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**Mainstreaming digital farming for a
Climate Smart Agriculture in Europe**



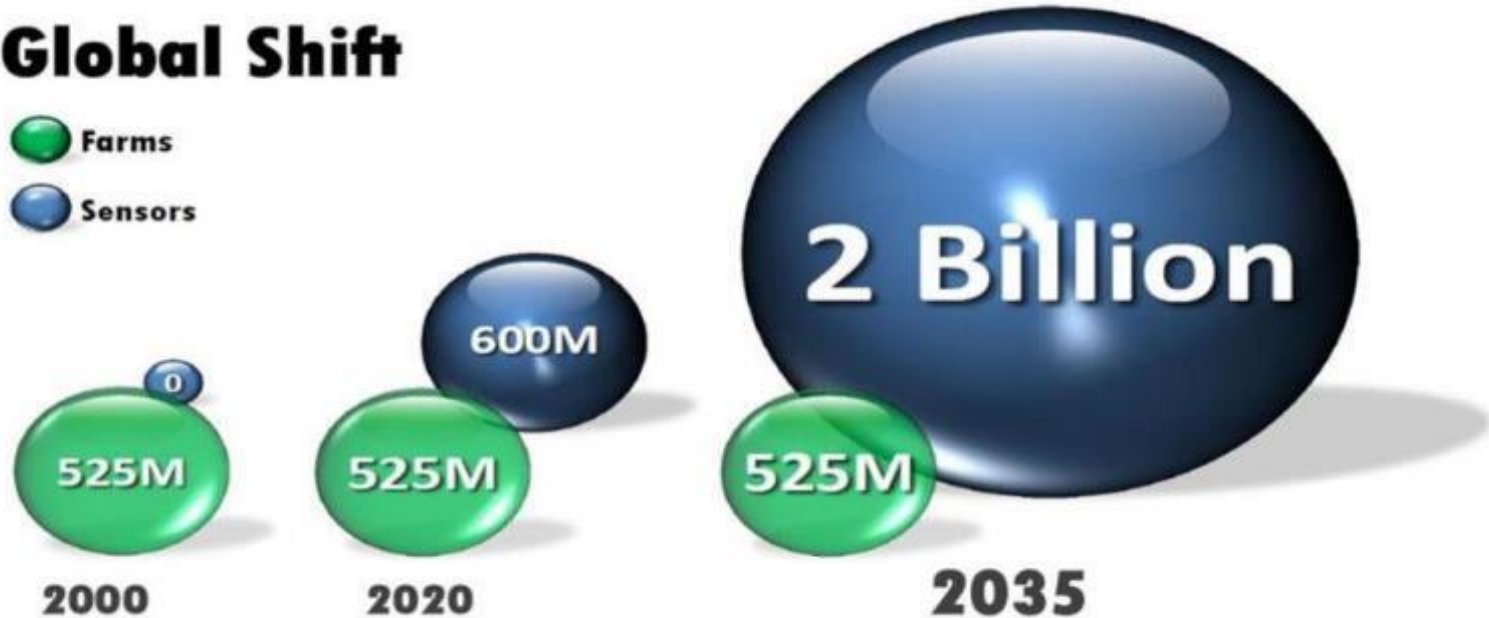
Harnessing Research and Innovation for FOOD 2030

Brussels, 16 October 2017

Volume of sensors in agriculture

Global Shift

-  Farms
-  Sensors



Data Need per Plant



0.5 kB/corn plant/year

2250 acres per 2 GB thumb drive

- Amazon charges \$0.36/GB/yr for storage.
- Raw data storage cost approaches \$300/yr for 5,000 ac farm with 10 years of data

Defining attributes for

- Leaf
- Ear
- Stalk
- Tassel
- Root Mass

0.85 kB/plant/yr

Growing Conditions

Crop + Soil + Weather + Irrigation



Image courtesy of Corn and Soybean Digest / Mitchell Farms

Precision Ag Data Generation - Today

Source: <http://bit.ly/1KUVVoR>

Image Data Need per Plant

Image Data Generation – Future

- 24 bits per pixel
- 2.0 cm/pixel
- 5 overflights/season
- 4.6 kB/plant of image data



Solutions



New Crop Varieties



Smart Crop Protection



Precision Agriculture



Internet of Things

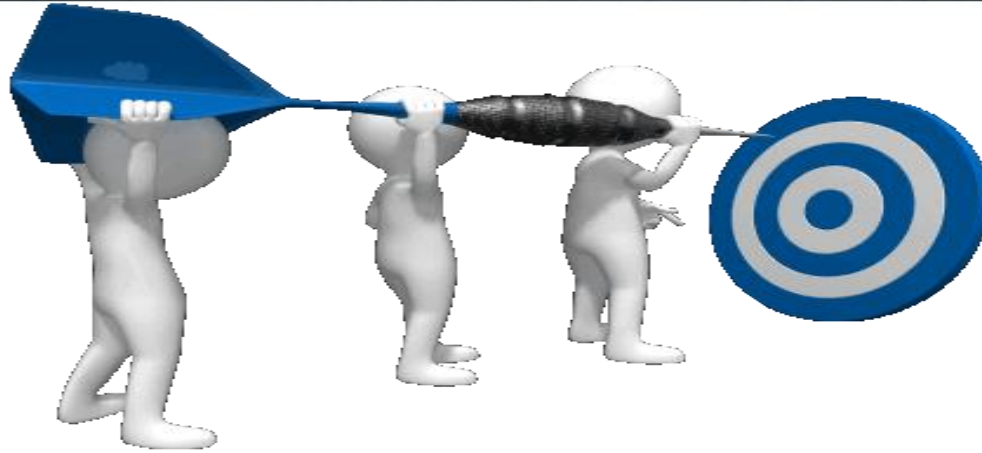


Remote Sensing



Big Data Analytics

Not an Easy task for the farming community



81% of the Danish and 78% of the US famers preferred to store the data themselves.

88% of the US famers preferred not to store the data in a shared Internet-based database explaining the reluctance of software vendors to push in this direction, which further emphasize the importance of farm data ownership.

(Fountas et al., 2005. Precision Agriculture 6, 121-141)

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

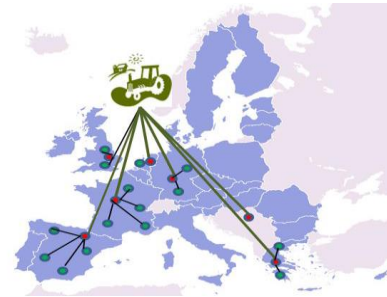


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THE **EUROPEAN UNION'S HORIZON 2020 RESEARCH
AND INNOVATION PROGRAMME** UNDER GRANT
AGREEMENT N. 696294

- **FOCUS:** Smart Farming technologies: Application of ICT into Agriculture, leading to a Third Green Revolution:
 - ✓ Information Management systems.
 - ✓ Precision Agriculture.
 - ✓ Automation & Robots.



- **APPROACH:** Involvement of a wide range of actors of the Agricultural Knowledge and Innovation Systems (AKIS) following a **“MULTI-ACTOR”** approach:
 - ✓ Farmers,
 - ✓ Research,
 - ✓ Industry
 - ✓ Extension Services / Consultants / Advisors.
- **PARTNERSHIP:** 13 partners from Belgium, France, Germany, Greece, Netherlands, Serbia, Spain and UK.

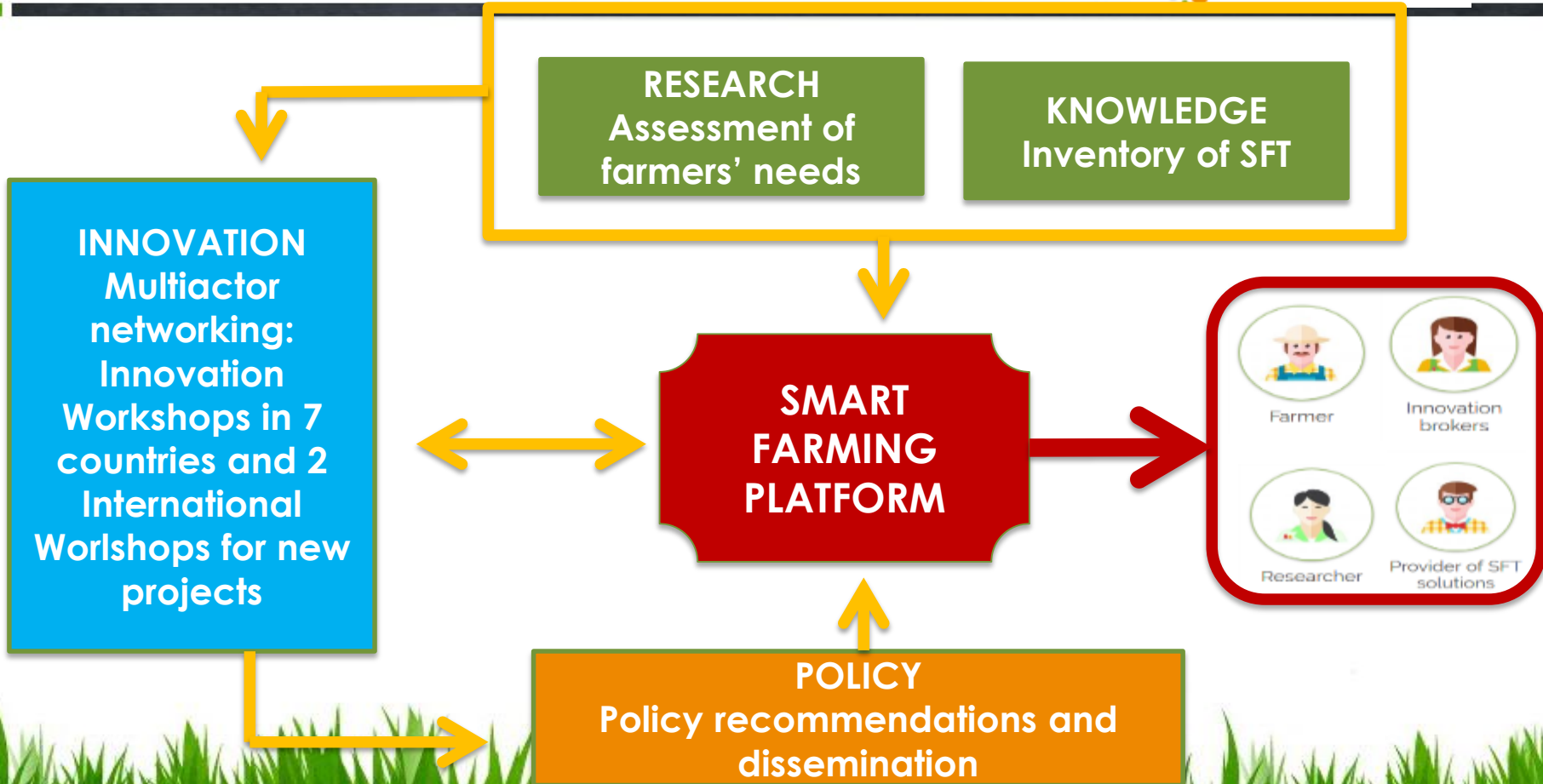


SMART AKIS PARTNERS:



- Response to the global food challenge of feeding more than 9 billion people in 2050.
- Sustainability (resource efficiency) and competitiveness (increased yield) challenges of the European agricultural sector, lagging on Smart Farming adoption.
- Technological, social, regulatory and economic factors hinder the widespread adoption of Smart Farming in EU.





ONLINE SURVEY created for MAPPING Smart Farming Technologies (SFTs): SMART FARMING PRODUCTS, PROJECTS & ARTICLES

- Tech category: Mapping, Variable Rate, Controlled traffic, Information management system & Robotics.
- Info: Specification of cropping systems, crop & field operation. Description and dissemination materials.
- Benefits: Environmental, yield and work conditions benefits.



Mapping of Smart Farming Technologies

Resume later Edit and clear survey Question Index

 smart AKIS
Smart Farming Thematic Network

SFT details

This SFT has the following effect on:

	Large decrease	Some decrease	No effect	Some increase	Large increase	If possible, please quantify percentage of change
Productivity (crop yield per ha)	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	
Quality of product	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	
Revenue, profit, farm income	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	
Soil biodiversity	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	
Biodiversity (other than soil)	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	
Input costs	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	
Variable costs	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	
Post-harvest crop wastage	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	

OPEN CALL to SFT providers (ag equipment machinery, SMEs, startups and spin-offs) and research community through CEMA, partners channels and Social media.

SMART FARMING PLATFORM as the main entry point for:

- Online survey available all along the project.
- SFTs compiled in tech database available from Jan. 2017 onwards.
- Users will be able to assess the SFTs according to innovation & interest.

Data entries:

- A total of >1250 entries in the platform
 - 800 scientific articles (from 13.000 initially screened)
 - 210 research projects
 - 240 commercial products
- 

- Alliances with consultants for better penetration and adoption. Smart farming as a service an emergent business model fits farmers' needs.
- Many instances report an increase in revenue and reduction in labour time
- Comparison and trends among commercial and scientific products
 - Research projects mainly focus on crop and soil scouting of crops
 - Product SFTs require more ha's compared to research SFTs
 - Adoption of commercial SFT fit for bigger farms, while research SFT are more prone to be used and experimented in smaller farms

FARMERS NEEDS & INTERESTS ON SMART FARMING:

1. Challenges important for farmers to be addressed with SFTs
2. Perception of farmers of SFTs as able to overcome challenges.
3. Information sources on SFTs by farmers.
 - 271 farmers interviewed following a survey of 129 questions.
 - 48% of them considered as SFT adopters.

	France	Germany	Greece	Serbia	Spain	Netherlands	UK	Total
Arable	21	25	10	16	8	26	16	122
Orchards	0	0	27	10	0	9	0	46
Field veg	16	2	4	0	4	9	4	39
Vineyards	10	1	27	10	16	0	0	64
Total	47	28	68	36	28	44	20	271

- Main challenges: Crop disease reduction & soil conservation
- Perception: High doubts about the ability to SFT to solve problems.
- 67% of the farmers had recently sought out information on SFTs.
- Most useful SFTs: 1) robots for monotonous work processes (e.g. weeding, hoeing, harvesting), 2) real-time diagnostics via drones, satellite imagery, or smart phone sensors , 3) integration of various SFT, and 4) data for information and decision support.
- Areas of improvement of SFTs: information (e.g. turning data into useable information, reducing complexity in data presentation), cost and size.
- Innovation ideas: Building, adapting, and adjusting machinery to improve work processes.

Identify innovation cases across the Innovation Hubs

- Step 1: Identify innovation cases from project partners
- Step 2: Select cases from a multi-actor selection body
innovations have already reached a certain level of implementation and a number of users. Practice partners are keen to cooperate in the case study
- Step 3: Analysis, further assistance of the selected cases



plantix

- Plantix selected innovation case from Germany
- the user takes pictures of the damaged plants and in return receives information about the respective problem
- 150,000 registered users
- 10,000 pictures every day

REGIONAL INNOVATION

- Holding of 3 multi-actor Innovation Workshops in France, Germany, Greece, Netherlands, Serbia, Spain and UK.
- General Framework & Guidelines of Workshops agreed and dates planned.

Goals:

- Give feedback to the SFT solution providers.
- Provide inputs to researchers for the definition of commercialization strategies.
- Generate innovative uses for SFT solutions.
- Foster the development of new SFT solutions.

Expected outcomes: MULTI-ACTOR PROJECTS



Barriers for the adoption of SFT:

- As expected, differences were observed among more advanced countries (Netherlands, France, UK and Germany) and countries with SFT less widespread (Serbia and Greece).
- Main barriers mentioned were:
 - Cost-benefit is uncertain
 - Difficulties in using equipment and lack of “Plug&Play”
 - Lack of specific subsidies and access to funding
 - Lack of compatibility among equipment (old one), systems and data formats
 - Need for adaptation to local context (size and topography of plots)
 - Lack of training and information, high speed of SFT development
 - Accurate data collection and reliability of data
 - Need for demonstrations on farm level (not at SFT level) and need for practical research
 - Data ownership

Incentives for the adoption of SFT

- Reduction of inputs
- Useful for complying with regulation
- Easiness of data recording
- Reduces labour and monotonous tasks

Interest in adoption

- In all hubs, farmers were eager to adopt new technologies, being in general more hesitant about digital platforms' usefulness.
- Their interest strongly depends on their farm type
- Results from early adopters could help laggards to make right decision (guinea pig syndrom!)
- Need for “ground truthing” for more than 1 season: network for benchmarking and international cooperation

Ideas generated for future projects

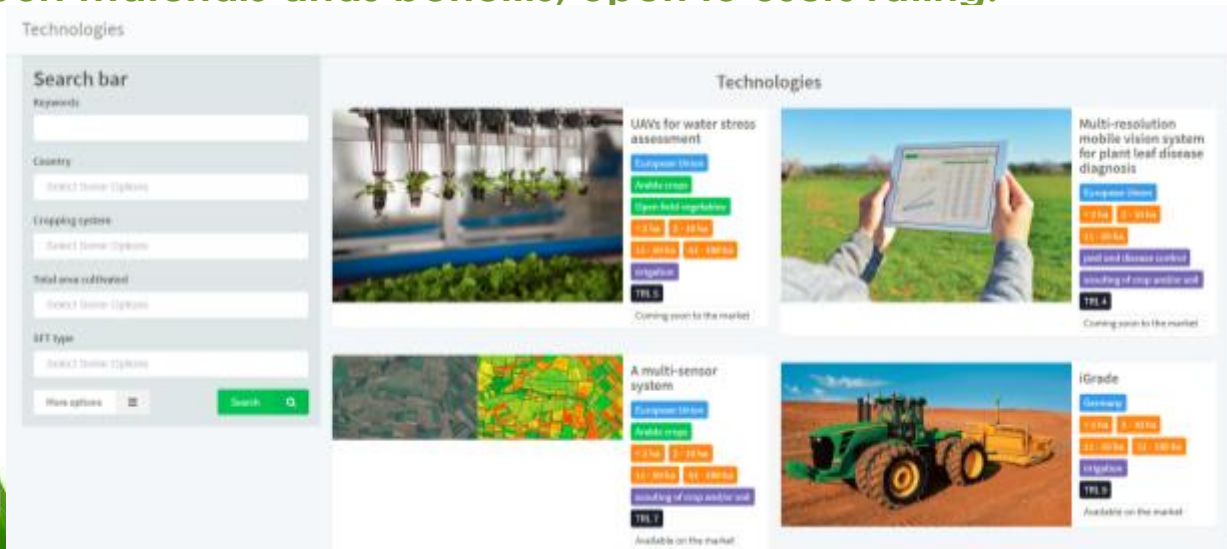
- 16 projects ideas just from the UK second Innovation Workshop!

FREE & OPEN ONLINE PLATFORM, main entry point for Smart AKIS SERVICES, embedded on webportal. Available from Feb. 2017 onwards.

Target Groups: Farmers, industry, researchers and advisers.

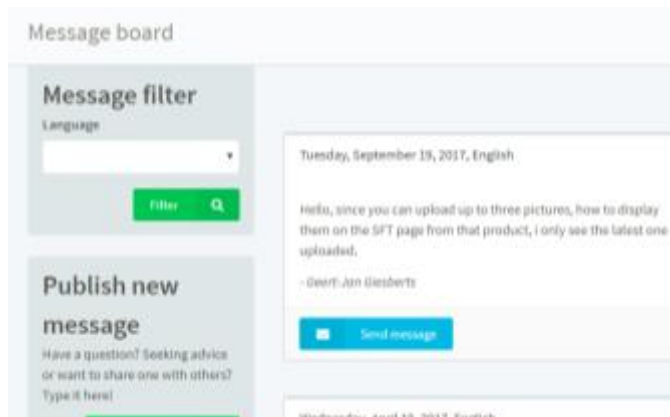
4 Services offered:

1. **TECH FEED:** Online survey for SFT mapping
2. **TECH BROWSE:** Searchable SFTs database. Results on Technology Cards with SFT info, support materials and benefits, open to users rating.



The screenshot displays the 'Technologies' section of the Smart Farming Platform. On the left, there is a search bar with fields for 'Keywords', 'Country', 'Cropping system', and 'Total area cultivated', along with a 'SFT type' dropdown and a 'Search' button. The main area shows a grid of technology cards. Each card includes a representative image, a title, a brief description, and a set of colored tags indicating various attributes like 'Equipment linked', 'Available online', 'Open field compatible', 'T1 to T4', 'Crop rotation', and 'Soil and disease control'. The cards shown are: 'UV's for water stress assessment', 'Multi-resolution mobile vision system for plant leaf disease diagnosis', 'A multi-sensor system', and 'iGrpde'.

- 3. **QUICK ASSESSMENT TOOL:** Survey open to Farmers and Advisory Services that will propose the most suitable SFTs following their needs, using a new algorithm.
- 4. **MESSAGE BOARD:** Open board for posts by registered users to be filtered by country, SFT and subject, open to be responded on the board or privately.



Please rate this technology

Question 1: Is this a useful innovation?

No

Maybe/Don't know

Yes

Question 2: Are you interested in this innovation?

Not at all

Maybe

Yes

Question 3: Do you know other people [colleagues, neighbors, ..] who would be interested in this innovation?

Nobody

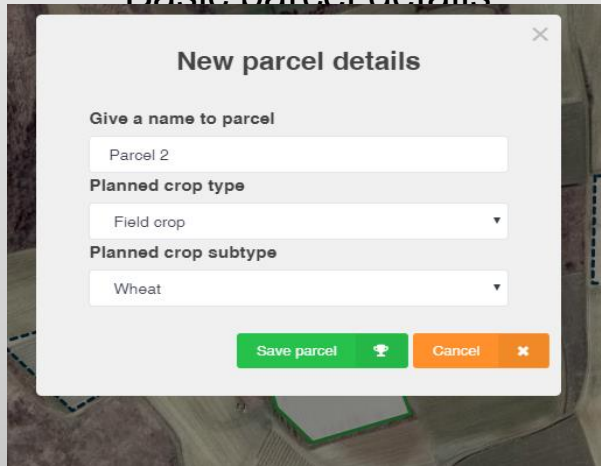
A few

Many

Farmers benefit from Smart-AKIS through AgriSens

New user

Basic personal information
Basic parcel details



New parcel details

Give a name to parcel
Parcel 2

Planned crop type
Field crop

Planned crop subtype
Wheat

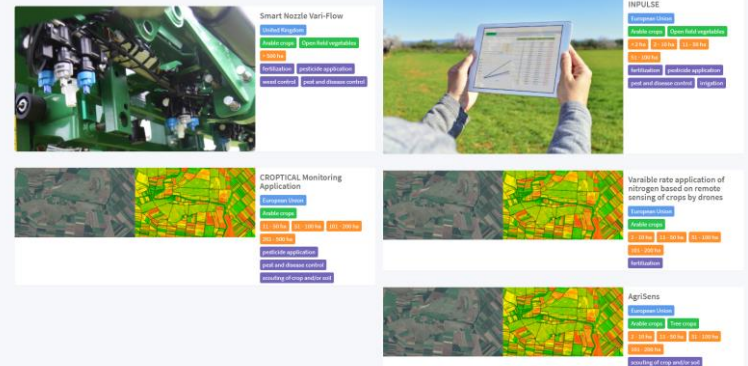
Save parcel Cancel

→ the platform automatically suggests relevant technologies

Already registered user updates farming

Tillage Planting Fertiligation Plant protection Harvesting Picture Note

After inserting new farming practice, the system will in real-time process new inputs and suggest technologies that can



Smart Nozzle Vari-Flow

CROPTICAL Monitoring Application

Variable rate application of nitrogen based on remote sensing of crops by drones

AgriSens

Success in first 2 weeks in Serbia



- **Total registered users: 616**
- **Total number of App downloads: 483**

Role of FOOD 2030 to move forward Smart Farming Applications

- Continue the multi-actor approach!
- Bring innovative digital solutions from start-ups closer to farmers
- Promote more research to link pre-harvest practices with the quality of end products
- Make the citizens understand the value/benefits from digitized farming for higher quality nutritional value and demand these solutions paying premium prices
- Link climate change events with plants and animal responses





Thank you for your attention!

www.smart-akis.com

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