Smart-AKIS: European Agricultural Knowledge and Innovation Systems (AKIS) towards innovation-driven research in Smart Farming Technology

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Website:
Smart-AKIS project site [1]
Title (in English):
Smart-AKIS: European Agricultural Knowledge and Innovation Systems (AKIS) towards innovation-driven research in Smart Farming Technology

Objective of the project (in English):

The main objective of Smart-AKIS is to set up a self-sustainable Thematic Network on Smart Farming Technology designed for the effective exchange between research, industry, extension and the farming community so that direct applicable research and commercial solutions are widely disseminated and grassroots level needs and innovative ideas thoroughly captured, thus contributing to close the research and innovation divide in this area.

Description of activities (in English):

The main activities of Smart-AKIS project are:
1. Create an inventory of direct applicable solutions from the large stock of research results and
commercial applications

2. Assess end-user needs and interests, and identify factors influencing adoption taking into account regional/national specificities

3. Generate multi-actor, innovation-based collaborations among different stakeholders

4. Set up of an ICT tool for the on-line assessment of the Smart Farming Technology solutions and the crowdsourcing of grassroots-level ideas and needs

5. Disseminate the results of the project to increase visibility of Smart Farming Technologies in the EU

Project coordinator

Contact person: Spyros Fountas
Address: Iera Odos 75, Athens, Greece
E-mail: sfountas@aua.gr
Phone: +302105294035
Partner category: Researcher

Short summary for practitioners

Practice abstract 1

Short title (native language): sigAGROasesor

Short summary for practitioners (native language):

The online services platform sigAGROasesor integrates the main pillars upon which this expert decision support system is based. The application of new GIS technologies in managing geo-referenced data; it uses the variability of the ground, climate, pesticide alerts and biotic and abiotic risks, allowing data to be loaded from remote detection, via satellite or captured using drones. The use of online Decision Support Tools based on real-time geo-referenced data. This gives agricultural farmers and cooperative managers an instrument with specific expert advice, with precise usage recommendations (varieties, fertilisation, irrigation and risk of disease) in extensive crops. The platform uses Geo-referenced traceability as a tool to administer the record of agricultural plot. This gives users an Exploitation Activity Manager, an instrument that can be used to administer plot records and to manage the Exploitation logbook[]. The agricultural farmer can additionally use a computer-based tool to manage activity traceability, which also issues necessary reports associated with agricultural activity. This module also allows for the financial management of all actions by keeping a record of prices in the farm inventory.

See also: https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=12

Practice abstract 2

Short title (native language):

INSPIRATION: Managing soil and groundwater impacts from agriculture for sustainable intensification
Short summary for practitioners (native language):

Agricultural production in Europe has significantly damaged soil and water resources, ecosystem biodiversity, socio-economic well-being and contributed to climate change. Expected further intensification of production to ensure food safety must be sustainable to minimise future impacts and negative externalities. INSPIRATION trains 15 early stage researchers in cutting edge research skills and innovative approaches to manage soil and groundwater impacts from agriculture, namely (1) management techniques to mitigate environmental impacts of agricultural practices on soil, water and climate systems, and support sustainable intensification using new production methods; (2) smart environmental monitoring, biotechnology and modelling tools to predict the outcome of measures and practices in (1); and (3) decision-making tools with sustainability indicators to implement sustainable agricultural production methods. This is being achieved by linking lab-scale studies with field-scale evaluation of novel management concepts, analytical tools and modelling, using state-of-the-art methods. The network includes research, advisory and commercial organisations from all sectors of the agri-environmental management community, and SMEs to multinational firms. Its novel training agenda of workshops and summer schools on technical and business skills, international conferences, industry secondments and knowledge transfer activities aim to transferable skills training. This is highly relevant for scientific communication, societal impact and entrepreneurship, preparing the fellows for careers in many sectors.

See also: https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=26 [4]

Practice abstract 3

Short title (native language):
iTractor: Smart farmer's assistant - iTractor ®

Short summary for practitioners (native language):

iTractor is a hybrid smart robotized compact tractor designed to work inside the farmyard or livestock farm. The hybrid navigation has two separate systems: a manual for the farmer and an programmable autopilot. iTractor is a multifunctional machine and with its help you can spare yourself the effort of doing a lot of your daily chores by hand. Universal microcontroller platforms and laser, infrared and hydroacoustic sensors are used with proven accuracy up to +/- 2 mm. These are some of its functions and abilities:
- It charges the manger with food at a programmable interval;
- Cleans the cattle shed at a programmable interval;
- Mows the lawn with an ecologically friendly technology Ÿ?? mulching, it is not necessary to collect the mown grass. Twigs, fir-cones, etc., do not hinder the mowing;
- Regulates the depth of plowing;
- Regulates the cutting height;
- Stops the mowing when it is raining owing to the rain sensor;
- It trains itself by scanning the new terrain
- it can till separate farm areas;

With regard to safety when rolled over, the iTractor's knives of the lawn mower stop turning.
There is a sound signalization at the starting, as well as child protection. Also it is eco friendly and easy to maintain- the maintenance is identical to the maintenance of household electrical appliances. Lastly, it is accessible for widespread use, due to the fact that you do not need to have a driving license to operate with the iTractor.

See also: https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=29 [5]

Practice abstract 4
Short title (native language):
VegAlert: Low cost, early Phytosanitary monitoring and alert service for horticultural farmers

Short summary for practitioners (native language):
Since plant pathogen diseases in horticultural crops are responsible for 35% of crop losses, farmers need a diagnostic tool for early diagnosis of potential diseases that already exist in the soil and surrounding environment. Microgaia has developed a DNA microarray tool that allows rapid and quantitative detection of 200 specific plant diseases. VegAllert is an easy to use multi-device tool which integrates on line support for end users in making decisions on pest management. Providing the advantages of:
• Control over your crops
• Real-time monitoring
• Reduction of costs in treatments
• Anticipation to the problem
• Reduction of chemical residues in soil and water
• Decision power for farmers
Each analysis with VegAlert is sold at 50 €. On average, 4 samples will be taken for each hectare and per season. In www.vegalert.es [6], by moving in "private area" you can download the app and install in your mobile.
See also: https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=33 [7]

Practice abstract 5
Short title (native language):
TARGIS-VRA: TARGIS - Variable Rate Smart Fertilizing System in Precision Agriculture

Short summary for practitioners (native language):
Precision agriculture is a practice that adopts high information technologies like GPS, control units and software for the purpose of optimizing yield according to local varying soil conditions while conducting agricultural inputs applications (planting, fertilizing, spraying and harvesting, land surveying, line handling systems, yield mapping and grain loss monitoring systems). Current precision agriculture technology platforms provide compact system
solutions. Traditionally manufactured agriculture machines, commonly used in European countries cannot adapt precision agriculture technologies. Precision agriculture platforms in Europe are mainly based on ISO-bus structures that are compatible only with ISO-bus tractors, which are advanced and highly expensive solutions. However, the current structure of TARGIS-VRA can be adapted to traditional agricultural machines. The added value has been demonstrated in a five-year field study resulting in a 25-30% reduction in fertilizer use. These results show that precision farming is made possible for traditionally manufactured machines and pays itself off in maximum one year for a single farmer with 20 hectares of average field size.

See also: https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=35

Practice abstract 6

**Short title (native language):**
TREAT&USE: Safe and efficient treatment and reuse of wastewater in agricultural production schemes

**Short summary for practitioners (native language):**

TREAT&USE project aims to bring together 6 European SMEs and one RTD to prove and disseminate the technical and economic viability of a method for safe and economic wastewater treatment that allows a direct reuse of the water and nutrients in agricultural production with minimal operational and maintenance costs.

TREAT&USE is based on the outcomes of two successful finished EU research projects: PURATREAT and WACOSYS on wastewater treatment, reuse technologies and fertigation systems. The produced technical and scientific results of both projects were excellent and very promising in terms of energy and cost efficiency. The most promising MBR system developed in PURATREAT run successfully with reduced energy consumption (90 % less than RO). The tested MBR lab-prototypes generated an effluent not suitable for drinking water but an excellent source for irrigation and fertilization purposes (rich on nutrients such as N and P and free of pathogens). In WACOSYS, the application of wastewater in agricultural production schemes has been successfully applied and monitored. Based on these valuable outcomes, within TREAT&USE is planned to construct and implement a pre-commercial prototype unit which combines the treatment of substantial amounts of communal wastewater in an up scaled MBR system and the safe application of the effluent as irrigation and fertilization water in agricultural production schemes. The tailor-made MBR effluent will be applied directly for irrigating and fertilizing fruit trees and vegetables in commercial agricultural production site in Southern Spain. To measure the performance and the reliability of the approach, the pre-commercial prototype will include a feedback and control unit based on soil sensors. Therefore, the gained knowledge and tools of PURATREAT and WACOSYS will be further specified, applied and demonstrated in praxis and developed to direct market applications. The participating SMEs have already developed business plans.

See also: https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=49
FUTUREROOTS: Redesigning root architecture for improved crop performance

Food security is a pressing global issue. Crop production has to double by 2050 to keep pace with global population growth increasing to 9 billion. This target is challenging given the impact of climate change on water availability and the drive to reduce fertilizer inputs to make agriculture more environmentally sustainable. FUTUREROOTS aims to create a unique high throughput root phenotyping facility that exploits recent advances in biological image analysis, wheat genetics and mathematical modelling to pinpoint the key genes that control root architecture and develop molecular markers and new crop varieties with improved nutrient and water uptake efficiency. Rooting depth impacts the efficient acquisition of soil nitrogen (and water) since nitrate leaches deep into the soil. Phosphate use efficiency could be significantly improved by manipulating the angle of root growth to explore the top soil where this macronutrient accumulates. A key impediment to genetic analysis of root architecture in crops grown in soil has been the ability to image live roots non-invasively. FUTUREROOTS will make use of recent advances in microscale X-ray Computed Tomography which permits root phenotyping. In parallel, innovative mathematical models simulating the impact of root architecture and soil properties will be developed as tools to assess the impact of architectural changes on uptake of other nutrients in order to optimise crop performance.

See also: [https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=59](https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=59)

SemaGrow: Data intensive techniques to boost the real-time performance of global agricultural data infrastructures

SemaGrow (a) developed scalable and robust semantic storage and indexing algorithms that can take advantage of resource naming conventions and other natural groupings of URIs to compress data source annotations about extremely large datasets; (b) developed query decomposition, source selection, and distributed querying methods that take advantage of such algorithms to implement a scalable and robust infrastructure for data service federation; and (c) rigorously tested its components and overall architecture over real, complex, interconnected datasets comprising data and document collections, sensor data, and GIS data. SemaGrow is available on Github. The main SemaGrow Stack is developed on github, as project semagrow/semagrow. Besides the SemaGrow Stack, the github.com/semagrow organization also publishes tools needed to configure the Stack, including:

1. semagrow/strHist for dynamically adapting data source descriptions from query feedback
Practice abstract 9

**Short title (native language):**
EASY-IMP: Collaborative Development of Intelligent Wearable Meta-Products in the Cloud

**Short summary for practitioners (native language):**

A (Meta-) product is now a customer driven customisable entity that integrates sensory/computing units, which are in turn connected to the cloud, leading to a paradigm shift from mass production to intelligent, over-the-web configurable products. Product design and production is however becoming highly complex and requires interdisciplinary expertise. The goal of EASY is to develop new methodologies, tools and ready-to-use components for designing and producing intelligent wearable products as Meta-Products. A Cloud Computing enabled framework is developed, combining embedded sensors and mobile devices with facilities for joint open development of enabling downloadable applications. The Meta-Products consist of intelligent wearables (clothing, footwear, accessories) equipped with embedded networks of sensors. Sensorial data will be communicated to smart phones via Bluetooth or Wifi. The required functionality will be configured by the end-users; the design, selection of components, sourcing of materials and sensors, virtual prototyping, as well as production planning and services integration is a collaborative process of all involved companies, designers, sensor producers, software developers and application experts. This infrastructure will enable all interested 3rd parties to offer new services to smart phone and EASY wearable users, resulting to an open platform of literally infinite applications in many target market.

See also: [https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=67](https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=67) [12]

Practice abstract 10

**Short title (native language):**
AGRISENSACT: A new generation of wireless sensors for integrated precise agriculture

**Short summary for practitioners (native language):**

The increasing demand for more agricultural products forced farmers to adopt resource-intensive and unsustainable practices which increased economic and environmental costs. Precision agriculture (PA), one of the most significant advancement in agriculture since the
advent of mechanization, allows considering the spatial and temporal needs of soil and crop to maximize production and profitability while minimizing risk. Wireless sensors networks have recently emerged as one of the key technologies to implement precision agriculture and have already been applied to precision irrigation, the application of water to a given site in a volume and at a time needed for optimum crop production.

The AGRISENSACT initiative worked to establish an integrated precision agriculture system to better manage crops. The system is based on the AgriProbe concept, a modular device that can be tailored for many specific agricultural applications. Three different types of soil sensors were integrated in the soil module and consequently added to the probe for field tests in the Matarromera vineyards, allowing measuring four different parameters such as: soil moisture, soil temperature, pH and soil electrical conductivity. Regarding Atmospheric Sensor Module (ASM), the air humidity plus air temperature sensor was successfully placed inside the module, ready for sending data in real time. Concerning the power generation scheme, thermoelectricity has been considered a promising candidate for powering remote sensors systems. Testing the module in the field provided valuable information regarding the overall system performance, efficiency and network reliability.

See also: https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=71 [13]

Practice abstract 11

**Short title (native language):**
LEO: Linked Open Earth Observation Data for Precision Farming

**Short summary for practitioners (native language):**

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 (Linked Open Earth Observation Data for Precision Farming) software tools are developed that support the whole life cycle of reuse of linked open EO data and related linked geospatial data. A precision farming application was developed to demonstrate the benefits of linked open EO data and its combination with linked geospatial to the European economy. See also: https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=72 [14]

Practice abstract 12

**Short title (native language):**
MODEM_IVM: A web-based system for real-time Monitoring and Decision Making for Integrated Vineyard Management

Short summary for practitioners (native language):

The MODEM_IVM project developed a complete Decision Support System (DSS) in terms of methodology, software and devices. Specifically, the DSS integrates the following components:

1. a Wireless Sensor Network (WSN) for real-time monitoring of the vineyard environmental conditions
2. hand-held devices for monitoring grapevine plants, pests, and diseases
3. a web-based tool which hosts the technological infrastructure of the DSS and:
   • analyses the data collected by the WSN and the hand-held devices using advanced modelling techniques
   • optimises decision making
   • suggests the best options for managing the vineyard
   • alerts on abiotic stresses
   • provides an estimate of pending yield

In this DSS, the provider closely interacts with the decision makers for designing the best monitoring system for each situation. Then, the DSS provider implements the WSN for monitoring the vineyard environment, provides the grapevine manager with the necessary hand-held devices for scouting the vineyard(s) during the season, and trains her/him in using both devices and the web-based DSS. The grapevine manager uses the DSS for inserting site-specific data for each vineyard. The DSS analyses data and produces the decision supports; when necessary, the DSS asks the grapevine manager to scout the vineyard through the hand-held devices, and to send information. The decision supports help the grapevine manager make decisions about management options. The system includes a continuous updating of the DSS and its adaptation to the client needs. This process involves a feedback from grapevine managers and the involvement of researchers who have been involved during the project as well as other researchers with specific expertise.

See also: https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=73 [15]

WEARHAP: WEARable HAPtics for Humans and Robots

Short summary for practitioners (native language):

The WEARHAP system is wearable and its architectural concept is envisioned in the way devices interact with the fingepads, the elbow and the skin. The complexity of the whole wearable system is not a-priori fixed, indeed the inherently modular nature of the proposed solutions will allow to customize the WEARHAP system according to the given application. WEARHAP aims at laying the scientific and technological foundations for wearable haptics, a novel concept for the systematic exploration of haptics in advanced cognitive systems and
robotics that will redefine the way humans will cooperate with robots. Wearable haptics will enable robots to observe humans during natural interaction with their shared environment. Research challenges are ambitious and cross traditional boundaries between robotics, cognitive science and neuroscience. Research findings derived from distributed robotics, biomechanical modeling, multisensory tracking, underaction in control and cognitive systems will be integrated to address the scientific and technological challenges imposed in creating effective wearable haptic interaction. To highlight the enabling nature, the versatility and the potential for industrial exploitation of WEARHAP, the research challenges will be guided by representative application scenarios. These applications cover robotics, health and social scenarios, stretching from human-robot interaction and cooperation for search and rescue, to human-human communication, and interaction with virtual worlds through interactive games.
See also: https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=74 [16]

Practice abstract 14

**Short title (native language):**
SmartAgriFood: Smart Food and Agribusiness: Future Internet for Safe and Healthy Food from Farm to Fork

**Short summary for practitioners (native language):**

The SmartAgriFood project is funded in the scope of the Future Internet Public Private Partnership Programme (FI-PPP). The key objective was to elaborate requirements that shall be fulfilled by a “Future Internet” to drastically improve the production and delivery of safe & healthy food. It provided the basis for the development of new Smart Applications in multiple sectors: 1) smart farming, focusing on sensors and traceability, 2) smart agri-logistics, focusing on real-time virtualisation, connectivity and logistics intelligence, 3) smart food awareness, focusing on transparency of data and knowledge representation. Key features of SmartAgriFood concepts will be demonstrated and verified by simulations and experimental systems within this project and by large scale demonstration. The six pilot cases were : a) Greenhouse management; b) Smart spraying; c) fresh fruit and Vegetables; d) Plants and flowers; e) Tailored information for customers and f) tracking tracing and awareness meat.
See more information in http://smartagrifood.eu/pilots [17].
See also: https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=76 [18]

Practice abstract 15

**Short title (native language):**
FRACTALS: Future Internet Enabled Agricultural Applications

**Short summary for practitioners (native language):**

The purpose of FRACTALS is to support the community of innovative ICT SMEs and Web
Entrepreneurs to harvest the benefits of Future Internet Public Private Partnership (FI-PPP) initiative, by developing applications with high market potential, addressing the needs of the agricultural sector. This support is going to be multi-dimensional in the sense that it aims to span beyond grant assistance to also include: (1) the technical capacity building of ICT SMEs and Web entrepreneurs with respect to developing applications based on FI-PPP infrastructures (2) the testing and validation of applications in an open innovation context (by involving end-users in the testing/validation assignment through a Living Labs environment) and (3) clustering and mentoring services related to entrepreneurship and venture capital finance.

See also: [https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=78][19]

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**Practice abstract 16**

**Short title (native language):**

CROPS: "Intelligent sensing and manipulation for sustainable production and harvesting of high value crops, clever robots for crops"

**Short summary for practitioners (native language):**

CROPS developed scientific know-how for a highly configurable, modular and clever carrier platform that includes modular parallel manipulators and “intelligent tools” (sensors, algorithms, sprayers, grippers) that can be easily installed onto the carrier and are capable of adapting to new tasks and conditions. Several technological demonstrators were developed for high value crops like greenhouse vegetables, fruits in orchards, and grapes for premium wines. The CROPS robotic platform is capable of site-specific spraying (targets spray only towards foliage and selective targets) and selective harvesting of fruit (detects the fruit, determines its ripeness, moves towards the fruit, grasps it and softly detaches it). CROPS developed techniques for reliable detection and classification of obstacles and other objects to enable successful autonomous navigation and operation in plantations and forests. The agricultural and forestry applications share many research areas, primarily regarding sensing and learning capabilities. The project developed a Sweet-pepper harvesting robot ([http://www.crops-robots.eu/index.php?option=com_content&view=article&id=...][20]), an apple harvesting robot ([http://www.crops-robots.eu/index.php?option=com_content&view=article&id=...][21]), a close range precision spraying robot and a canopy optimized spraying robot ([http://www.crops-robots.eu/index.php?option=com_content&view=article&id=...][22]).

See also: [https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=81][23]

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**Practice abstract 17**

**Short title (native language):**

TOAS: New remote sensing technologies for optimizing herbicide applications in weed-crop systems

**Short summary for practitioners (native language):**
An EU initiative developed intelligent drones that detect weeds on crops, enabling herbicides to be targeted to infested areas only. EU policy encourages farmers to limit the use of herbicides by applying them exclusively to infested areas instead of entire crop fields. In the past, infestations were detected by satellite imagery, but this technology has very limited resolution capabilities. To address this issue, the EU-funded TOAS (New remote sensing technologies for optimising herbicide applications in weed-crop systems) project developed unmanned aerial vehicles, or drones, that can detect weeds on crops fast and accurately. The focus was on maize and sunflower crops, as well as olive and poplar trees. The specific objectives will concentrate on the evaluation of the specifications (sensor type, imagery characteristics, crop-weed phenological stage) required for each type of crop and on the development of advanced algorithms for crop assessment and weed mapping using the captured remote images. The ultimate objective is to generate geo-referenced weed infestation maps for making in-season site-specific herbicide treatments in early weed stages. The successful implementation of the TOAS project would lead to a 15-35% reduction in farm costs and a 20-30% decrease in the use of crop protection chemicals.

See also: https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=83

Short title (native language):
MOCCCASIN: MOonitoring Crops in Continental Climates through Assimilation of Satellite INformation

Short summary for practitioners (native language):
Information on the outlook of yield and production of crops over large regions is essential for government services, food relief agencies, and international organizations monitoring the world food production and trade. The MOCCCASIN project aimed to improve monitoring of winter-wheat in regions with high risk of frost damage, through modelling and assimilating satellite information. An intensive field campaign in the Tula region of Russia was carried out successfully during the 2011 and 2012 growing seasons and the main results were:
1. a database is available containing observations of winter-wheat growing under actual field conditions
2. an overview of existing approaches for winter wheat recognition using Earth observation data was carried out. The most accurate and reliable for Russia, were based on time-series analysis and adaptive maximum likelihood classification
3. the results from the biophysical variable retrieval from MODIS satellite seem to be not as stable and operationally applicable
4. some new modules (e.g. FROSTOL model for simulated wheat cold tolerance and damage due to frost; see http://onlinelibrary.wiley.com/doi/10.1111/jac.12187/full) for WOFOST crop simulation model (http://onlinelibrary.wiley.com/doi/10.1111/j.1475-2743.1989.tb00755.x/epdf) have been successfully implemented, calibrated/validated and applied

See also: https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=85
Short title (native language):
AGRIXCHANGE: A common data exchange system for agricultural systems

Short summary for practitioners (native language):
With an increasing global population, the demand for food production will continue to increase. This will put intense pressure on agricultural industries and associated sectors such as retail and logistics to make agribusiness more sustainable, efficient and economical. These challenges require coordination and up to date information. AGRIXCHANGE aims to develop new ways of sharing information and expertise. A platform is built that facilitates communication and collaborative working groups. The framework consists of a sound architecture and infrastructure integrating existing standards and services. Main topics are establishing a platform on data exchange in agriculture in the EU, developing a reference framework for interoperability of data exchange and identifying the main challenges for harmonizing data exchange.

See also: [https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=88](https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=88) [28]

Practice abstract 20

Short title (native language):
N-TOOLBOX: Toolbox of cost-effective strategies for on-farm reductions in N losses to water

Short summary for practitioners (native language):
The aim of this supporting action was to develop a “toolbox” of cost-effective technologies to be implemented at the farm level to protect water from nitrate pollution. The first component of the toolbox was a catalogue of technologies for reducing N losses on the farm, produced using previous research results and local experience. Technologies were prioritized based on their cost-effectiveness and efficiency at reducing N losses and listed according to region and production-system. The second toolbox component was an enhanced decision support tool (NDICEA) which can be used at the farm level to illustrate options for improved N management and assist farmers in reaching their goals of compliance with the Nitrates Directive. The results were:

- The NDICEA model can be used in England, Denmark and Spain
- It is strongly recommended to use the model in combination with a validation scheme with sufficient soil mineral N measurements spread over the season
- Under arid conditions the Penman-Monteith equation for calculating evapotranspiration should be used instead of the Makkink equation.
- Model performance could be improved by changes in the crop sub model, by adaptations in the release of nitrogen out of artificial fertilizers and by creating a multi-layer soil sub model. NDICEA model can be downloaded from [http://www.ndicea.nl/](http://www.ndicea.nl/) [29] and the manual to use it for the purposes of any farm is given in [http://www.ndicea.nl/docs/Manual_UK_NDICEA_6_2.pdf](http://www.ndicea.nl/docs/Manual_UK_NDICEA_6_2.pdf) [30]
Using this model, N losses can be reduced significantly.

See also: [https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=96](https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=96) [31]

**Practice abstract 21**

**Short title (native language):**
FUTUREFARM: Integration of Farm Management Information Systems to support real-time management decisions and compliance of management standards

**Short summary for practitioners (native language):**
European farmers can reap major benefits by utilising state-of-the-art farm-management information systems (FMISs). A new 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. A prototype browser-based viewer was first presented at Agritechnica 2009 is now available on the public website at [http://test.futurefarm.eu](http://test.futurefarm.eu) [32]

See also: [https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=98](https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=98) [33]

**Practice abstract 22**

**Short title (native language):**
FUNRESO: FUNctional-structural plant models for improved estimation of crop and soil status based on REmote Sensing Observations

**Short summary for practitioners (native language):**
FUNRESO project aimed to develop a novel remote sensing approach for improving the accuracy of estimation of crop and soil variables. To this end, the project developed a Functional Structural Plant Model (FSPM) capable of taking into account particular water and nitrogen stress responses at the canopy level.

Accuracy improvements in remote sensing information retrieval were achieved by including prior knowledge of vegetation properties and through improved simulation models of canopy reflectance. Such detailed three-dimensional (3D) canopy models were used to retrieve the canopy biophysical and biochemical properties. Remote sensing information was fed into dynamic crop functioning to estimate crop and soil agronomic and environmental variables which are unattainable by direct estimation from remote sensing.

Funreso-developed tools will help remote sensing of crop and soil status and hopefully lead to improved planning and management of agricultural activities.

See also: [https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=99](https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=99) [34]
Short title (native language):
SAFEGRAPE: "Biosensor based instrumentations to be used in vineyards and wineries for fast and sensitive detection of Botrytis"

Short summary for practitioners (native language):
The result from the project is a biosensor system to detect Botrytis cinerea (B. cinerea) in grape juice. It can be used as a portable device in the vineyard for winegrowers in the field or after grape-harvest and as an on-line instrument for quality control in wine production sites, to be integrated in the quality controls commonly applied (sugar and total acidity content). These instrumentations will allow to increase the wine quality, reduce the use of fungicides and sulphites and reduce the loss of harvest of about 10%, by a fast intervention in the field.

See also: https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=103

Practice abstract 24

Short title (native language):
VINEROBOT: VINEyardROBOT

Short summary for practitioners (native language):
The VineRobot project designed and developed a novel use-case agricultural robot under the scope of unmanned ground vehicles (UGV), and equipped with several non-invasive sensing technologies to monitor the following parameters:
• Grape yield
• Vegetative growth
• Water status
• Grape composition
The VineRobot may provide key information regarding vineyard parameters much faster than manual solutions and at higher resolution, in a more flexible manner and with lower costs than aerial scouting technology carried out by drones or planes. Final users receive updated information concerning their vineyard status through an application (mobile, tablet, computer), as simple maps. The proposed agricultural robot will allow for revolutionary and conclusive decision-making to optimize vineyard management and to drive agronomical fundamental decisions.

The robot work in the following way:
1. The robot monitors viticulture parameters on-the-go: grape yield, vegetative growth, water status and grape composition.
2. Images acquired, and data generated by the VineRobot are processed and sent to grape-growers.
3. Final users receive real-time data in specifically developed app for tablets, computers and smartphone devices.
4. Vineyard management optimization and grape quality improvements.
Practice abstract 25

**Short title (native language):**
E-AGRI: Crop Monitoring as an E-agriculture tool in developing countries

**Short summary for practitioners (native language):**

European research institutions have developed series of agricultural monitoring approaches to support European Common Agriculture Policy (CAP). These approaches are based on the European Information and Communication technologies including space-based Earth Observation (EO), geographical information systems and agro-meteorological modelling. The transfer, adaptation and local application of these E-agriculture practices will assist the policy makers of developing countries in their challenge to sustain agriculture's productivity growth. It helps to achieve the food security, increase farmer incomes and protect local farmer interest, in the context of agricultural liberalization, which is a fiercely disputed issue in the forums of the World Trade Organization.

See also: [https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=110](https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=110) [37]

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Practice abstract 26

**Short title (native language):**
UD_AGR_REPO: "Improving research potential of the Institution for Land Utilization, Technology and Regional Development"

**Short summary for practitioners (native language):**

The project worked with agricultural producers to establish a geo-informatic technical and advisory system, which supported environment-friendly and efficient agro-technological interventions. The developed system is suitable for the detailed, plot-scale analysis of production site circumstances and yield, as well as the spatial-temporal evaluation of production technology parameters.

UD_AGR_REPO laid the scientific foundations for rational land-use and environmentally sound agriculture. Researchers used geographic information system (GIS) techniques to form the basis of a sustainable agricultural economy within the North Great Plain region of Hungary. Project partners improved the efficiency of agricultural production and the adaptation of environmentally sound management in the region.

UD_AGR_REPO also assumed the role of an educational, research and consulting centre for the region and coordinated and fostered development efforts in surrounding countries. Practical experience achieved through the project such as developing a database, planning a GIS, adapting production technologies and networking with EU institutions and farmers, also benefited young researchers.

Research results facilitated effective land use and improved regional development. This was
achieved while ensuring that the interventions were environmentally friendly and met the requirements for sustainable farming.
See also: https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=113 [38]

Practice abstract 27

**Short title (native language):**
CLAFIS: "CLAFIS - Crop, Livestock and Forests Integrated System for Intelligent Automation, Processing and Control"

**Short summary for practitioners (native language):**

CLAFIS brings together technologies, experience and research results from industrial automation, Internet of Things and agribusiness sectors. The system is developed for data transfer between field devices, autonomous equipment and machineries and devices in farms and forests related process. The project is centred on a Use Case demonstrator involving a complete process sequence of a smart seeding, spraying and harvesting for grass/grains/trees.

A prototype of the gateway has been constructed and tested. Minor parts of the software still need to be implemented. Integration with external agricultural devices and IoT cloud has begun and in some cases also taken place. An integration platform has been created and specification made of communication between IoT cloud and agricultural devices. 12 use cases from different farming operations have been described in details. They form the basis for the development of the CLAFIS platform and the demonstration. The software architecture of the platform has been specified with main components and services.

See also: https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=114 [39]

Practice abstract 28

**Short title (native language):**
EFFIDRIP: "Enabling next generation commercial service-oriented, automatic irrigation management systems"

**Short summary for practitioners (native language):**

EFFIDRIP is an ICT-based tool for supporting the management and supervision of irrigation and fertigation in tree crops. It offers a cost-effective tool that provides the end-users (farmers or technicians) effortless irrigation and fertilization management, as well as easy and reliable supervision of the state of the irrigation system. The tool establishes automatical the accurate daily water and fertilizer volumes as well as the optimal application strategy in terms of cost, productivity and environmental impact to achieve the highest efficiency depending on the given irrigation system and site-specific conditions.

Design, implementation and validation of an ICT based platform was completed. The
EFFIDRIP system was tested at three pilot sites, in Spain, Portugal and Greece. The results showed that in all three cases EFFIDRIP delivered a seasonal volume of irrigation within the range expected from FAO recommendations. The results ranged from an increase of 48% in water productivity by young apples to 47% more water due to the severe deficit irrigation applied by the farmer. The tool permit fruit farmers to increase water, fertilizer and energy use efficiency up to 15%.

See also: https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=116

Practice abstract 29

**Short title (native language):**
ICT-AGRI 2: Information and Communication Technologies and Robotics for Sustainable Agriculture

**Short summary for practitioners (native language):**

See also: https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=123

Practice abstract 30

**Short title (native language):**
WinePen tests grape ripeness on the vine

**Short summary for practitioners (native language):**

Recent EU quality legislation in the viticulture industry is putting a lot of pressure on small vineyards. To survive, they will need to increase the quality of their grapes and reduce the production of low-quality wine. Thanks to the EU-funded PREMIVM project, winemakers now have a device that can quickly and easily monitor grape ripeness without any damage to the fruit.

The device (WINEPEN) uses fluorescence to measure the concentrations of various chemicals related to ripeness and comes with built-in software. Vineyards in the Czech Republic, Spain, Italy and Portugal participated in the research and testing process.

Researchers used a wide range of grape varieties to build a reference library that was used to calibrate the prototype device.

The device software provides useful statistical analyses based on the data collected, telling farmers about grape ripeness and sugar content.

It can also coordinate GPS data, has an online interface, and can be accessed from a computer, tablet or smartphone. PREMIVM's demonstration prototype was successful — results are internally consistent, and they correlate well with conventional methods of measurement.

PREMIVM has thus developed a device that could help small EU vineyards remain competitive in the face of challenging legislation.

the prototype is given in the link below:
Practice abstract 31

**Short title (native language):**
AGRIC-LASERUAV: Precision agricultural crop monitoring using laser scanning and unmanned aerial vehicles

**Short summary for practitioners (native language):**

Recently two technological developments on remote sensing advancements came available: 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. Issues regarding spatial scales can be addressed with terrestrial LiDAR systems that allow the characterization of spatial organization of tree crown elements from a ground-level perspective. 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.

See also: [https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=136](https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=136)

Practice abstract 32

**Short title (native language):**
IAM4MARS: Intelligent Automated Methods for Monitoring Agriculture with Remote Sensing

**Short summary for practitioners (native language):**

For monitoring agriculture in Europe, an unsupervised automated method (with limited interaction) is developed based on advanced similarity criteria utilizing spectral/spatial characteristics and on manifold learning techniques for clustering large data sets of very-high resolution images.

Spectral clustering has ability to extract clusters with distinct characteristics without using a parametric model in expense of high computational cost. To utilize its advantages in large datasets where it is infeasible, ASC methods apply spectral clustering on a reduced set of points (data representatives) selected by sampling/quantization. The SFT will provide a fast and accurate approach for assessment of agricultural systems at the community level, which is currently done by expert image analysis. The contributions are threefold: i) advanced similarity criteria for approximate spectral clustering (ASC); ii) ensemble methods for ASC; iii)
monitoring agriculture with proposed methods. These contributions produce effective clustering not only for remote sensing images but also other large datasets.

See also: https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=143 [45]

Practice abstract 33

**Short title (native language):**
Greyback cane grub of sugarcane monitoring and control in Australia

**Short summary for practitioners (native language):**

The Australian greyback cane grub (Dermolepida albohirtum) is the most devastating sugarcane pest in the country. As sugarcane is such an important food and energy crop, improved pest management is crucial.

Funded by the EU, the ECOGRUBS project aimed to assess how the landscape affects the movement and breeding of D. albohirtum. The information will help improve pest management strategies and reduce the unnecessary use of pesticides.

Researchers used tools such as satellite imaging, geographic information systems software and radio tracking to understand the distribution ecology of D. albohirtum. In addition, they created a database of trees on which the adult insects preferentially feed.

The project found that the insects do not travel far between sugarcane fields and feeding trees, which mostly grow along the banks of rivers. Thus, researchers concluded that pesticide treatment could be limited to just 200 metres into the sugarcane plantations and still be effective.

ECOGRUBS has contributed to overall knowledge on the greyback cane grub, particularly in terms of its movement and feeding habits. These findings will aid pest management and decrease pesticide application.

See also: https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=147 [46]

Practice abstract 34

**Short title (native language):**
VINBOT: AUTONOMOUS CLOUD-COMPUTING VINEYARD ROBOT TO OPTIMISE YIELD MANAGEMENT AND WINE QUALITY

**Short summary for practitioners (native language):**

VINBOT is an all-terrain autonomous mobile robot with a set of sensors capable of Capturing and analysing vineyard images and 3D data by means of cloud computing applications, to determine the yield of vineyards and to share information with the winegrowers. VINBOT
uses NDVI sensors together with colour cameras, 3D range finders and GPS to assess the canopies in the vineyards. Data-intensive computer vision algorithms are offloaded to external internet servers (the cloud). Wineries and wine growers will be able to make accurate yield predictions to organise the production and marketing their wines, coordinating the mixing of grapes of homogeneous quality to efficiently market a range of wines by quality and price. Using the VinBot, the consortium wine producer associations will be able to coordinate and optimise yield management strategies throughout their thousands of members vineyards, based on their collective expertise and commercial objectives. They expect to sell their wine for 8%-20% more over a five year period by employing the VinBot system to accurately estimate yield.

See also: https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=151

Practice abstract 35

**Short title (native language):**
OSCAR: Optimising Subsidiary Crop Applications in Rotations

**Short summary for practitioners (native language):**

OSCAR studies the success of cover cropping systems, including cultivation methods, machinery and suitable plant genotypes, that increase the duration of soil coverage by plant canopies; minimize the need for soil tillage; increase the diversity of species within the plant canopy and the rotation; reduce the need for fertilisers, pesticides and herbicides; and in dry climates, conserve water and reduce need for irrigation. Results are based on 11 coordinated field experiments on of living mulch (LM) and cover crop (CC) based reduced tillage systems. For successful LM based cropping high crop densities are needed and regular sowing patterns were best suited. If expected cereal yields 6 t ha⁻¹, a clover LM canopy sufficiently strong to generate a dense sward after main crop harvest can establish in temperate and north Mediterranean environments with mild winters and no water limitation of wheat productivity. In cooler places sowing the LM before the main crop or undersowing in spring can be solutions. High biomass producing CCs can compensate typical negative initial effects of reduced tillage (RT) with respect to yield and weeds. Especially further north, where the growing season is shorter, it is necessary to develop new methods for weed control in spring and autumn. Over the long-term RT either was neutral or led to positive effects on yields and weeds especially in the sub-tropical climates in southern Brazil.

See also: https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=154

Practice abstract 36

**Short title (native language):**
MISTRALE: Monitoring of Soil moisture and water-flooded Areas for agriculture and Environment

**Short summary for practitioners (native language):**
To feed an additional 2 billion people by 2030, water needs to be used more efficiently. Agriculture uses around 70 percent of all freshwater worldwide. It is estimated that water demand would grow by 45 percent by 2030 as increasingly affluent consumers demand higher value food. Farmers are challenged to produce “more crop per drop”. MISTRALE sets up a service providing soil moisture maps and flooded area maps for improved monitoring of agricultural fields. These soil moisture maps help farmers to make more efficient decisions where and when to irrigate. MISTRALE also enables the monitoring of catchment areas and wetlands, providing water managers with information to optimize their activities.

To do so, MISTRALE developed a prototype of a GNSS Reflectometry sensor integrated on a dedicated remotely piloted aircraft system (RPAS). The GNSS-R sensor measures the GNSS signals reflected by the ground and derives from these measurements the soil-water properties. As with other remote sensing techniques, observations in GNSS-R are based on the variability of the soil’s dielectric properties with the humidity of the terrain. Consequently, the reflected signal's peak power can be related to soil moisture. Practical results of the prototype are given in the following link:

http://www.mistrale.eu/Results/preliminary-flights/first-results [49]

See also: https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=156 [50]

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Practice abstract 37

**Short title (native language):**
AUDITOR: Advanced Multi-Constellation EGNSS Augmentation and Monitoring Network and its Application in Precision Agriculture

**Short summary for practitioners (native language):**

GNSS network software is developed that enables enhanced features, including advanced precise positioning with high accuracy and fast fix. Global (low resolution, left image) and regional (high resolution, right image) ionosphere products for the calculation of real-time corrections enables a precise navigation with a shorter cold start time. Sudden enhancements of ionospheric conditions are handled with an autonomously down weighting of highly disturbed satellite signals. Flexible dual-frequency GNSS receiver platform, hardware/software hybrid, with SDR-based low-power embedded receiver, will serve as a test-bed for advanced signal processing algorithms. A web-based platform will be build to collect, store and process geo-referenced data for precision agriculture and mobile applications. Services will be provided through an intuitive mobile and web interface, adapted to the needs of farmers. The platform will be highly automated, and simple to implement in different landscapes/agricultural. Furthermore, services in precision agriculture will be made available based on the above, including data collection and recommendations to farmers regarding site-specific application of water, fertilizer and pesticides.

See also: https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=160 [51]
MOSES: Managing crop water saving with Enterprise Services

MOSES is an information platform for water procurement and management agencies (e.g. reclamation consortia, irrigation districts, etc.) to facilitate planning of irrigation water resources at the real scale. MOSES solution can be considered a form of climate service, as it will make available to agriculture water providers:
- seasonal forecasting of water requirements over their areas of interest, in order to plan water procurement and allocation before the start of irrigation season, to mitigate the risk of water shortages and to improve water procurement efficiency;
- detailed in-season monitoring of crop water requirements and use, in order to regularly update, fine tune and adjust allocation plans and management of the water resources to end users (districts and farmers).
To achieve these goals, the MOSES project combines a wide range of data and technological resources: EO data, probabilistic seasonal forecasting and numerical weather prediction, crop water requirement and irrigation modelling and online GIS Decision Support System. Spatial scales of services range from river basin to sub-district.
See also: https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=162

Combined wastewater treatment and reuse technology for agricultural purposes

RichWater project developed an up-scaled commercial prototype (min. 100 m³ treatment capacity/day) based on the TREAT&USE project (http://www.treatanduse.eu) and pursued the goal of implementing it in a real scale food producer in Southern Spain to reuse local community wastewater for irrigation purposes. The prototype has been designed to end up with a system fulfilling the following characteristics:
- Energy consumption of water treatment of approximately 1kWh/m³
- Able to treat 150 m³/day of waste water
- Compact system
- High automation
- Minimized dosage of fertilizers for irrigation
- Effluent free of pathogens and rich in nutrients
- Competitive price of the technology
The aim was to create a win-win situation between two sectors (the wastewater treatment and the agricultural sector) by turning public wastewater into a valuable end-product. A detailed life cycle assessment and business plan will help to precisely assess the ecologic, technological and economic benefits enabling an effective market strategy.
See also: https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=163 [54]

Practice abstract 40

**Short title (native language):**
SENSOILS: Sensing soil processes for improved crop nitrogen bioavailability

**Short summary for practitioners (native language):**

The recent development of transparent soils gives great scope to unravel the processes involved in the reactive transport of nutrients in soil and their interaction with the soil biota. Principles of optics, chemical engineering, the physics, chemistry, and biology of soils, and plant biology will be combined to image and characterise nitrogen movement in soil at the micro-scale. A new generation of transparent soil analogues makes it possible to measure the biological and chemical status of soils to characterise transport at the surface of soil particles and to elucidate the role of root?particle?particle contacts, exudation and microbial transformation on the bioavailability of nitrate and ammonium. Understanding of nutrient movements in soil will lead to substantial progress in the development of more efficient fertilisers. New model soil systems could be used to better understand the spread of soil-borne diseases, the bio-remediation of contaminated soils and the mechanisms underlying soil biodiversity and activity.

See also: https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=168 [55]

Practice abstract 41

**Short title (native language):**
AgriCloud P2: Demonstration of a cloud-based precision farming management system for a sustainable and intensive agriculture

**Short summary for practitioners (native language):**

This project targets the pilot application and market introduction of AgriCloud, a cloud-based precision farming (PF) management system for more efficient, sustainable production of crops in Europe. Today, most farmers manage their crop by gut feeling, leading to inappropriate fertilization, plant damage and unnecessary environmental impact. AgriCloud is the first holistic FP approach, processing all available data from agronomic sensors, machinery and service companies and, backed by plant nutrition expert knowledge, facilitates a targeted use of fertilisers and herbicides, efficient machinery utilisation and workflow management. Farmers are operating a mixed stock of stand-alone agricultural machinery. AgriCloud meets their need for integrated solutions with only one data infrastructure for a coordinated, easy-to-use machinery control from one user interface. By using AgriCloud, they will increase yield production between 3-10%, reduce lodging to 50-100%, reduce fertilisers by 12-20% and improve harvest efficiency by 12-20%. Their annual savings amount to approx. 130Ÿ?¦/ha, which enables amortization of the AgriCloud
invest within 1-1.5 years.
See also: https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=171

Practice abstract 42

**Short title (native language):**
CANTOGETHER: Crops and ANimals TOGETHER

**Short summary for practitioners (native language):**

CANTOGETHER aims at designing a Mixed Farming System (MFS) at individual farm level or collective implementation at the territorial level. The MFS will be based on the simultaneous utilization of crops (cash, feed and energetic) and various rearing animals with full recycling practices of animal wastes in view to ensure high resource-use efficiency (notably of nutrients), reduction in dependence on external inputs (fertilisers, pesticides, concentrated feeds), and acceptable environmental and economic performances. The most promising innovations were selected and implemented in a pan-European network of 24 case studies (experimental or commercial farms, local groups of farms) to test their feasibility and contribution to sustainability. Besides biogas plants (6 instances), the innovations were mainly based on agroecological principles as diversification of crop rotations (8 instances), valorisation of semi-natural spaces such as landscapes elements and grasslands (12 instances) and optimisation of cover crops (3 instances). The importance of organisational aspects was highlighted: local market development appeared in 4 instances, as did forage banks or systems for farmers to directly exchange products (feed, manure) with each other. See also: https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=176

Practice abstract 43

**Short title (native language):**
GALNIMBUS

**Short summary for practitioners (native language):**

The GALNIMBUS system in order to perform detailed real-time forecasts for crop water requirements
- Defines irrigation needs based on crop specific data bases
- Analyses real time data from the field (soil moisture, solar radiation, pH, plant stress, etc) to evaluate crop status.
- Checks online weather forecasts to readjust irrigation doses
- Satellite images
Thanks to GALNIMBUS irrigation tasks are fully automatized, and the grower can monitor the crop or activate irrigation valves remotely anywhere at anytime.

See also: https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=177
**Practice abstract 44**

**Short title (native language):**
SaveEUSaffron: Sales and production acceleration of EU saffron through an innovative cultivation and crop system

**Short summary for practitioners (native language):**

The European saffron production will be increased through innovative cultivation and crop system. This system will increase the European producers competitiveness making better quality saffron, reducing production costs and using an environmentally sustainable cultivation method, in conclusion, one more resource-efficient and sustainable saffron production and processing. Saffron cultivation and crop methods have mostly been unchanged for centuries and the need for labour is high due to the low mechanization of farms. Due to this, saffron production in European countries has shrunk dramatically during the last century. SaveEUSaffron will change the current process to automate it and with more added value. The only solution to the problem is to reduce the final price of the product (through automation) and offer a better quality product (with the benefits of ecological production). CEAE has developed a machine to harvest saffron quicker than the current manual way had very good results in the tests carried out in a relevant environment (floating trays) based in the first machine.

See also: [https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=180](https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=180) [59]

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**Practice abstract 45**

**Short title (native language):**
StemSense: A precise irrigation sensor system to provide an accurate indication of water status in crops and deliver increased yields to farmers

**Short summary for practitioners (native language):**

Saturas is an SME from Israel that has developed a sensor system to accurately deliver an indication of water status and determine precise irrigation levels. 95% of farmers irrigate land without any scientifically based information leading to significant overwatering and lowering potential yields. Overwatering drowns crops reducing the quantity and quality of yields. Water is becoming scarcer and more expensive as pressure on supplies continue to increase. The StemSense sensor is the worlds first to deliver accurate measurements of stem water potential and relay to farmers exact quantities of water required and when. The sensor is embedded in the trunk of the plant and information sent via a communication box to the farmers. Farmers using the StemSense sensor experience up to 20% higher income, significant water savings and reduced costs. The patented technology has been engineered for use in fruit trees and successfully tested on citrus and peach trees. Within the overall project, Saturas intends to optimise the communication and control interface to reflect real-time stem water potential levels; manufacture 300 sensors for test sites; undertake full scale tests of the StemSense sensor systems in Israel, Italy and Spain; and engineer a miniaturized
version of the StemSense sensor to fit grapevines.  
See also: [https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=181](https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=181) [60]

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Practice abstract 46

**Short title (native language):**
CoolFarm in/Store and CoolFarm Eye solutions

**Short summary for practitioners (native language):**

CoolFarm aims to empower indoor farming with flexible, integrated, intuitive and intelligent solutions to achieve maximum efficiency, quality and profitability. CoolFarm system understands better the vertical farm functioning which resulted in a product that brings several advantages to the existing growing systems. CoolFarm in/store is a turnkey solution to grow food all year round with minimum waste and maximum safety at work. It is a closed climatized fully automatized, and vertical space managed by vertical and horizontal lifts and with all CoolFarm Technology. CoolFarm in/Store also holds great socio-economic impact as it is possible to grow fresh, nutritious and delicious food all year round with minimum waste and maximum safety. Cities now can become producers of local, healthy and tasty food. Also, the CoolFarm Eye is the optical sensor that gives information to CoolFarm in/Control on the plants health and size. CoolFarm Eye as a standalone version allows the grower to finally have access to an innovative smart sensor at a competitive price that reduces the error at the farm.

See also: [https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=187](https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=187) [61]

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Practice abstract 47

**Short title (native language):**
SIAM: Source Integration for Agriculture Management

**Short summary for practitioners (native language):**

eLEAF aims to deliver data that does meet farmers needs through its Sensor Integration for Agricultural Management (SIAM) innovation. It is a complete redesign of the way this data is generated, applying a big data approach to information collection and processing. eLEAFs ambition is to increase food security by support agricultural development worldwide. The core data stream for SIAM is satellite based optical earth observation data. SIAM enable information driven innovation, supporting highly needed productivity increases and improvements in resource use efficiency. This enhance the resilience of Europe’s agricultural sector against climate change and improve its competitiveness on the global market.

See also: [https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=189](https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=189) [62]
Short title (native language): AgriCloud management system
Short summary for practitioners (native language):

The AgriCloud system is a cloud-based Precision Farming (PF) management system for more efficient, sustainable production of crops in Europe. It is a holistic management approach, processing all available data from agronomic sensors, machinery and service companies and, backed by plant nutrition expert knowledge, facilitates a targeted use of fertilisers and herbicides, efficient machinery utilisation and workflow management. AgriCloud increases yield production between 3-10%, reduces lodging to 50-100%, reduces fertilisers by 12-20% and improves harvest efficiency by 12-20%. Farmers total annual savings amount to approx. 130€/ha, so that their pay-back time, dependent on the total arable land, is about 1.5-3 years.

Farmers are operating a mixed stock of stand-alone agricultural machinery. AgriCloud meets their need for integrated solutions with only one data infrastructure for a coordinated, easy-to-use machinery control from one user interface that informs on the causalities and determinants of yield.

The feasibility study was comprised an investigation of market structures, segments and barriers, specifically of international markets, a customer survey, the identification of 7 pilot customers and development of an IP strategy. Technical goals were a customer-oriented specification and revision, risk analysis and consideration of regional characteristics.

See also: https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=190

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Short title (native language): SenSOP-II: Novel sensor based soil-plant-climate control system for European smart farming
Short summary for practitioners (native language):

New tools are developed to mitigate emissions of greenhouse gases and adapt to impacts of climate change with respect to the interfaces of water, land use and biodiversity due to water saving techniques, technology development of innovative mapping and plant growth monitoring systems. SenSOP-II is an innovative solution based on a Three-Layer approach with soil-plant-climate based sensors, simulation software tools embedded in a web-based server structure. The industry independent software tool is accessible to end-users through internet client devices. Key market is the wine producing sector in Europe. Wine regions outside Germany will be covered by our prospective contracted strategic system partners. Further system openness to new applications, techniques and data sources ensures continuous improvement of SenSOP-II approach within the system partner network.

See also: https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=194
Flourish: Aerial Data Collection and Analysis, and Automated Ground Intervention for Precision Farming

The Flourish project aims 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.

See also: https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=198

ROBOTGRAFT (An integrated high throughput robot and a new multi-rootstock grafting technology to improve plant/crop yield)

ROBOTGRAFT is a high performing automated robot system to replace the existing time-consuming, laborious method of grafting plants. Plant grafting is the combination of a stronger root with a desired plant seedling and is used to improve the quality and performance of vegetables, flowers and herbs. Grafting is the most diffused practice employed to achieve more durable, more resistant and productive plants. Current practice is often by manual grafting and is labour intensive and inefficient; robotics have been introduced but offer limited improvements. An alternative plant modification method is needed to cultivate stronger plants without using pesticides or genetically modifying the structure. ROBOTGRAFT is fully automated and can graft a tray of plants whilst simultaneously undertaking trimming, clearing and disinfecting. The robot improves nursery operations by increasing capacity and shortening growth time; enables early stage grafting providing a faster recovery; increases the yield and produces better quality grafts. Plants grafted by ROBOTGRAFT can grow and survive in lower quality soils as the rootstock used in the grafting strengthens the plant and is resistant to a range of soil-borne diseases.

Within the overall project, ROBOTGRAFT aims to: engineer the automatic grafting machine to graft a full tray simultaneously and reach a capacity of no less than 5000 plants an hour; automate grafting methods to a level that will increase productivity and reduce water and fertilizer usage; to expand the robot’s capability to graft combinations of three plants; and demonstrate and validate the robot grafting process with the involvement of at least one
end-user in the field of tomato plants production.
See also: https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=199 [66]

Practice abstract 52

**Short title (native language):**
OrchardMan: A novel vision based orchard system to maximize fruit tree yields and Class 1 quality by 20% while reducing waste by 50%

**Short summary for practitioners (native language):**
OrchardMan will bring vision-based tree-fruit measurement technology to the European market. This will provide in-field data based on cost-effective image capture technology and novel image processing algorithms, which can identify commercially relevant yield factors such as fruit size, growth and tree architecture automatically in the difficult environment of the orchard under variable weather and lighting conditions. The developed system has the capability to support precision horticultural management at the single tree level, reducing waste from growing undersize fruit by up to 50%, and increasing overall tree yields by up to 20%.
See also: https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=200 [67]

Practice abstract 53

**Short title (native language):**
EO-FARM: EARTH OBSERVATION FARMING

**Short summary for practitioners (native language):**
EOFARM makes use of satellite images to help farmers in monitoring and managing crops from planting to harvesting. EOFARM main objective is to launch in the market an innovative PF service which targets small farms (average size between 5-30ha), addressing a clear user need, and to enter in the emerging market of commercial applications of EO downstream services in agriculture, estimated to be worth approximately 43 million in 2015.
EOFARM is be based on:
- an innovative algorithm able to integrate the algorithm indexes derived from NDVI (Normalized Difference Vegetation Index), LAI (LEAF AREA INDEX) and OSAVI (Optimized Soil-Adjusted Vegetation Index) for the production of 3 different kind of maps at the same time: crop vigor maps, vegetation status maps, green leaf maps,
- free satellite data derived from the constellation Copernicus (sentinel 2) and Landsat 8
- Open Geo, an open source solution
See also: https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=204 [68]
**Practice abstract 54**

**Short title (native language):**
Pamcoba - Precision agriculture - Methodology for Cost Benefit Analysis

**Short summary for practitioners (native language):**

The Pamcoba project envisages the development and implementation of a comprehensive methodological approach that will facilitate the evaluation of adopting PA technologies, balancing expected initial investment, management costs and benefits. The methodology will support cost-benefit analysis related to PA and will embrace four sets of evaluation namely: (1) financial performance and risk (2) strategic impact, (3) effects on fields operations, (4) environmental impact and other social impacts. The four sets will be combined into a single Key Performance Index. The methodology will support a broad range of farm operations, covering arable crops, orchards, vineyards, field and field vegetables. The evaluation protocol will be applicable to all operations that have been reported to be implementable through PA equipment or solutions. As currently reported, PA (specifically VRA and CTF applications) apply to all on-farm operations from tillage to harvesting.

See also: [https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=1045](https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=1045) [69]

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**Practice abstract 55**

**Short title (native language):**
Open System for TRAcTOR’s autonomouS Operations (STRATOS)

**Short summary for practitioners (native language):**

STRATOS is an open ICT hardware-software infrastructure enabling partial automation of tractors and at the same time enhancing their operational safety and production efficiency. Furthermore it will have positive effects of reduced accident risk and environmental impact. STRATOS aims to develop and demonstrate new functions enabled by ISOBUS technology that allows a substantial improvement of the quality of the farming jobs. In more detail, ISOBUS and appropriate control strategies implemented as Task Controller modules, relying on appropriate information gathered on soil characteristics form a sensor network, are used to improve quality and precision of the farming task. Self-power and wireless sensors network characteristics make it possible to place sensors anywhere over the tractor and implement with very low installation effort. ISOBUS extension is also defined to include wireless node signals, therefore it was feasible to develop a wireless sensor network (WSN) ISOBUS compliant.

See also: [https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=1057](https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=1057) [70]

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**Practice abstract 56**

**Short title (native language):**

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

Short summary for practitioners (native language):

3D-MOSAIC project targets zone or tree individual production measures that shall trim down the environmental footprint of food production through enhanced resource efficiency. The application of ICT considering plant monitoring and spatial evaluation tools has a high potential to cope with this problem. 3D-MOSAIC captured a horizontal approach bringing together work groups with synergistic multidisciplinary expertise, facilities, and infrastructure. Experiments were carried out on economically important fruit trees (citrus and plum). Tree monitoring was carried out by means of manual rating, laboratory analyses, and automated 3D-MOSAIC sensors. For the automated plant readings, an autonomous platform was adapted to carry and control sensors (vision systems) and collect data from low-cost fruit sensors by wireless sensor networks in the orchard. As an important plant growth indicator, the leaf area was analyzed by algorithms for fast image analyses comparing 2D and 3D camera readings (3 RGB 1280x920 images with 60% of overlap (Bumblebee XB3), 2 Grasshopper 2 1600x1200 intensity (8bit) NIR Images) as well as LiDAR systems. Emerging sensors, capturing thermal imaging, NDVI and hyperspectral readings, were tested for measuring spatial canopy variation. Vis/NIR spectroscopy and multispectral backscattering imaging were employed on subsamples for approaching the fruit quality. Novel 3D-MOSAIC sensors for fruit analyses in-situ were developed, and advanced by means of robust calibrations based on physical models for photon transport in plum and citrus, as well as pip fruit and berries for comparison.

See also: https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=1061

Ambient Awareness for Autonomous Agricultural Vehicles (QUAD-AV)

Short summary for practitioners (native language):

Autonomous vehicles are being increasingly adopted in agriculture to improve productivity and efficiency. For an autonomous agricultural vehicle to operate safely, environment perception and interpretation capabilities are fundamental requirements. The obstacles that might be encountered in the field can be separated into four overall categories that should be detected and handled in different ways: positive obstacles, negative obstacles, moving people/animals/obstacles, and difficult terrain. Further, obstacles may vary greatly from situation to situation, depending on type of crop, fruit, vegetable or plant grown, curvature of landscape as well as other factors. Owing to the variety of situations and problems that may be encountered, no sensor exists that can guarantee reliable results in every case. Therefore the project will focus on the development of sensors and sensor processing methods to provide an autonomous agricultural vehicle with such ambient awareness (Safe Field Navigation). The "obstacle detection" problem will be addressed through 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.
See also: https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=1062

Practice abstract 58

**Short title (native language):**
Fusion of multi-source and multi-sensor information on soil and crop for optimised crop production system (FarmFUSE)

**Short summary for practitioners (native language):**
The main purpose of this project was to increase farm competitiveness by providing a system consisting of hardware and software that is both a support for better farming. The integration of data on soil, crop cover, pest, yield, topography and weather will furnish the farmers with ground truth decisions on applications of chemical fertilisers (e.g. N, P & K) and agrochemicals. End users (farmers and agronomists) have access to different layers of information and decisions via FMIS. Homogeneous application of fertilisers and agrochemicals is adopted by the majority of farmers worldwide. Variable rate applications are expected to result in increasing profitability, while reducing environmental impact by reducing amount of chemicals applied into the environment. Results showed that the on-line multi-sensor platform provide accurate measurement of key soil properties. The largest accuracy was reported for moisture content, organic carbon and total nitrogen. Moderate accuracy was reported for phosphorous, calcium, sodium, pH and cation exchange capacity. A new hybrid self-organizing map (SOM) and k-means algorithm for delineation of management zones maps showed better separation of clusters when compared with the standard k-means algorithm. The architecture of a FMIS was defined and a prototype is running. The cost-benefit analysis revealed FarmFUSE concept to be profitable to the partner farmers across the three experimental farms in Europe. Farmers’ feedback was positive about the project findings and supportive to become early adopters.
See also: https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=1065

Practice abstract 59

**Short title (native language):**
USability of Environmentally sound and Reliable techniques in Precision Agriculture (USER-PA)

**Short summary for practitioners (native language):**
USER-PA proposes a conceptual framework, an innovative technical architecture, and the enabling technologies that will integrate canopy and fruit sensors with mobile vehicles and wireless sensor networks and provide spatial data for high value crops (vineyards and apple orchards), and farm management information systems. The system will integrate sensing methods, including 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.
See also: https://smart-aks.com/SFCPPortal/#/app-h/technologies?techid=1066

Practice abstract 60

**Short title (native language):**
Real time disease outbreak prediction system (AgriFI)

**Short summary for practitioners (native language):**

AgriFI service, based on SynField product was tested and validated in the Hessische Staatsdomane Frankenhausen farm (320ha) provided by University of Kassel and the Vakola research farm (150ha) provided by MTT.
AgriFI service include disease prediction rules for a variety of crops cultivated across Europe, including cereals (wheat, barley), vineyards, potatoes, tomatoes, carrots, cauliflowers and cherry trees.
Main results: At the research farm of the University of Kassel three crops (potatoes, carrots & tomatoes) were grown in 2015 and 2016, accompanied by visual records of optional leaf diseases. Phytophthora infestans and Alternaria solani were monitored at potatoes in a cultivar trial, 2015 with low, 2016 with higher levels of infection.
Carrots and tomatoes were found with negligible symptoms of leaf diseases. Two serious obstacles caused negative impacts on the course and result of the project: (a) The exclusion of the coordinating partner after six months, technical support and maintenance of the system were afterwards suboptimal, (b) the failure of the sensor for leaf moisture measurements and missing automatic inspections of transmission rates and fixed levels of acceptable extremes.
See also: https://smart-aks.com/SFCPPortal/#/app-h/technologies?techid=1069

Practice abstract 61

**Short title (native language):**
Agroptima, “The Internet of Fields”: mobile farm management software

**Short summary for practitioners (native language):**

Agroptima is a simple and modern mobile APP and a cloud software tool for 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. The benefits for the farmer:
- Manage his farm efficiently from anywhere
- Save time by keeping records from the field, so when he arrives home most administrative
work is done
- Have real data to make better decisions
- Concentrate all his information in one single place
- Be more competitive, by identifying which crops, fields, machines or workers have better productivity. Improve decisions on his inputs, crop planning, investment in machinery, hiring, etc.
See also: https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=1070

Practice abstract 62

**Short title (native language):**
Future Internet – Orchards Automated Management System (FI-ORAMA) application

**Short summary for practitioners (native language):**

FI-ORAMA 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 main components of FI-ORAMA is the android application, the web application (hosted at fispace), and the PHP API developed to communicate with Orion, Orion context broker, the sensors, the external sources (openweathermap for forecast) and a MySQL database.

Through the mobile app, the user has full capabilities over the system and all the data produced are saved in a local SQLite database and then synced to the remote database. Then, when the user is finished, he can sync the data to the cloud. The prototype is available at http://oobsoftwarecy.com/FI-ORAMA/android/fiorama_1.0.apk and the installation guide and the user manual are available at http://oobsoftwarecy.com/FI-ORAMA/

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
* Decision Support System with a limited set of predefined patterns and the ability for user-defined custom patterns and alerts.
* 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.
* Dual user roles, farmer and agricultural advisors
* Ability to connect farmer and agricultural advisors for real-time advice, via email
See also: https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=1071

Practice abstract 63

**Short title (native language):**
Organic-AgriWare: an application for the organic agriculture community (Organic-AgriWare)
Short summary for practitioners (native language):

The problem that the project Organic-AgriWare wants to solve is the difficulty for organic agriculture stakeholders to access knowledge which is often dispersed at different online and offline locations. Organic-AgriWare focuses on organic agriculture and provides a unique access point to Organic Eprints and its entire open access scientific knowledge base. All recent publications on organic information, dissemination material and organic sector specific data will provide every user with a broad range of state of the art research information on issues that are critical to the everyday reality of the organic agriculture community. The Organic-AgriWare application could be used by anyone interested in organic agriculture, however, the targeted customer segments are agricultural advisors and organic farmers. Organic AgriWare is projected to be offered in a freemium model, with the free version offering the ability to receive information on organic agriculture and users will be provided with advanced search tools in order to access relevant content from research papers hosted in Organic Eprints. In premium version, users will be provided with tailor made scientific information based on their specific location, the crop type, the local climate and the current weather conditions.

See also: https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=1072

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Short title (native language):

Smart Good Agricultural Practices (S-GAP) application

Short summary for practitioners (native language):

The S-GAP system is an automated checklist system for compliance standards and including 2 applications: a) the android application for farmers for checking the various checklist after completed an action, and b) the web application that provides reporting from the checklist system. The prototype is a result of phase 1 in the SmartAgriFood project, whereas revised project objectives included determining good agricultural practices for a crop (sunflower) in Turkey as well as for crops (specifically spring wheat) for organic production in Denmark. The results show resource allocation profiles depending on the type of production, soil conditions, type of crops grown, etc. Necessary information is available to allow for sufficient traceability and checking of good agricultural practises.

The android application has been implemented at Kirklareli Soil and Water research Institute from Turkey and used at 2 test fields. The prototype is available at http://kpadltd.co.uk/sgap/sgap.apk and the installation guide and user manual is available at http://kpadltd.co.uk/sgap/help. The hard-copy documentation and online published checklists for compliance to standards was transferred into machine readable forms with a focus on organic farming. Guidelines on good agricultural practises were exploited and shared with the pilot farms and parts of the results and estimations were integrated and used for updating advisory tools for operations planning.

See also: https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=1075
**Practice abstract 65**

**Short title (native language):**
Field Readiness Indicator System (FERIA)

**Short summary for practitioners (native language):**

The readiness of a field can be broken down into Trafficability and Workability. Trafficability is the ability of the soil to support a given tractor and implement for an operation, without causing substantial or irreversible damage to the soil structure. Workability is the ability of the soil and crop to be in a state that it is suitable for given operation to work on it and produce quantitative and qualitative results while limiting any damage to the soil or crop. Based on the current research activities, we provide the modelling capability for predicting field readiness based on input data for soil characteristics, soil moisture level based on the soil moisture sensors in the field and accurate weather forecast. This solution has a great influence in the organic farming due to many field operations especially for mechanical weeding, as chemical herbicides are forbidden. In collaboration with Aarhus University and University of Athens, we have developed set of sensors and templates in that serve as an indicator system to support the decision of when and where a certain operation should be scheduled in order to be most productive and cause minimum damage to the soil.

See also: [https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=1076](https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=1076) [84]

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**Practice abstract 66**

**Short title (native language):**
Precision soil mapping

**Short summary for practitioners (native language):**

The benefits of precision farming (PF) - dividing land into management zones according to soil characteristics - has been proven to yield better results when compared to conventional farming. The perceived high entry cost into PF has long been a barrier to entry for some smaller arable farmers. This project aims to make the financial entry into PF more affordable whilst not compromising on the high resolution data required to produce meaningful soil management zones. This large-scale collaborative project aims to integrate satellite data with the UKs most comprehensive soil datasets to produce a precision soil map. The resultant map would present an economically viable alternative to the current labour intensive methodology of soil surveying and represents a opportunity for arable and vegetable farming to embrace precision farming. Growers will be able to increase yields with lower input costs and reduced environmental impact.

See also: [https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=1079](https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=1079) [85]
**Short title (native language):**
Services and Applications for Smart Agriculture Farm Financial Analysis App (ifarma-ffa)

**Short summary for practitioners (native language):**

Agrostis, develops and markets ifarma, an integrated Farm Management App for both individual farmers and farmer groups. ifarma-ffa is a tool for the individual or family run farm owners, to make informed decisions related to financial management of their business, taking into account cost and profitability analysis. ifarma is provided 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.

The aim of the proposed project is to make ifarma's financial analysis module available as an App on the FISpace platform utilizing FIWare technologies. The Farm's Financial Analysis (FFA) FISpace App, will provide an interoperable service in the FISPace platform receiving field, crop and cultivation task data and using existing ifarma module as a backend service will:

a) Display a profitability and cost analysis dashboard as a widget on the FISpace and
b) provide the resulting analyses as output via the FISpace platform for use by other Apps and services.

See also: [https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=1093](https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=1093)

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**Short title (native language):**
Integrated robotic and software platform as a support system for farm level business decisions (ROBOFARM)

**Short summary for practitioners (native language):**

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. Specifically, all modules of the systems will be involved (Economic Evaluation Module, Monitoring Robotic Vehicle Tool); software packages (Farm Management Information System - FMIS, middleware distributed system); Robotic vehicle; sensors to detect the weed patches, plant growth status and if available diseases, insects; wireless communication hardware to acquire data for the determined tasks by DSS and transmit data over the Internet. The Economic Module database follows the steps which are presented in the presentations of this link: [http://robofarm.unibo.it/final-demonstrat](http://robofarm.unibo.it/final-demonstrat).

See also: [https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=1099](https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=1099)
Practice abstract 69

**Short title (native language):**
User-centric adoption of sustainable farming operation involving ICT and robotics

**Short summary for practitioners (native language):**

This project will develop a novel lightweight, autonomous machine concept for economically and environmentally sound harvest of grass on lowland. 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. Additionally, the concept will be demonstrated in three countries under realistic field conditions, but following all current safety regulations. The proposed integrated ICT and robotics concept will in itself reduce the direct energy consumption as a result of the reduced machine weight and optimised driving patterns and logistics. It will reduce soil compaction significantly, which will increase yield and reduce the need for soil tillage which are the most energy demanding field operations. Also, the smaller and slower moving machinery will be more receptive to needs of nature, particularly the wildlife.

See also: [https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=1117](https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=1117) [89]

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Practice abstract 70

**Short title (native language):**
GREEN-GO

**Short summary for practitioners (native language):**

GREEN-GO will develop a suite of ICT-Robotics agromonitoring products, which will be simple, rugged and affordable. The products will:
- Fully and automatically monitor crop, soil and agroclimatic conditions, with flexibility for spatial variability
- Scout, geolocalize and quantify known problem spots or farm artefacts and peculiarities
- Manage where and when all the information above is gathered
- Feed all the information within an all-encompassing software where data are stored and interpreted on a crop-specific basis
- Aid farmers in their day-to-day choices on agronomic input and work on said crop

The products should reach the market in mid-2018 and we will then market them in EU and worldwide.

See also: [https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=1175](https://smart-akis.com/SFCPPortal/#/app-h/technologies?techid=1175) [90]
Short title (native language): Smart-AKIS Smart Farming Platform

Short summary for practitioners (native language):

Smart-AKIS Project has developed and still operates and maintains the networking and knowledge brokerage Smart Farming Platform offering a range of services to key stakeholders and end-users, including: knowledge sharing, communication and networking, testing and evaluation of Smart Farming Technologies (SFT) and matching between the supply and demand side. The Platform contains a series of SFT derived from (i) scientific papers of high Technology Readiness Level (over 4), (ii) research projects and (iii) commercial products. All of the SFT are presented in a Technology Card format where the SFT is described shortly accompanied by a representative picture and links to extra information in the web. In addition, there is also an evaluation of the SFT capabilities to optimise agricultural practices in terms of cost, labour, environmental impact, etc. The Platform provides also the option to the user to (i) assess each SFT according to his/her opinion in order to give feedback and (ii) use the message board to ask/suggest anything regarding the presented SFT. The Platform is available at: https://smart-akis.com/SFCPPortal/#/app-h/dashboard [91].

Project partners

**Contact person:** Spyros Fountas  
**Address:** Iera Odos 75, Athens, Greece  
**E-mail:** sfountas@aua.gr [2]  
**Phone:** +302105294035  
**Partner category:** Researcher

**Contact person:** Frits van Evert  
**Address:** Droevendaalsesteeg 1, 6708 PB Wageningen, The Netherlands  
**E-mail:** frits.vanevert@wur.nl [92]  
**Phone:** +31317480573  
**Partner category:** Researcher

**Contact person:** Andrea Knierim  
**Address:** Eberswalder Str. 84, MUENCHEBERG, Germany  
**E-mail:** akinierim@zalf.de [93]  
**Phone:** +493343282111  
**Partner category:** Researcher

**Contact person:** Maja Radisic  
**Address:** Dr Zorana Djindjica 1, Nov Sad, Serbia  
**E-mail:** radisic@biosense.rs [94]
Phone: +381214852605
Partner category: Researcher

Contact person: Adrien Guichaoua
Address: rue de Bercy 149, Paris, France
E-mail: adrien.guichaoua@acta.asso.fr
Phone: +33 (0)1 40 04 50 61
Partner category: Adviser

Contact person: Alberto Lafarga
Address: AVENIDA SERAPIO HUICI VILLAVA 22, Navarra, Spain
E-mail: alafarga@intiasa.es
Phone: +34948013040
Partner category: Adviser

Contact person: Klaus Erdle
Address: Eschborner Landstraße 122, Frankfurt, Germany
E-mail: k.erdle@dlg.org
Phone: 0049 (0 )6924788326
Partner category: Adviser

Contact person: Harm Brinks
Address: AGRO BUSINESS PARK 65, Wageningen, The Netherlands
E-mail: H.Brink@delphy.nl
Phone: +31620423895
Partner category: Adviser

Contact person: Borislav Brunet
Address: Bul.Mihajla Pupina 16, Novi Sad, Serbia
E-mail: borislav.brunet@vojvodina.gov.rs
Phone: +381214874418
Partner category: Other

Contact person: Maite Zarranz
Address: CALLE ZABALGAINA 3/1 OFICINAS 4 Y 5, Zizur Mayor, Spain
E-mail: mzarranz@iniciativas-innovadoras.es
Phone: +34948281270
Partner category: SME

Contact person: CEMA aisbl - COMITE EUROPEEN DES GROUPEMENTS DE CONSTRUCTEURS DU MACHINISME AGRICOLE
Address: Bd. Auguste Reyers, 80, 1030 Brussels, Belgium
E-mail: secretariat@cema-agri.org
Phone: 003227068173
Partner category: Other

Contact person: Fabien Valorge
Address: 73 rue de Saint-Brieuc, Rennes, France
E-mail: ouest@cuma.fr
Phone: 33299546315
Partner category: Other

Contact person: David Tinker
Address: CHANDOS ROAD 17, Ampthill, MK45 2LD, United Kingdom
E-mail: d.tinker@ntlworld.com
Phone: +441525750337
Partner category: Other

Contact person: Thanos Balafoutis
Address: 6th km Charilaou-Thermis Road, Thessaloniki, Greece
E-mail: a.balafoutis@certh.gr
Phone: 302311257651
Partner category: Researcher

Further details

Audiovisual material:
Smart Farming Platform

Source URL:

Links
[2] mailto:sfountas@aua.gr