EUROPEAN COMMISSION
DIRECTORATE-GENERAL FOR AGRICULTURE AND RURAL DEVELOPMENT

Directorate H. General aspects of rural development and research
H.5. Research and innovation

PROJECTS ON SMART AGRI-FOOD SYSTEMS

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1. ROBOTICS

GARNICS - Gardening with a Cognitive System (GARNICS)

Programme: FP7
Call: FP7-ICT-2009-4

Project abstract:

The GARNICS project aims at 3D sensing of plant growth and building perceptual representations for learning the links to actions of a robot gardener. Plants are complex, self-changing systems with increasing complexity over time. Actions performed at plants (like watering), will have strongly delayed effects. Thus, monitoring and controlling plants is a difficult perception-action problem requiring advanced predictive cognitive properties, which so far can only be provided by experienced human gardeners. Sensing and control of the actual properties of a plant is relevant to e.g. seed production and plant breeders. Plant models will be acquired and by interacting with a human gardener the system will be taught the different cause-effect relations resulting from possible treatments. The robot gardener will be able to choose from its learned repertoire the appropriate actions for optimal plant growth

Web: http://www.garnics.eu/

FLOURISH - Aerial Data Collection and Analysis, and Automated Ground Intervention for Precision Farming

Programme: H2020
Call: H2020-ICT-2014-1

Project abstract:

To feed a growing world population with the given amount of available farmland, we must develop new methods of sustainable farming that increase yield while reducing reliance on herbicides and pesticides. Precision agricultural techniques seek to address this challenge by monitoring key indicators of crop health and targeting treatment only to plants that need it. This is a time consuming and expensive activity and while there has been great progress on autonomous farm robots, most systems have been developed to solve only specialized tasks. This lack of flexibility poses a high risk of no return on investment for farmers. The goal of the Flourish project is to bridge the gap between the current and desired capabilities of agricultural robots by developing an adaptable robotic solution for precision farming. By combining the aerial survey capabilities of a small autonomous multi-copter Unmanned Aerial Vehicle (UAV) with a multi-purpose agricultural Unmanned Ground Vehicle, the system will be able to survey a field from the air, perform targeted intervention on the ground, and provide detailed information for decision support, all with minimal user intervention. The system can be adapted to a wide range of crops by choosing different sensors and ground treatment packages. This development requires improvements in technological abilities for safe accurate navigation within farms, coordinated multi-robot mission planning that enables large field survey even with short UAV flight times, multispectral three-dimensional mapping with high temporal and spatial resolution, ground intervention tools and techniques, data analysis tools for crop monitoring, weed detection, and user interface design to support

agricultural decision making. As these aspects are addressed in Flourish, the project will unlock new prospects for commercial agricultural robotics in the near future.

Web: http://grantsaccess.ethz.ch/de/researchprojects/eu-projekte-eu-grantsaccess/flourish/

SWEEPER - Sweet Pepper Harvesting Robot

Programme: H2020
Call: H2020-ICT-2014-1

Project abstract:

In modern greenhouses there is a high demand to automate labour. The availability of a skilled workforce that accepts repetitive tasks in the harsh climate conditions of a greenhouse is decreasing rapidly. The resulting increase in labour costs and reduced capacity puts major pressure on the competitiveness of the European greenhouse sector. Present robotization of this labour has entered a high level of technological readiness. However, a gap remains which halts the transition from science to economic and societal impact; the so called 'Technological Innovation Gap'. In the EU-FP7-project CROPS, extensive research has been performed on agricultural robotics. One of the applications was a sweet pepper harvesting robot. It was shown that such a robot is economically and technically viable. The proven hardware and software modules (TRL: 6) developed in CROPS will be used as the groundwork. The successful CROPS software modules based on the Robotic-Operating-System (ROS) will be maintained and expanded in SWEEPER. Also the gripper end-effector will be retained. This patent pending module is able to grasp the sweet pepper without the need of an accurate measurement of the position and orientation of the fruit. In several experiments, it turned out that different growers use different cropping systems ranging in crop density. In SWEEPER, the cropping system itself will be optimized to facilitate robotic harvesting. In CROPS it was concluded that instead of a 9DOF, a 4DOF robot arm is sufficient, greatly reducing costs. To improve the level of robotic cognitive abilities, plant models will be applied to approximate location of sweet peppers. This "model-based vision" will increase and speed up fruit detection. Based on the insights of CROPS, sensors will be placed onto the gripper only. Also a LightField sensor will be introduced, which is able to record both colour and 3D information simultaneously.

Web: http://www.sweeper-robot.eu/

TrimBot2020 - A gardening robot for rose, hedge and topiary trimming

Programme: H2020
Call: H2020-ICT-2015

Project abstract:

The TrimBot2020 project will research the robotics and vision technologies to prototype the first outdoor garden trimming robot. The robot will navigate over varying terrain, approach rose bushes, hedges and boxwood topiary, to trim them to an ideal shape. The robot will be based on a modified Bosch Indego robot lawnmower, which will navigate using a user-defined garden map and 3D scene analysis, and then visually servo a novel electric plant cutter. Achieving this will require a combination of robotics and 3D

computer vision research and innovation activities. Original developments will be required for 3D sensing of semi-regular surfaces with physical texture (overgrown plant surfaces), coping with outdoor lighting variations, self-localising and navigating over real terrain and around obstacles, visual servoing to align the vehicle with potentially moving target plants, visual servoing to align leaf and branch cutters to a compliant surface, and innovative engineering to deliver all this on a small battery-powered consumer-grade vehicle. Development of these capabilities aligns closely with the Robotics Strategic Research Agenda and Multi-Annual Roadmap aspirations. This project falls clearly in the consumer market domain. It will develop service robotics, advanced perceptual capabilities, mobile manipulation, and flexible and reactive autonomy. As a novel robotics application, the current TRL is 1/2, but the project aims to achieve TRL 5/6. Bosch expects to exploit the project's results to extend its current automated lawnmower product. This exciting project will extend generic robotics and computer vision technologies, explore a new robot application, has an explicit route to market exploitation by an experienced manufacturer, and has a great team with experienced plant roboticists and world leading computer vision researchers, led by an experienced EC project coordinator.

Web: http://homepages.inf.ed.ac.uk/rbf/TRIMBOT2020/

VINEROBOT - VINEyardROBOT

Programme: FP7
Call: FP7-ICT-2013-10

Project abstract:

The aim of this project is the design, development, and deployment of a novel use-case agricultural robot under the scope of Unmanned Ground Vehicles (UGV), and equipped with several non-invasive sensing technologies to monitor: 1) of grape yield, 2) vegetative growth, 3) Water stress and 4) Grape composition in order to optimize the vineyard management and improve grape composition and wine quality.\n\nThe use of UGVs to monitor vineyard physiological parameters and grape composition has several advantages over simple hand-held devices for manual sampling and over UAV.\n\nUGVs may provide key information regarding vineyard physiology and water stress, grape composition, and pests and diseases' incidence much faster than manual solutions and at higher resolution, in a more flexible way, and lower cost than aerial scouting carried out by drones or planes.\n\nThe scope covers the integral monitoring of vineyards, over the entire season, by placing a ground robot along the vineyards (endowed with artificial intelligence and machine learning techniques).\nThe final users will receive updated in mobile application (app).\n\nThe proposed use-case agricultural robots (where key proximal sensing technologies will be implemented) will allow revolutionary and conclusive decision making to optimize vineyard management and to drive agronomical fundamental decisions according to grape yield estimation, plant growth monitoring, water status, and berry composition assessment. UGV proposed will incorporate an integrated system that includes machine vision, thermography and fluorescence-based sensors. Canopy images and data acquisition processes will be executed in real time through customized algorithms to compose specific production maps..

Web: http://www.vinerobot.eu/

ECHORD Plus Plus – MARS - Mobile Agricultural Robot Swarms
Programme: FP7
Call: FP7-ICT-2011-9

Project abstract:

The MARS experiment aims at the development of small and stream-lined mobile agricultural robot units to fuel a paradigm shift in farming practices. The concept addresses looming challenges of today's large and constantly growing tractor-implement combinations with mainly three aspects. First: to optimize plant specific precision farming, leading to reduced input of seeds, fertilizer and pesticides and to increased yields. Second: to reduce the massive soil compaction as well as energy consumption of heavy machinery. Third: to meet the increasing demand for flexible to use, highly automated and simple to operate systems, anticipating challenges arising from climate change as well as shortage of skilled labour.
The robots will cooperate as a group, similar to swarm principles. MARS will focus on the seeding process for corn performed by two robots as an example. The key strategy of this approach is on the one hand the radical reduction of weight and size compared to conventional farming equipment, which also allows for a fundamental simplification of safety tasks. On the other hand it is the essential simplification compared to known agricultural robot prototypes, especially by minimized use of on-board sensors. This will be realized by transferring control algorithms, process optimizing and supervising intelligence to cloud services and utilizing precise GPS-Real Time Kinematic technology. All these measures are intended to lead to a significant cost reduction of the overall system paving the way towards robots as a true alternative in the agricultural domain

Web: http://www.servicerobotik-ulm.de/drupal/?q=node/75

ECHORD Plus Plus - GARotics – Green asparagus harvesting robotic system

Programme: FP7
Call: FP7-ICT-2011-9

Project abstract:

Due to lower harvesting costs, there is an increasing trend towards the production of green asparagus. Today harvesting is done by seasonal workers, however the increasing labour costs and the lack of available labour supply forces farmers to optimize the harvesting process and to introduce harvesting aids. With automated harvesting the availability of labour force would play a less important role and make the harvesting much more flexible and cost efficient.
While for the cultivation of green asparagus the degree of automation is quite high, automation of harvesting is still an unsolved challenge. Several approaches for automated machines have been made, but none of the known automated harvester can guarantee a picking rate and quality like manual labour. This is mainly because of the difficulty and the complexity of the asparagus detection.
GARotics will improve the automatic harvesting systems for green asparagus by enhancing the quality of the asparagus detection and by increasing the detection rate as well as the harvesting rate. Furthermore, GARotics will present a new gripping

mechanism with three robotic arms. In addition, data are collected to support the yield forecast and panning of the next harvest run.

Web: http://echord.eu/garotics/

ECHORD - Hubrina - HUman-roBot co-woRking IN Agricultural master-slave systems

Programme: FP7
Call: FP7-ICT-2007-3

Project abstract:

In this experiment, a master-slave robot control for agricultural activities will be developed and its feasibility demonstrated. The human takes over the nonrobotized tasks of safety prevention and feedback on the quality of work performed by the robot. The HUBRINA experiment roposes to advance the research to master-slave systems in agriculture beyond just the level of simulation and prove the feasibility of a fully automated master-slave system. This fits into the ECHORD research focus 'human robot co-worker' in that a robot co-worker interacts with a human towards achieving a common goal. The research foci of ECHORD that relate to this experiment are human-robot interfacing and safety and cooperation.
Tractor manufacturer CLAAS supports the research by supplying a tractor for the experiment.

Web: http://echord.info/wikis/website/home

2. DATA

AgroIT - Increasing the efficiency of farming through on open standards based AgroIT platform

Programme: CIP
Call: CIP-ICT-PSP-2013-7

Project abstract:

The overall objective of the project is to implement AgroIT platform. This is an open platform based on open standards. AgroIT will deliver applications and services to various stakeholders: farmers, local communities, state institutions, consulting institutions in farming (government founded and private) and EU institutions.
It will help accelerate the transfer of innovative applications and services to the Europe-wide market by: quicker integration of new ICT elements (applications, services, monitoring systems) into the platform and as a consequence quicker transfer of integrated ICT solution to market. As we will define open standards, farmers will not be limited to selection of our products (products, which will be finalized based on prototypes implemented within this project).

Web: https://www.agroit.eu/SitePages/About.aspx

Foodie – Farm Oriented Open Data in Europe

Programme: CIP
Call: CIP-ICT-PSP-2013-7
Project abstract:

The agriculture sector is of strategic importance for European society and economy. Due to its complexity, agri-food operators have to manage many different and heterogeneous sources of information. Agriculture requires collection, storage, sharing and analysis of large quantities of spatially and non-spatially referenced data. These data flows currently present a hurdle to uptake of precision agriculture as the multitude of data models, formats, interfaces and reference systems in use result in incompatibilities. In order to plan and make economically and environmentally sound decisions a combination and management of information is needed.
The key point of FOODIE project is creating a platform hub on the cloud where spatial and non-spatial data related to agricultural sector are available for agri-food stakeholders groups and interoperable. It will offer an infrastructure for the building of an interacting and collaborative network; the integration of existing open datasets related to agriculture; data publication and data linking of external agriculture data sources, providing specific and high-value applications and services for the support of planning and decision-making processes.

FOODIE project is addressed to four basic groups of users:

1. Stakeholders from the agriculture sector as end-users of final applications, including:
    a. Farmers
    b. Advisory services
    c. Service organization

    d. Retail business
2. Public sector for communication with farmers about taxation, subsidies, regulation etc.
3. Researchers for large scale experimentation on real data
4. ICT companies for the development of new applications for agriculture and food sector, mainly using implemented tools, encompassing:
    a. SME developers of ICT for agriculture platform
    b. Technology producers

FOODIE platform will contain:

- Farming data such as maps, sampling data, yield, fertilisation, etc. Some of this data will be obtained from sensors on the farm and will have character of private data.
- Public Open Data as land satellite images, environment and biodiversity information, agro-food statistical indicators, nature data, hydrometeorlogical data, soil data, etc.
- Commercial data, mainly VHR satellite images and ortophotos, but it could be also market related data.
- Voluntary data like OpenStreetMap, voluntary collected data about market situation, agriculture production etc.

Technology

FOODIE aims at deliver a cloud computing environment. Three types of solutions will be used as software platform:

1. Existing legacy platforms Dokoplant and Prefarm;
2. Existing common open source platform of third parties like Geoserver, Mapserver, North and LayMan;
3. Partner's assets like Tabels, NetRS and DEWS alerting system.

OBJECTIVES

In order to realize FOODIE concept and the service platform hub, the project pursues the following objectives:

- Exploiting of existing spatial information resources and services from various domains –coming from different initiatives like INSPIRE, SISE, GMES/Copernicus, GNSS, GALILEO, GEOSS , GBIF, EUNIS, EEA, etc.
- Designing and creating an open and interoperable geospatial platform hub on the cloud based on existing software components from research results and available solutions in the market;
- Integrating external agriculture production and food market data using principles of Open Linked Data;
- Using of open and flexible lightweight Application Programming Interface (API) for the publishing of datasets by private and public stakeholders in the agricultural and environmental area (e.g., datasets provided by local sensor networks deployed in situ in farms, knowledge from farm communities, agricultural services companies, etc.) and making it available in the platform hub as open linked data (and enabling it to further processing and reasoning over it);

- Availability of specific and high-value applications and services for the support in the planning and decision-making processes of the different stakeholders groups;
- Providing security mechanisms to prevent the unauthorised access and use of the platform users' personal information as well as the data published by them;
- Offering a marketplace where data can be discovered and exchanged with the additional contribute of external companies that can publish their own agricultural applications based on the data, services and applications provided by FOODIE.

Web: http://www.foodie-project.eu/CIP.php

BigDataEurope - Integrating Big Data, Software and Communities for Addressing Europe's Societal Challenges

Programme: H2020
Call: H2020-ICT-2014-1

Project abstract:
BigDataEurope will provide support mechanisms for all the major aspects of a data value chain, in terms of the employed data and technology assets, the participating roles and the established or evolving processes. The effectiveness of the provided support mechanisms will be assessed in different domains pertaining to Europe's major societal challenges with respect to the needs and requirements of the related communities. To this end, BigDataEurope focuses on providing an integrated stack of tools to manipulate, publish and use large-scale data resources; tools that can be installed and used freely in a customised data processing chain with minimal knowledge of the technologies involved and integrating and industrially hardening key open-source Big Data technologies and European research prototypes into a Big Data Integrator Platform, i.e. an ecosystem of specifications and reference implementations that are both attractive to current players from all parts of the data value chain while also lowering the entry barrier for new businesses. In order to realise its objectives, Big Data Europe will focus on two clearly defined coordination and support measures: 1. Coordination: Engaging with a diverse range of stakeholder groups representing particularly the Horizon 2020 societal challenges Health, Food & Agriculture, Energy, Transport, Climate, Social Sciences and Security; Collecting requirements for the ICT infrastructure needed by data-intensive science practitioners tackling a wide range of societal challenges; covering all aspects of publishing and consuming semantically interoperable, large-scale data and knowledge assets; 2. Support: Designing, realizing and evaluating a Big Data Aggregator platform infrastructure that meets requirements, minimises the disruption to current workflows, and maximises the opportunities to take advantage of the latest European RTD developments, including multilingual data harvesting, data analytics, and data visualisation. BigDataEurope will implement and apply two main instruments to successfully realize these coordination and support measures: a) Build Societal Big Data Interest Groups in the W3C interest group scheme and involving a large number of stakeholders from the Horizon 2020 societal challenges as well as technical Big Data experts; b) Design, integrate and deploy a cloud-deployment-ready Big Data aggregator platform comprising key open-source Big Data technologies for real-time and batch processing, such as Hadoop, Cassandra and Storm. BigDataEurope aims to provide an adaptable, easy to deploy and use solution, which will allow the interest-ed user groups and stakeholders to extend their Big Data solutions or introduce Big Data technology to

their business processes, based on a concrete methodology for producing a technically sound solution and maximizing its outreach to the relevant communities.

Web: https://www.big-data-europe.eu/

3. MICRO-NANO-BIO SYSTEMS

FOODSNIFFER, FOOD Safety at the point-of-Need via monolithic spectroscopic chip identiFying harmFul substances in frEsh pRoduce,

Programme: FP7
Call: FP7-ICT-2011-8

Project abstract:

Concern for our food is growing in Europe, driven by industrialised food production and repeated crises. Current analytical technology is too expensive and bound to the laboratory to test more than a small fraction of 1% of the EU's food. This problem requires more massive screening of food and water extending from the source to the point of consumption. A low-cost and portable system delivering analytical data to a central location would help to prevent or identify early any food safety threat outbreaks and thereby massively reduce human suffering and its associated financial cost on both sides of the global divide. FOODSNIFFER is field-deployable and simple-to-use as a result of the integration of three major innovations: (i) the transducer itself, an all-silicon fully integrated optoelectronic platform based on Broad-Band Mach-Zehnder Interferometry capable of synchronous highly-sensitive label-free multi-analyte detection. This ultimately-integrated transducer due to the incorporation of the light-sources, sensing elements, spectral analyzer and photodetectors, in a single chip, can be used in single-shot cartridges. (ii) the innovative design of the wafer-scale microfluidics and filtration systems that unburden the reader of external pumps/valves, and intensive sample preparation. (iii) the development of a low-power reader controlled by a smartphone through a custom-produced application. The software controls the sensor and also processes its signal and then sends the results securely via the internet during the on-the-spot food safety analysis. FOODSNIFFER is a complete business solution which will be demonstrated in three areas of great importance to European society and regulators, viz. the detection of pesticide residues, mycotoxins and allergens in selected food categories in order to demonstrate field-based detection of harmful species at low concentrations, which is a feat unattained so far by any point-of-need system.

Web: http://www.foodsniffer.eu/

LOVE-FOOD, Love wave fully integrated Lab-on-Chip platform for food pathogen detection,

Programme: FP7
Call: FP7-ICT-2011-8

Project abstract:

The project is aimed at developing a fully integrated lab-on-chip microsystem platform, performing multimodal analysis of several analytes combining nucleic acid and whole bacteria detection. The system will allow directly and without prior culture the identification in one single run of a multiplicity of pathogens and their specific sequences responsible will be targeted and identified. The heart of this system will be an acoustic detection biochip incorporating an array of Love wave acoustic sensors, integrated with a microfluidic module. This detection platform will be combined with a micro-processor,

which, alongside with magnetic beads technology and a micro-PCR module will be responsible for performing sample pre-treatment, bacteria lysis, nucleic acid purification and amplification as well as whole bacteria detection. Automated, multiscale manipulation of fluids in complex microchannel networks will be combined with novel sensing principles developed by some of the partners. This system is expected to have a significant impact in food-pathogen detection by addressing for the first time a pathological condition on a global rather than germ-by-germ basis, while screening simultaneously for various pathogens. Finally, thanks to the low cost and compact technologies involved, the proposed set-up is expected to provide a competitive analytical platform for direct application in field settings.

Web: http://love-food-project.eu/doku.php

FOODMICROSYSTEMS - Microsystems and Smart Miniaturised Systems for Food Quality and Safety Control,

Programme: FP7
Call: FP7-ICT-2011-7

Project abstract:

The overall objective of FoodMicroSystems is to initiate the implementation of microsystems & smart miniaturised systems in the food sector by improving cooperation between suppliers and users of microsystems for food/beverage quality and safety. The project has five specific objectives: 1. To improve the coordination of national and EU programmes for the development of food applications 2. To facilitate cooperation of the value chain actors from research to industrialisation of smart systems in the food sector 3. To promote industrial take-up actions in the food sector 4. To develop roadmaps linking applications and technologies 5. To promote international cooperation The project is structured into 5 main work- packages (WPs). WP1 (Current state of play) will identify partners for international cooperation as well as examples of existing MST applications in the food sector. WP2 (Research inventory) will provide an analysis of MST research programmes and activities in regards to food applications. WP3 (Food industry demands and constraints) will study the needs of the food industry, the economic and technical constraints, the perception of the consumers as well as the ethical and regulation context. WP4 (Roadmapping) will develop detailed research and application roadmaps for three food chains. WP5 (Communication and exploitation) aims at communicating the project's results through dissemination, presentations, information campaigns and training. The consortium includes key research players in both the food and the microsystems' sectors. FoodMicroSystems is an "open project" that will associate industry and other stakeholders in its activities.

Web: http://www.foodmicrosystems.eu/

BIOFOS- Micro-ring resonator-based biophotonic system for food analysis

Programme: FP7
Call: FP7-ICT-2013-10

Project abstract:

Current methodologies for detection of food contamination based on heavy analytical tools cannot guarantee a safe and stable food supply. The reasons are the complexity, the long time-to-result (2-3 days) and the cost of these tools, which limit the number of samples that can be practically analyzed at food processing and storage sites. The need for screening tools that will be still reliable but simple, fast, low-cost, sensitive and portable for in-situ application is thus urgent. BIOFOS aims to address this need through a high-added value, reusable biosensor system based on optical interference and lab-on-a-chip (LoC) technology. To do this, BIOFOS will combine the most promising concepts from the photonic, biological, nanochemical and fluidic parts of LoC systems, aiming to overcome limitations related to sensitivity, specificity, reliability, compactness and cost issues. BIOFOS will rely on the ultra-low loss TriPleX photonic platform in order to integrate on a 4x5 mm2 chip 8 micro-ring resonators, a VCSEL and 16 Si photodiodes, and achieve a record detection limit in the change of the refractive index of 5•10-8 RIU. To support reusability and high specificity, it will rely on aptamers as biotransducers, targeting at chips for 30 uses. Advanced surface functionalization techniques will be used for the immobilization of aptamers, and new microfluidic structures will be introduced for the sample pre-treatment and the regeneration process. BIOFOS will assemble the parts in a 5x10x10 cm3 package for a sample-in-result-out, multi-analyte biosensor. The system will be validated in real settings against antibiotics, mycotoxins, pesticides and copper in milk, olive oil and nuts, aiming at detection below the legislation limits and time-to-result only 5 minutes. Based on the reusability concept, BIOFOS also aims at reducing the cost per analysis by at least a factor of 10 in the short- and 30 in the mid-term, paving the way for the commercial success of the technology.

Web: http://www.ict-biofos.eu/

Symphony- Integrated SYsteM based on PHOtonic Microresonators and Microfluidic Components for rapid detectioN of toxins in milk and dairY products

Programme: FP7
Call: FP7-ICT-2013-10

Project abstract:

In the milk industry, one of most pressing unmet needs is the timely detection of mycotoxins that originate from animal feed and are secreted into milk. In particular, milk and dairy products can be contaminated by aflatoxin M1, a potent carcinogen. The aflatoxin contamination represents a hazard for human health and an economic loss for the dairy industry. The available technology for aflatoxin detection is i) laboratory-based, ii) requires sample preparation, iii) does not provide timely identification of the carcinogen, thus iv) fails to deliver cost-effective management of contaminated milk. In this context, the SYMPHONY project aims to overcome these limitations by the integration of heterogeneous technologies, encompassing photonics, microfluidics and system integration, in a miniaturised smart system that will perform low cost label free detection of aflatoxin in milk and prevent infection of dairy products. The main goal is to produce an automated sampling and analysis system to be used on-line in Hazard Analysis and Critical Control Points (HACCP). In our strategy the following key enabling technologies will converge: 1) microfluidic technologies and biochemistry, to provide a miniaturised device capable of sample purification and pre-concentration by using the selectivity of aptamers and antibodies; 2) photonic resonators integrated in microsystem technologies, for highly sensitive detection; 3) compact hardware for the integration in the production chain and communication interfaces compatible with the

information system of the industry. In our vision, the system will represent a breakthrough for the dairy industry, leading toward precision process management. The smart system will be assessed on site and end-users will be involved in the evaluation of technical results, thus creating a close collaboration between SMEs who supply sensors, systems and microsystems, and to improve the exploitation of MNBS in industrial settings.

Web: http://www.symphony-project.eu/

Proteus- AdaPtive micROfluidic- and nano-enabled smart systems for waTEr qUality Sensing,

Programme: H2020
Call: H2020-ICT-2014-1

Project abstract:

Water management requires massive, low-cost monitoring means coping with differentiated and evolving requirements. However, the majority of multifunctional water sensors only supports predefined goals hindering interoperability, with a high cost, impeding large scale deployments. Addressing this, PROTEUS aims at offering x10 reduction in both size and unit function cost compared to state of the art. To this end, an increased number of functions will be integrated at a reduced cost and PROTEUS will deliver a reconfigurable microfluidic-and nano-enabled sensor platform for cognitive water quality monitoring. Innovative embedded software will provide reconfigurability of the sensing board to support several differentiated applicative goals while cognitive capabilities will manage evolving requirements during exploitation. Energy autonomy will be made by harvesting water flow energy. In addition, low cost of additional sensing components will enable redundancy increasing life span of the systems. The main challenge relates to the heterogeneous integration into a monolithic, microfluidic sensing chip of carbon-nanotubes-based resistive chemical sensors, of MEMS physical and rheological resistive sensors and of a multifunctional adaptive deep-submicron CMOS system on chip. Upstream, high level system design addressing industrial use cases, manufacturability and cost-effectiveness, packaging, energy budget and interfaces between building blocks, will enable consistency and efficiency of the whole approach. Downstream, system validation will be carried out at different levels: benchmarking, reliability assessment to guarantee service time, model deployments and field testing. The consortium brings together renowned actors along the whole value chain, including system integration and end users. This will contribute to post-project exploitation prepared by ensuring appropriate inclusion of business requirements within the system design.

Web: http://www.proteus-sensor.eu/

LoveFood2Market - A portable MicroNanoBioSystem and Instrument for ultra-fast analysis of pathogens in food: Innovation from LOVE-FOOD lab prototype to a pre-commercial instrument

Programme: H2020
Call: H2020-ICT-2015

Project abstract:

The development of new methodologies advancing the state of the art in foodborne pathogen detection is a challenge for scientists and technologists as well as food industry and consumers. This project aims to meet the challenge by providing a reliable and versatile solution thanks to the convergence of micro-nano-bio systems. The work capitalizes on several innovative concepts which have already been proven to meet the required criteria for fast, low cost and highly sensitive analysis of pathogens in food samples in a previous research project entitled LoveFood. These concepts are gathered on a credit-card size Lab-on-Chip platform, where all necessary steps for bacteria detection are performed on several chips. Specifically, bacteria capture and lysis (one chip), DNA extraction (second chip) and amplification (third chip) and finally pathogenic-DNA detection (fourth chip) can be performed in less than 8 hours and without the need for skilled personnel or large, lab-based dedicated equipment. To proceed for a higher Technology Readiness Level towards the successful commercialization of the current prototype and produce a portable, and rapid platform (targeting total pathogen analysis time 4 hours including a 3 hour pre-enrichment step), we propose to further develop it by integrating the bacteria lysis, DNA purification and amplification modules, as well as the biochip detection platform on a single cartridge, able to perform multi-pathogen analysis (i.e. Salmonella, Listeria, Escherichia coli and Bacillus cereus) in multiple samples. The system will be developed for dairy products and meat analysis, with a strong commitment to produce a pre-industrial prototype by the end of the project.

Web: http://cordis.europa.eu/project/rcn/199156_en.html

4. GNSS

Fieldcopter - GPS-EGNOS based Precision Agriculture using unmanned aerial vehicles

Programme: FP7
Call: FP7-GALILEO-2011-GSA-1-b

Project abstract:
Unmanned Aerial Vehicles (UAVs) are an up-and-coming method in providing farmers with (near) real time sensing information for precision agriculture applications such as water stress monitoring, detection of nutrient deficiencies and crop diseases. FieldCopter provides state-of-the-art multi-spectral cameras on UAVs that deliver the right information in the right time on the right spot. The FieldCopter project develops a complete solution for UAV sensing. Existing components will be brought together and required high precision navigation of EGNOS will be added in order to create an autonomous flying camera that follows a predefined pattern. The consortium aims at a complete operational service and brings together the necessary competences assembled on the platform: the sensing aspects, the navigation expertise and the market knowledge. As the service is based on EGNOS, we can operate it anywhere in Europe. The partners combine market knowledge in the Mediterranean and higher latitudes, each with specific challenges. We will commercially exploit the results of this project in addition to the current business of the project partners. FieldCopter allows farmers to create economical and ecological benefits through optimal use of resources like water, nutrients (potassium, nitrogen) and crop protection agents. FieldCopter proves the potential of a European-wide precision navigation system and benefits from its operational continuity. EGNOS is a key enabler to develop this service.

Web: http://www.gsa.europa.eu/fieldcopter

Geopal - GNSS-based Planning system for Agricultural Logistics

Programme: FP7
Call: FP7-GALILEO-2011-GSA-1-a

Project abstract:

Modern agriculture is at the stage of industrial production requiring high precision farming tools to organise the joint work on a field and the transportation of agricultural goods. Farms merge into bigger cooperatives in order afford the complex and more powerful machines and in the end increase their competitivity. The GeoPAL project will significantly contribute to frame and steer the development of “smarter” and “greener” in-field and inter-field transport systems in bio-production, taking the advantages provided by the high accuracy of the European GNSS navigation functions. The overall aim of GeoPAL is to provide an advanced logistics system for the harvesting and distribution functions of the bio-production related supply chains by the integration of cross cutting issues such as improvement of resource efficiency, improvement of GHG emissions balance, concerns of sustainable production, industrialisation/automation of production, and further development of the competitiveness attained by the European industries in the global market. The application will build on existing modules pre-

developed by the partners to design a new prototype including: - fleet management and logistics (operations management tools and the required ICT systems) - coordination, mission and route planning functionalities for field machinery - closed loop integrated optimal planning, execution of automated field operations, and monitoring The prototype is planned to be further upgraded after the project duration to be launched on the market. The idea of the project is to fully assess the market potential of the software to prepare for market uptake. GeoPAL will be led by the market leader CLAAS Agrosystems, and will bring in the experience of 2 SMEs, LACOS (specialist in guidance, navigation software), LEE (specialist in bioenergy and agricultural cooperative) and the Biosystems Engineering Dept. of University of Aarhus (specialist in operations management systems in bio-production).

Web: http://www.gsa.europa.eu/gnss-based-planning-system-agricultural-logistics

Geopal - GNSS User Forum on Navigation based Innovation for Farmers

Programme: FP7
Call: FP7-GALILEO-2011-GSA-1-a

Project abstract:

UNIFARM sets up a user forum to present and defend the needs of farmers in the development of GNSS applications and services. UNIFARM brings together precision agriculture projects and farmers representatives from all over Europe. The project collect users requirements as well as user cases (motivations to invest) and harmonises them, to provide policy makers in GNSS evolution and other policy areas with their requirements. The project will also disseminate this and others information to improve awareness. Also, the project will provide a design facility based on the users cases to provide firms the opportunity to benchmark their innovative application or service. UNIFARM aims at setting up a sustainable network. The project therefore is connected to already established networks and platforms that may continue the user forum after the project lifetime. Setting up this user forum will enhance the scientific and technological excellence in GNSS in agriculture.

Web: http://www.gsa.europa.eu/gnss-user-forum-navigation-based-innovation-farmers

Mistrale - Monitoring of SoIl moiSture and wateR-flooded Areas for agricuLture and Environment

Programme: H2020
Call: H2020-Galileo-2014-1

Project abstract:

The MISTRALE project proposes to address soils moisture management in agriculture as well as wetlands or flooded areas monitoring by using Global Navigation Satellite Systems reflected signals (GNSS-R) as a powerful technology for humidity or flooded mapping. The detection by GNSS-R is known to be much more reliable than visible/NIR imagery, and will be usable even under a cloud cover, during the night and even under vegetation (bushes, grass, trees) when passive remote sensing is not applicable. The main

objective is to demonstrate a service chain in different use cases : pilot projects will be carried out in soil humidity mapping for agriculture (optimizing the water resource management), wetlands and flooded areas (risk management, flood-prone areas, damages evaluation). In order to meet the objectives, a GNSS-R receiver embedded into a small RPAS (Remotely Piloted Aircraft System) will be developed and implemented into an operational chain to provide the service. GNSS-R technology aims at measuring the GNSS signals reflected on the ground, and, compared to the direct signals, permits a measurement of the soil humidity (from 0 to 100%) as well as flooded extend. The use of GALILEO signals will significantly improve the precision of mapping. The operational system will integrate three main axes of development: adapting the GNSS-R technology for the requirements, making a compact GNSS-R receiver and optimizing an existing RPAS. Using EGNOS and GALILEO in the project will also improve navigation capabilities of small RPAS (<4Kg) and contribute to the development of regulations for their integration in airspace. We assembled a consortium that addresses all aspects of the project : four SME specialized in GNSS receivers, GNSS-R technology, operational applications and dissemination, two labs for RPAS and GNSS-R technology. An advisory board composed of agronomy and environment specialists as well as end users will complete the skills of the consortium.

Web: http://www.gsa.europa.eu/monitoring-soil-moisture-and-water-flooded-areas-agriculture-and-environment

AUDITOR - Advanced Multi-Constellation EGNSS Augmentation and Monitoring Network and its Application in Precision Agriculture

Programme: H2020
Call: H2020-Galileo-2015-1

Project abstract:

The goal of AUDITOR is the implementation of novel precise-positioning techniques based on augmentation data in custom GNSS receivers to improve the performance of current augmentation services and reducing costs. These techniques are already patented by the consortium and proven to offer better accuracy with faster convergence times than solutions commercially available. More sophisticated atmospheric models will be implemented to provide better corrections of ionospheric errors and further increase accuracy. All these advances will be integrated in a software demonstrator that will use public data from GNSS networks to generate these correction data streams. These new receivers will enable cost-effective precision agriculture services to farmers, especially those with small and medium-sized businesses in areas of Europe. The custom dual-frequency receiver module will follow an innovative approach by porting a GNSS software-defined receiver to an embedded system that will integrate hardware accelerators to enable real-time operation in a low power system. The form factor and capabilities of the resulting receiver will be comparable to those of existing professional receivers in the market, while retaining all the advantages of software receivers: modularity, scalability, upgradability, and flexibility. Besides providing multi-frequency multi-constellation support, this advanced receiver will allow very low level access to key internals even at sample level, enabling the integration of other complementary techniques like interference analysis and monitoring or authentication using remote servers for encrypted bands. The fact that the software layer will be the evolution of an

existing and successful open-source project, GNSS-SDR, will allow GNSS developers and researchers to customize the code of the receiver to tailor it to their own applications or test their algorithms using this flexible receiver module, from reflectometry to ultra-tight coupled GNSS/INS systems.

Web:

5. FIWARE ACCELERATORS

FRACTALS

Fractals aims to support the community of innovative ICT SMEs and web-entrepreneurs to develop FIWARE based applications with high market potential, addressing the needs of the agricultural sector. FRACTALS Call will be open to all European SMEs and web-entrepreneurs but will additionally focus on areas which are considered as "white spots" (Balkans, South East Europe).

Web: http://fractals-fp7.com/

Finish ACCELERATOR

The FInish accelerator will foster the development and operation of intelligent software applications for supply chains of perishable products such as food or flowers. Application is open for SMEs, startups and web-entrepreneurs. Selection will be based on business potential, technological excellence and acceleration. Separate hackathons for natural persons and a competition for SMEs and startups will also be organized.

Web: http://FInish-Project.eu

SMARTAGRIFOOD

SmartAgriFood aims to provide farmers and agricultural producers throughout Europe with ICT products (services and applications) ready for immediate use through an open and easily accessible online marketplace. Projects are expected to address one or more of three representative farming subsectors (Arable Farming - large-scale, Horticulture, Livestock Farming) and provide smart solutions for specific farm operations or farm management activities. New or existing applications should use FIWARE technologies and ideally be delivered through the FIspace platform (an integrated collaboration system).

Web: http://smartagrifood.com

Some particularly successful start-ups that benefited of the FIWARE acceleration processes are the following:

CONNECTERRA

Connecterra has developed a sensor that measures the activity of a cow in 3D space and by leveraging its deep learning algorithms can detect various behaviors such as walking, eating, ruminating etc. This information is then modeled to provide farmers with health insights which help them reduce labor input and improve animal health resulting in higher productivity from each cow. In addition to providing farmers with insights, their platform also enables veterinarians to observe herd data and provide suggestions to farmers on improving farm practices. This helps democratize farmer knowledge to those that need it most and especially in developing countries.

Web: www.connecterra.io

AGRIVI

Agrivi is knowledge-based cloud farm management software that helps fruit, vegetable and grain producers to improve their productivity and profitability.
With the help of best practice farming processes knowledge base for over 100 crops, farmers can easily plan all seasonal activities, track their execution and related costs. Advanced reports and dashboards help farmers make data-driven decisions needed for improving their production**.**

Web: http://www.agrivi.com/

INFARM

Infarm is an indoor farming startup, that combines vertical farming with IoT technologies. Our mission is to help cities become self-sufficient in their food production, eliminating waste and reducing the environmental impact. Our vision stretches until autonomous vertical farms will be spreading through our cities, offering a huge variety of unique, fresh and healthy food in affordable prices.

Web: https://infarm.de/

DNA Phone

It designs and implements innovative solutions for the detection and measurement of biological parameters in the agrifood sector trough smart technologies.

Web: http://www.dnaphone.it/

AGROPTIMA

Agroptima helps you have a complete overview of your farm: visualize your fields, plan your crops, keep track of your machinery and workers and much more.

COOLFARM
The integrated, intuitive and proactive control system compatible with all horizontal/vertical greenhouses and warehouses.

Web: http://cool-farm.com/

FIspace

As part of the FIWARE initiative, a use case project, FIspace, developed and validated novel Future-Internet-enabled solutions to address the pressing challenges arising in collaborative business networks, focussing on use cases from the agri-food, transport and logistics industries. The result is a Future Internet Collaboration Platform for Safe and Healthy Food from Farm to Fork.

Web: http://www.fispace.eu/

6. THEMATIC NETWORKS

4D4F - Data Driven Dairy Decisions 4 Farmers

Programme: H2020
Call: H2020-ISIB-2015-1

Project abstract:

The Data Driven Dairy Decisions for Farmers (4D4F) thematic network will focus on the role which dairy animal and environmental sensors can play in collecting real time information to help make more informed decisions in dairy farming. The network will develop a Community of Practice comprised of farmers, farm advisors, technology suppliers, knowledge exchange professionals and researchers who will work together to debate, collect and communicate best practice drawn from innovative farmers, industry and the research community to facilitate the co-creation of best practice. The results will be communicated to farmers using best practice guides on the use of sensors and data analysis tools supported by videos, infographics and an online virtual warehouse of dairy sensor technologies. The network will include the development of Standard Operating Procedures (SOPs) which can be tailored to individual farms to help farmers and farm advisors adopt dairy sensor and data analysis technology. The SOPs will be developed by working groups of the Community of Practice including farmers, farm advisors, technology suppliers, knowledge exchange professionals and researchers, who will work together to develop farmer friendly SOPs. The on line Community of Practice and published communication tools will be complimented by on farm events and workshops to help farmers and farm advisors implement innovative sensor and data analysis technologies. The workshops and events will promote discussion between farmers and their peers on how best to use sensors and data analysis in their own businesses. This will lead to local peer to peer support to facilitate the adoption of data driven dairy decision making. The network will work closely with EIP Agri and at member state level it will work with existing EIP Operational Groups working on dairy data and sensors and, where suitable Operational Groups do not exist, it will work with local partners to develop new Operational Groups.

Smart-AKIS - Data Driven Dairy Decisions 4 Farmers

Programme: H2020
Call: H2020-ISIB-2015-1

Project abstract:

The project aims at setting up a self-sustainable Thematic Network on Smart Farming Technology designed for the effective exchange between research, industry, extension and the farming community in order to disseminate direct applicable research and commercial solutions and capture grassroots level needs and innovative ideas. Smart Farming Technology (SFT) encompasses Farm Management Information Systems, Precision Agriculture and Agriculture automation and robotics. Smart AKIS will collect existing knowledge related to SFT and will produce easily accessible end-user material

under the EIP-Agri common format. The project will also integrate the socio-economic aspects involved in the innovation processes and will generate interactive and innovation-based collaborations among researchers, advisors and farmers through the use of open innovation in multi-actor workshops. Knowledge flow will be facilitated through the implementation of the Smart Farming Community Platform, which will be compatible with the EIP-SP in order to ensure long term accessibility of results. Smart-AKIS will build on results from five flagship EU projects (VALERIE, SOLINSA, PRO-AKIS, FRACTALS, AGRISPIN), through the participation in the project of their core partners. The project will establish direct communication with EIP-Agri to maximize impact of project activities and stakeholder mobilization.

7. OTHER PROJECTS

Other projects funded under FP7 in the area of Precision Farming are the following:

FUTUREFARM - Integration of Farm Management Information Systems to support real-time management decisions and compliance of management standards

Programme: FP7
Call: FP7-KBBE-2007-1

Project abstract:

In the future European farmers will have to effectively manage information on and off their farms to improve economic viability and to reduce environmental impact. All three levels, in which agricultural activities need to be harmonized with economical and environmental constraints, require integrated ICT adoption: (i) improvement of farm efficiency; (ii) integration of public goods provided by farming into management strategies; (iii) relating to the environmental and cultural diversity of Europe's agriculture by addressing the region-farm interaction. In addition, the communication between agriculture and other sectors needs improvement. Crop products for the value added chains must show their provenance through a transparent and certified management strategy and farmers receiving subsidies are requested to respect the environment through compliance of standards. To this end, an integration of information systems is needed to advise managers of formal instructions, recommended guidelines and implications resulting from different scenarios at the point of decision making during the crop cycle. This will help directly with making better decisions as the manager will be helped to be compliant at the point and time of decision making. In FUTUREFARM the appropriate tools and technologies will be conceptually designed, prototypes developed and evaluated under practical conditions. Precision Farming as well as robotics are very data intensive and provide a wealth of information that helps to improve crop management and documentation. Based on these technologies a new Farm Information Management Systems (FMIS) will be developed. As most relevant farm data will be readily available in the proposed information system, or may be automatically integrated using standardised services and documentation in the form of instructions to operators, the certification of crop production process and cross compliance of standards can be generated more easily than with present systems.

Web: http://www.futurefarm.eu/

LEO - Linked Open Earth Observation Data for Precision Farming

Programme: FP7
Call: FP7-ICT-2013-SME-DCA

Project abstract:

A lot of remotely sensed data coming from satellites has become available at no charge in Europe and the US recently, and there is a strong push for more open Earth Observation data. Open Earth Observation data that are currently made available by space agencies (e.g., ESA and NASA) are not following the linked data paradigm. ICT STREP project TELEIOS recently introduced the linked data paradigm to the Earth Observation domain and developed prototype applications (wildfire monitoring and burnt scar mapping,

semantic catalogues and rapid mapping) that are based on transforming Earth Observation products into RDF, and combining them with open, linked geospatial data. However, TELEIOS did not consider the whole life cycle of linked open Earth Observation data, and concentrated mainly on developing scalable storage and query processing techniques for such data. In LEO, the core academic partners of TELEIOS (UoA and CWI) join forces with 2 SMEs and one industrial partner with relevant experience (SA, VISTA and PCA) to develop software tools that support the whole life cycle of reuse of linked open EO data and related linked geospatial data. Finally, to demonstrate the benefits of linked open EO data and its combination with linked geospatial to the European economy, a precision farming application is developed that is heavily based on such data.

Web: http://www.linkedeodata.eu/

Agric-LaserUAV.- Precision agricultural crop monitoring using laser scanning and unmanned aerial vehicles

Programme: FP7
Call: FP7-PEOPLE-2009-IIF

Project abstract:

Currently the science of the remote sensing community does not meet the stringent requirements of sustainable agriculture and forestry practices, where quasi-real-time decision making of irrigation management, fertilizer application and disease detection is needed. The two highlighted obstacles that the remote sensing community needs to overcome are: a) the high cost and operational limitations of airborne remote sensing for short turnaround time needed for agricultural applications, and b) the lack of detailed vegetation canopy structural information that can be used to bridge the gap between spectroscopic methods with 3D radiative transfer models. Recent remote sensing advancements have addressed these challenges using two recently-available, high-potential technological developments: a) Unmanned Aerial Vehicles (UAV) coupled with microsensors, and b) Ground-based Light Detection and Ranging (LiDAR) systems. The introduction of cost-effective UAV-based systems allows us to characterize individual trees within forested and agricultural ecosystems thereby highlighting novel scientific issues at new spatial scales. Such issues can potentially be addressed with terrestrial LiDAR systems that allow the characterization of spatial organization of tree crown elements from a ground-level perspective. As such, this project aims to couple the use of UAV-based imagery with ground-level LiDAR data to characterize important biophysical processes at unprecedented spatial and temporal resolutions, suitable for precision, and sustainable forestry/agricultural monitoring. The project will investigate the impact of vegetation architectural parameters, retrieved using a ground-based LiDAR scanner, on the quantitative estimation of physiological indicators of stress (i.e. evapotranspiration, and leaf chlorophyll content) using UAV-based spectral imagery and 3D radiative transfer modeling.

ALL-SMART-PIGS.- Practical implementation of precision livestock technologies and services at European pig farms using the living lab methodology

Programme: FP7
Call: FP7-KBBE-2012-6

Project abstract:

There are two main objectives with A Living Lab for Smart Pig farming (ALL-SMART-PIGS), where in total 4 farms will participate (2 in Hungary and 2 in Spain):
1. To demonstrate the technical and economic viability of precision livestock farming technologies in European pig farming.
2. To establish of Living Lab infrastructure for bringing innovative Precision Livestock Farming (PLF) technologies to European livestock farmers.

The main outcome of the project will be proven PLF applications ready for commercialisation among European pig farmers; provided by innovative SMEs which in ALL-SMART-PIGS have tested and validated their technological prototypes and services in real life conditions together with pig farmers and other food business operators. The project initiators have identified health, growth rate and feed usage as key parameters to monitor at this stage (note that the latter two allow to determine the feed conversion rate). The SME technology partners in ALL-SMART-PIGS will employ PLF technologies to monitor the indicators related to these parameters:
A consortium of 3 high-tech SMEs, an established provider to the European farming community, regional R&D partners and an experienced SME and Living Lab facilitator have the potential to generate great synergy and meet the project' goal of demonstrating the economic benefits and technical viability of PLF, develop a business model for future SMART Pig Applications and showcase that the Living Lab methodology can pave the way for innovative technologies to the market.
The lead user of the result will be the SME technology providers involved, the pig farmers (which all are SMEs) and other food business operators related to the pig farming value chain. In the long term the lead users are also European research & development institutions and enterprises dealing with the challenge to bring innovation to the market. The results of the project will be disseminated among authorities, stakeholders and industries.

Web: http://www.all-smart-pigs.org/

ICT-AGRI 2 - Information and Communication Technologies and Robotics for Sustainable Agriculture

Programme: FP7
Call: FP7-ERANET-2013-RTD

Project abstract:

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.

Some of the projects funded under the ICT-AGRI ERA-Net are the following:

Advanced Monitoring of Tree Crops for Optimized Management (3D- Mosaic). 3D-Mosaic is targeting the automation of irrigation in orchards. Input requirements in an orchard show spatial and temporal pattern due to the variability of climate, soil and plant growth. On a tree-scale, irrigation needs will be evaluated considering the spatial distribution of the soil properties and of the apparent phenotypes using automated sensors and GIS.

Ambient Awareness for Autonomous Agricultural Vehicles (QUAD-AV). Autonomous vehicles are being increasingly adopted in agriculture to improve productivity and efficiency. For a vehicle to operate safely, environment perception and interpretation capabilities are fundamental requirements. The project focuses on the development of sensors and sensor processing methods to provide a vehicle with such ambient awareness.

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

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.

Integrated robotic and software platform as a support system for farm level business decisions (ROBOFARM). ROBOFARM aims 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 automatically collect data from the field, feeding a farm management DSS and considering the agronomical, environmental and food safety aspects

Open System for TRAcTOrs' autonomouS Operations (STRATOS). 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.

Optimizing performance and welfare of pigs using High Frequent RFID and synergistic control on individual level (PIGWISE).
An ICT based tool will be developed that can be used to monitor performance and welfare of pigs at the individual level in order to detect problems at an early stage and hence preventing economic losses. Computer-aided analysis of individual animals' data enables to develop an Early Warning System for potential drops in performance or potential health.

Preparing for the EU Soil Framework Directive by optimal use of Information and Communication Technology across Europe (Predictor). Soil quality is threatened due to traffic with modern agricultural machinery. The PredICTor project has two main deliverables, i) an online decision support tool for evaluating an intended field traffic situation, and ii) an online tool for creating European-wide maps of the wheel load carrying capacity for combinations of tyres, soils and water contents.

Web: http://ict-agri.eu/