methods for combining this data to make relevant information easily visible to the farmer, and methods for incorporating real-time sensor data into historical data both to increase precision during applications and to provide fast automated safety responses.

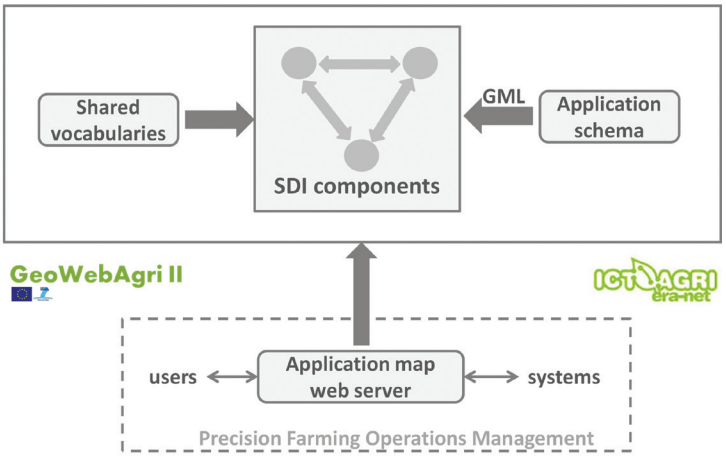
Topics:

- Farm management information systems (FMIS)
- Sensors
- Usability

Outputs:

- Development and implementation of advanced perception systems based on multi-sensor platforms and sensor processing algorithms to be integrated onboard agricultural vehicles, in order to support precision farming (PF) tasks.
- A unifying sensor framework
- Seamless integration of complex 3D data through the entire pipeline from sensing, through FMIS, to user interaction

Geospatial ICT infrastructure for precision farming operations management (GeoWebAgri II)



Impact:

GEoWebAgri II will enhance open standards and interoperability in information management whithin the framework of Precision Farming. Heterogeneous user groups, from different backgrounds with the need to access common spatial data sets, could benefit with an extensible and open data structure that can be created and maintained throughout different systems and located in different physical locations (web, machinery, office, etc.).

Topics:

- Methodologies for transnational Precision Farming solutions
- Compatibility and interoperability of the components in PF solutions
- Open Standards

Outputs:

- Identification and specification of an application schema for Precision Farming Operations Management in the Unified Modelling Language (UML).
- Definition and implementation of sets of conversion rules in a tool that reads UML class diagrams and writes corresponding GML code as specified by the Open Geospatial Consortium (OGC) and ISO 19136.
- Development of an Application Map Web Service (AMWS) that allows for a standardized communication between technological entities involved in Precision Farming operations (e.g. sensors, decision support systems, FMIS, machinery on-board interfaces etc.).
- Test cases of selected field operations management tasks (related to other ICT-Agri projects) will be defined and subjected to test and demonstration validating the defined data model.

Project number:
29884

Project dates:
1 January, 2016 to
31 December, 2017

Coordinator:

Dionysis Bochtis, Aarhus University (Denmark)

Collaborating Institutions:

Jere Kaivosoja, LUKE: Natural resources Institute (Finland)

Ilkka Seilonen, Aalto University (Finland)

Ole Juhl, SEGES (Denmark)

Jens Wiebensohn, Rostock University (Germany)
Markus Jackenkroll, University of Hohenheim (Germany)

Bart De Lathouwer, Open Geospatial Consortium Europe (UK)

Project number:
29924
Project dates:
1 January, 2016 to
31 December, 2018

Coordinator:

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Collaborating Institutions:

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(Denmark)

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(Finland)

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University of Agricultural
Sciences (Sweden)

Putting sensors to work – Targeted application of nutrients and pesticides (Targ_App)

Impact:

One of the critical challenges for the successful and widespread adoption of Precision Farming in Europe is to mainstream the use of the technologies to ensure it is accessible to all farmers and can become an integral part of crop management supported by crop advisors / agronomists where decisions are based on cost-benefit analysis. To achieve this, appropriate research-based validation and comprehensive support to advisors and farmers, is essential to facilitate the adoption of crop-sensor based management. This project will deliver the necessary research, validation and support.

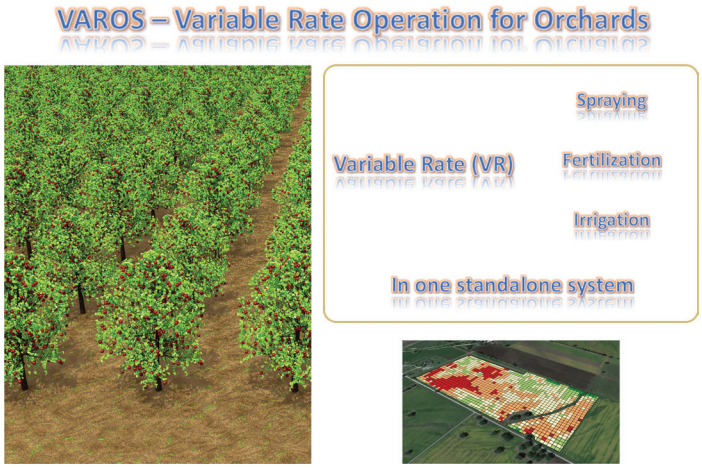
Topics:

- Implementation of transnational Precision Farming solutions
- Variable rate application of fertilizers or pesticides

Outputs:

- Desk study on best practices and identification of barriers to the adoption of crop sensing based precision agriculture technology;
- Development of support tools for advisors/consultants to aid implementation of sensor-based variable rate input application;
- Stakeholder involvement (farmers, industry, advisors, and researchers), in technology transfer initiatives aimed at mainstreaming the use of crop reflectance sensors;
- Implementation of sensor technology on demonstration farms;
- Evaluation of yield and economic effects of variable rate applications using sensor data;
- Adoption analysis regarding different farming systems and regions.

Variable Rate Operations for Orchards (VAROS)



Project number:
29957

Project dates:
1 January, 2016 to
31 December, 2018

Coordinator:

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(Denmark)

Collaborating Institutions:

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Manuel Pérez Ruiz, Soluciones Agrícolas de Precisión S.L. (AgroSap) (Spain)

Maurizio Canavari, University of Bologna (Italy)

Adnan Dogan, Atatürk Central Horticultural Research institute (Turkey)

Impact:

The ability to optimize inputs at spatial scale has been enabled with the use of Variable Rate Applications (VRA). Despite the fact that there are numerous VRA systems aimed at arable crops, specific systems for orchard management utilizing precision monitoring and application of the orchards are still lacking. These cropping systems face increasing market pressure to produce quality products, and provide a detailed traceable system for the origin of the product including, the treatments and the conditions that have occurred during the production. The main aim of this project is to advance the Technology Readiness Level (TRL) of the VRA for orchard management, from the research stage to prototype testing, to enable more optimized use of inputs in fruit production, minimize the use of pesticides and protect the environment.

Topics:

- Implementation of transnational Precision Farming solutions in orchards
- Variable rate application of fertilisers, irrigation water and pesticides

Outputs:

- Field applications will be carried out in 3 countries: variable rate irrigation in Spain, variable rate fertilization in Turkey and variable rate spraying in Greece. Specific orchards have been identified in all three countries: apples in Turkey citrus in Spain and table grapes in Greece.
- Develop a set of algorithms for operations management for VRA in orchards based on task allocation and auxiliary data.
- Implement a set of sensing systems for 3D representation of the tree canopy, which will feed into the research activities for the application of VRA (irrigation, fertilization and spraying).
- Adoption studies in Spain, Turkey and Greece, where the experimental fields are located.

Project number:
30079
Project dates:
1 January, 2016 to
31 December, 2018

Coordinator:

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Collaborating Institutions:

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The DockWeeder robot enables organic dairy farming by controlling grassland weeds (DockWeeder)

Plant data acquired with LMS 400

Plant data acquired with Ranger C55

Impact:

Broad-leaved dock (Rumex obtusifolius L.) is a common and troublesome weed with a wide geographic distribution. The weed is readily consumed by livestock but its nutritive value is less than that of grass. The high contents of oxalic acid and oxalates can affect animal health if consumed in larger doses. When left uncontrolled, the weed will reach a high density and reduce grass yield by 10 to 40%. In conventional dairy farming, the weed is normally controlled by using herbicides. In organic farming no synthetic pesticides are used and there is a risk that broad-leaved dock will spread. This is also true in ecologically intensive dairy farming, where one of the goals is to maintain multi-species pastures where use of herbicides would affect desirable species such as clovers and vetch. As an illustration, on 17 organic dairy farms surveyed in The Netherlands, 51% of fields were infested at more than 1,000 plants hectare-1. Similarly, of 108 organic farmers surveyed in Germany, 85% indicated having problems with broad-leaved dock. Thus, broad-leaved dock may turn out to be a serious obstacle to achieve the European goal of increasing the share of organic farming.

The solution proposed here consists of creating a robot that is capable of exploring a pasture by relying on GPS, equipping it with an array of sensors to detect the weed, and also equipping it with a non-chemical method to eliminate detected weeds.

Topics:

- Implementation of transnational Precision Farming solutions
- Precision Livestock Farming

Outputs:

- Creating a robot that is capable of exploring a pasture by relying on GPS, equipping it with an array of sensors to detect the weed, and also equipping it with a non-chemical method to eliminate detected weeds.
- Advance the state of the art of weed detection by combining two-dimensional (2-D) and three-dimensional (3-D) imaging
- Adopt and optimize an innovative, environment-friendly hot-water treatment to eliminate weeds.

Mainstreaming Controlled Traffic Techniques and Optimization of Movements (CTF-OptiMove)

Project number:
35778

Project dates:
1 February, 2016 to
31 January, 2019

Coordinator:

Claus Grøn Sørensen, Aarhus University, Department of Engineering (Denmark)

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Soren Marcus Pedersen, University of Copenhagen (Denmark)

Jacob Van Den Borne, Van Den Borne Aardappelen (Netherlands)

Jens Ole Pedersen, Gefion (Denmark)

Impact:

Controlled Traffic Farming (CTF) management can play a key role in sustaining soils and future crop production, which are today threatened by heavy machinery traffic and intensive production systems. To play this role in sustainable intensification, CTF needs to be developed to become a mainstream technology rather than a niche practice.

The overall objective of this project is to develop an integrated CTF innovation package based on research, operational tools and decision support systems which will underpin the wider adoption of CTF and related position based technologies. The project will use a multi-actor approach to demonstrate the benefits for CTF adoption across a wider range of European growing conditions, Existing dedicated optimization tools on vehicle routing, resource allocation, operations scheduling, etc. will be further developed. Using quantitative research data, the benefits and the importance of adapting the technologies to solve the constraints will be demonstrated and evaluated for at number of specific scenarios from farms in the participating countries. The effects of the configuration of the CTF farming systems will be modeled including the optimal routing pattern, etc.

Topics:

- Implementation of transnational Precision Farming solutions
- Variable rate application of fertilisers, water or pesticides
- Controlled traffic farming

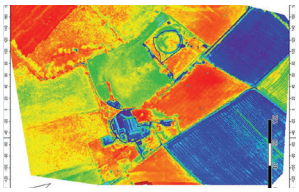
Outputs:

- Applied research will quantify and illustrate the benefits of controlled traffic and related technologies in terms of crop, and machine efficiency and soil quality
- Development of innovative DSS and operational tools
- Designated field trials carried out in Belgium, Ireland, the Netherlands and Denmark

Project number:
35779

Project dates:
1 February, 2016 to
31 December, 2018

Development of ground based and Remote Sensing, automated 'real-time' grass quality measurement techniques to enhance grassland management information platforms (GrassQ)



Coordinator:

Bernadette O'Brien, TEAGASC – Agriculture and Food Development Authority (Ireland)

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Enda Keane, TreeMetrics Ltd (Ireland)

Eija Honkavaara, Finnish Geospatial Research Institute, National Land Survey (Finland)

Jere Kaivosoja, Green Technology, Natural Resources Institute Finland (LUKE) (Finland)

Christina Umstatter, Work, Buildings and System Evaluation (Switzerland)

Peter Hemmingsen, ASCENDXYZ (Denmark)

Impact:

The focus of this project is to develop and enable an intelligent system that will apply precision management to whole farm grassland and grazing systems. The goal is to optimize grass quality, utilization efficiency, and ultimately profitability, with minimal labour requirement and maximum objectivity. To precisely allocate to the cow herd the absolutely correct area of grass, it is necessary to have an accurate 'real-time' measure of grass quality (as well as quantity). The research proposed here is new and innovative, in that two very different techniques will be used to derive this grass quality measure, either by automated grass quality data capture by a near infrared spectroscopy (NIRS) sensor at ground level or by Remote Sensing image data captured using satellite or unmanned aerial vehicles (UAVs) and subsequent predictive modelling. This project provides a unique opportunity for these two techniques to be operated in parallel.

Topics:

Precision Livestock Farming

Outputs:

- Provision of high quality, 'real-time', geo-tagged information in the form of herbage mass, and specifically grass quality, through a user friendly software package on a Smartphone App or web-based decision support system (DSS).

Notes

Notes

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