D3.2. Smart-AKIS Regional Report

Dutch Innovation Hub

Document Summary

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Abstract

This report presents the results derived by the 3 Regional Innovation Workshops organised in the Netherlands.

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1. Executive Summary

- Description of the partners involved in the process at regional innovation hub level.
  The following partners were involved in the Dutch innovation hub: farmers, SFT providers, policy makers and researchers.

- Short description of the findings on the use of SFTs at regional level resulting from WP2 survey.
  Three important 'input' categories farmers need for their work are machines, supplies and information. SFT can contribute to at least 2 of these aspects of farm management:

    - More clever machinery (GPS, section control, yield maps, etc.)
    - Extra/new data (hyperspectral data about crop performance, yield maps, soil sensing data, etc.)

  SFT's from the first category are rather popular among farmers, many farmers use SFT's from this category. Almost every arable farmer uses auto pilot systems and every new sprayer has section control. SFT's from the second category have a different status, the benefits are often not clear, data management is time consuming and complicated. Here is the biggest challenge for farmers, advisers, researchers and the industry to improve on practical aspects of SFT's.

- Short description of SFTs selected from WP1 inventory.
  See table paragraph 2. The SFT's selected were mainly products already on the market and new products, still in development. More particularly, a mix of variable rate application, sensing information and farm management systems was presented. WR gave an overview of what's going on in research projects.

- Short description of the communication strategy followed to engage target groups.
  We invited SFT producers directly, by mail and telephone. We used the contacts in our own network, and in a joined effort with FEDECOM, branch organisation of the machine industry. Farmers were informed about Smart-AKIS through the DELPHY website and the DELPHY newsletters that we send to a few thousands of farmers in the different sectors.

- Summary of main findings from RIWs.
  All partners in the food chain have high expectation of SFT's. Technology development goes fast; implementation in practice goes at a much lower speed. Suppliers of SFT are focussed on the technology, where farmers look at/search for benefits in practice. Benefits can be comfort, cost reduction, higher yields, and better management. Documentation of the benefits and training for farmers in using SFT's can help to overcome this gap.

- Summary of main recommendations.
  Further uptake of SFT solutions in practice, especially the ones that are based on (new) data asks for actions on data validation and easier data management. Interpretation of (different layers of) data is also a point of attention. Training on the operation of SFT's in practice is also required, as many SFT's are time consuming and complicated. More information on the costs and benefits of SFT in different circumstances also can help to boost investments.

Dates and attendance of target groups to the three Regional Innovation Workshops:

Regional Innovation Workshops	Place and date	Nº of participants (and type)
1st RIW	Ede, March 9, 2017	40, a mix if farmers, advisors, researchers, SFT companies, policy makers.
2nd RIW	Wageningen, December 13, 2017	40, again a mix of farmers, advisors, researchers, SFT companies and policy makers
3rd RIW	December - March	In our second RIW we already covered the funding opportunities and selected ideas for new projects. Based on these ideas and funding opportunities we worked and till work on project proposals with farmers and SFT companies. We expect at least 5 proposals. Results are expected not earlier than in the second half of 2018.

Summary of the results of the Regional Innovation Workshops, following this table:

KPI	Result
Nº of stakeholders participating in RIWs	80
Nº of SFT solutions presented in RIWs	13
Nº of SFT solutions adopted by practitioners	?
Nº of project ideas captured	18
Nº of INNOVATION project ideas	*8*
Nº of TECHNOLOGY TRANSFER project ideas	*4*
Nº of MARKET UPTAKE project ideas	*6*
Nº of multi-actor projects funded	5
Nº of multi-actor cross-border projects started	0

2. Innovation Process

Communication Strategy

- Description of communication channels mix used to disseminate call to Regional Innovation Workshops:
  - Website: https://DELPHY.nl/?s=smart+akis
  - Newsletter: DELPHY Varia, a newsletter we frequently send to thousands of farmers in NL
  - Magazine: Oogst, October 3, 2017. One or two more articles to come.
  - Social media: Delphe Facebook and Twitter account
  - Presentation at other events: ATH (Agrarische Technology days Holland), EIP network event March 18, EIP network event Den Haag, September 17, NVTL (Dutch Society Technology in Agriculture), March 18.
  - Other organisation channels: none
  - Telephone calls to key target groups: several phone calls to members of FEDECOM (branche organisation of the machine industry, member of CEMA), policy makers for funding opportunities and presentations on regional workshop 1 and 2, SFT representatives of farmers' organizations.

- Registration tools used to register in advance participants to workshops (email, telephone, Google Form, etc.). People could register themselves on the DELPHY website through a link in the invitation.

- Additional communication activities carried out in order to ensure a high level of participation. DELPHY newsletters, through the network of DELPHY advisers and WR contacts.

Target Groups needs and expectations

- Findings from regional farmers' needs surveyed in WP2 that have been taking into consideration for:
  - The selection of the SFTs to be showcased in the RIWs. We considered the different sectors that were involved in the RW's, the needs mentioned by farmers and consulted the SFT producers.
  - The definition of the target groups to address on RIWs. Main target groups are farmers and SFT suppliers. As new project ideas and funding opportunities are also important in Smart-AKIS we also invited policy makers and researchers.
  - The definition of the programme or agenda of RIWs. Leading in definition of the program was:
    - Give feedback to the SFT solution providers to facilitate their innovations to reach the market by the localization to specific regional conditions or different uses or other innovative approaches.
    - Provide inputs to researchers for the definition of commercialization strategies for research based SFT not available on the market yet.
    - Generate innovative uses for available SFT solutions with grassroots level ideas and farmers' needs.
    - Foster the development of new or evolved SFT solutions taking into consideration grassroots level ideas and farmers' needs.
    - Gather ideas for national and cross border projects and research.

Selection of Smart Farming Technologies

- Description of the method followed to select Smart Farming Technologies (SFTs) of interest to the regional stakeholders. In the invitation for the meetings we asked SFT companies about their ideas for a presentation during the workshop. After this we had individual contact with the companies to fit their ideas to the goal of the meeting.
- Listing of SFTs presented at the workshops:

Nº	Name of SFT	SFT Category	Cropping system	Purpose
	Management software for precision agriculture Homburg	• Product	• Arable • Vegetables • Grassland	• Mapping/recording • Reacting/Variable rate technology • Guidance/Controlled Traffic • Farm management information system
	Apps for Agri, weather and soil data	• Product	• Open field crops in general	• Farm management information system
	MagGrow spraying technique	• Product	• Open field crops in general	• Spraying with low doses and with minimal drift
	Management software Dacom	• Product	•	• Farm management information system
	Precision spraying, WR	• Research results	• Arable and vegetable crops	• Variable rate technology
	Hyperspectral imaging, Airinov	• Product	• Arable crops	• Mapping • Variable rate technology
	Task map generator	• Innovation product	• All field crops	• Mapping • Variable rate technology
	IoT for irrigation management	• Innovation product	• All field crops	• Recording • Farm management information system
	Precision spraying	• Innovation product	• Arable and vegetable crops	• Precision spraying/Variable rate technology for pesticides
	Cloud farming	• Innovation product	• Open field crops in general	• Farm management information system
	Data management	• Product	• Open field crops in general	• Farm management information system • Variable rate application

Sources of funding for Project Ideas

Description of the sources of funding identified at regional and national level for the potential funding of multi-actor collaborative projects to be listed on the following tables:

Funding source – grants and open calls

Nº	Name of grant (and link)	Funding body	Geographical scope	Eligible projects*	Eligible beneficiaries	Eligible expenses	Aid intensity (%)	Coming deadlines	Other info
	https://www.pop3subsidie.nl/	Government	regional	Training and demonstrations	Farmers	Labour, investment, communication cost, materials needed	70-80	several	
	https://www.pop3subsidie.nl/	Government	Regional	Cooperation for innovation	Farmers and SME's	Labour, investment, communication cost, materials needed	35-70	several	
	https://www.pop3subsidie.nl/	Government	Regional	Operational groups	Farmers and advisors	Labour, investment, communication cost, materials needed	70-80	several	
	https://www.pop3subsidie.nl/	Government	Regional	Investments in specific machinery and equipment	Farmers	Machinery and equipment	40	several	

**General individual and collaborative R&D&I projects, agri-food specific R&D&I grants programmes, Operational Groups Calls under RDPs, Innovation vouchers for the purchase of external expertise, Proof of concept support for research results, Investment grant for equipment modernisation, Public procurement process.*

Funding source – financial instruments

Nº	Name of programme (and link)	Funding body	Geographical scope	Instrument category*	Eligible beneficiaries	Financial aid support	Coming deadlines	Other info
	MIT: SME innovation support Cooperation for R&D	RVO (Governmental organisation for Dutch enterpreneurs	National,& regional	Innovation support	SME's	35% of eligible costs	Per province 1 or 2 deadlines per year	
	MIT: SME innovation support 'Kennisvouchers'	RVO	Regional	Knowledge voucher	SME's	50	Per province 1 or 2 deadlines per year	
	MIT: SME innovation support	RVO	Regional	Feasibility study	SME's	40	Per province 1 or 2 deadlines per year	
	Eurostars	https://www.eurostars-eureka.eu/	International	R&D investment subsidy	R&D performing SME's	50	13-9-2018	

**Acceleration/incubation service for start-up, spin-off and entrepreneurs on agri-food sector, financial instruments: equity (seed capital), loans, warranties; crowdfunding platform, prize/challenge contest.*

Funding source – other instruments and tools for supporting multi-actor collaboration

Nº	Name of programme (and link)	Promoter body	Geographical scope	Eligible collaborations *	Eligible beneficiaries	Eligible expenses (if any)	Aid intensity (%)	Coming deadlines (if any)	Other info
			National, regional, local			• %			

**Own experimental programmes from advisory services, technical institutes, agricultural departments or farmers associations, coops or unions; agreements between advisors/technical institutes or farmers/coops and private companies to develop/demonstrate/test SFTs; peer-to-peer learning: early adopters support laggards in SFT uptake.*

3. Findings

3.1. Identification of barriers and incentives for adoption of SFTs

Main barriers for adoption of SFT's:

- Many SFT's are to complicate to operate, make it plug and play
- Costs are clear, benefits often are not. SFT with clear benefits are and will be adopted in practice. A good example is the use of auto pilot systems in arable farming and section control on sprayers.
- Lack of training for farmers that bought SFT's. Clear conclusion in the workshops was that there is great need of training. All companies selling SFT's agree, but don't have enough capacity to do so. Develop a national or regional SFT training program for farmers. Policy makers oft underestimate the need for training.
- Availability of fast internet in some of the rural areas.

3.2. Interest on existing SFTs – most demanded SFTs

- From data to side specific management, talking about:
  - Sensing data (hyperspectral images from crops, soil sensing data, etc.), zone identification, making prescription maps for different applications (soil herbicides, nematicides, organic matter, lime, NPK applications.
- Soil moisture sensors for different applications, IoT or other
- Decision support systems for crop protection, in combination with site specific application of pesticides based
- Data management, from data to information for farm management

3.3. Research needs in Smart Farming

- Validation of sensor data. More and more sensors are present in agriculture. Quality of data is not always sure, but is essential for farmers.
- Accurate as-applied maps
- Reliable yield mapping

For details see files Needs for research NL 1-3

- Cost benefit studies for SFT's. Attention and focus around SFT is on the technical opportunities. Farmers need information about results, how can SFT contribute to better economic results of their farm. This information is lacking in the current situation

3.4. Other relevant findings

There is a strong push strategy around the adoption of SFT in agriculture. We should work on a pull strategy, focussing on the question "how SFT can help farmers to find solutions for their problems and challenges?".

3.5. Potential collaborations identified

No.	Category of collaboration (Innovation, uptake or transfer: see definition in guidelines)	Related SFT	Cropping system	Short description of potential collaboration	Funding source matched with	Are you bringing this idea to Serbia?
1	Innovation uptake	Hypersp ectral imaging, site specific manage ment	Open field crops	More and more farmers acquire multispectral information about crop development. Handling of the data and transformation into prescription maps is rather complicated process. This process needs to be simplified for the convenience of farmers and advisors.		Yes
2	Innovation uptake	Several	Open field crops	Many farmers hesitate to invest in SFT, because they do not know which kind or brand of SFT will be beneficial and fitting best to their farming situation and how to use these SFTs. To encourage farmers to learn about the benefits, they need to have practical information at easy low cost access related to their farm situation and actual practical problems to solve to improve farming. By courses, training, workshops, mutual exchange of knowledge and demonstration, this problem can be solved. This will give impulse to forward thinking farmers to invest soon in SFT.		No
3	Innovation	IoT, soil moisture sensors	Fruit and other permanent crops	Smart irrigation. Ground water in large areas of South West of the Netherlands is not suited for irrigation because of high salinity. Tapwater sometimes is used for fruit crops, but is		Yes

				expensive. Smart irrigation, based on crop need, soil quality and crop development helps to optimize irrigation and reduce costs. This asks for a system using soil moisture sensors, measuring crop development, weather and climate data. The system can be further developed for other site specific measures like root cutting and fertigation.		
4	Innovation uptake	Data management	Open field crops	International exchange and documentation around the top 10 SFT applications in European open field crops. Focus on technical and economic aspects of the selected SFT's		No
5	Innovation uptake	Soil moisture sensors, IoT, soil management		Determine the optimal timing of soil preparation in spring with help of soil sensors (T and moisture content). Farmers should wait with soil preparation measures in spring until the field conditions are dry enough. For farmers with many different fields it is hard to monitor this 'by hand'. Sensors connected to internet could provide information about soil conditions and about the differences between all the fields. In this way a farmer has a DSS for where to begin first.		No
	Innovation	Site specific spraying in high resolution		Biomass or plant specific treatment of pesticides. First spraying machines come on the market that can steer every single nozzle. How can this technique be used in a practical way, taking in account the different cropping systems (potatoes, sugar beets, cereals, etc.). How to make a prescription map for this application? What input is necessary to optimize the use?		No

4. Recommendations

4.1. Sustainability and mainstreaming of Smart-AKIS results

The Smart-AKIS workshops brought together stakeholders around SFT's. During the workshops several ideas emerged and funding opportunities were presented. As a result of this we are busy with the development of project proposal for funding. Most opportunities are at the regional level.
We will not set up a permanent collaboration forum with the stakeholders. Stakeholders are organised in The Netherlands through FEDECOM and NVTL. There is no interest for yet another forum. DELPHY and WR both are member of NVTL and have a good network within FEDECOM.
National and regional Dutch policy officers show interest in Smart-AKIS and together we look how we can connect the Smart-AKIS agenda to the Dutch innovation agenda and how we can find opportunities for new projects. We will further promote and use the Smart-AKIS platform as it continues to develop and stays up to date with new developments about SFT' s in Europe.

4.2. Adoption of Smart Farming Technologies

To our opinion the two most important aspects for fostering the use of SFT's in The Netherlands are:

- Training activities for farmers that invest in SFT's, to help them to work with the SFT's and interpretation of the data.
- Documentation of the most relevant benefits of SFT's, making clear what SFT is relevant for what type of farm.

4.3. Strengthening Innovation in Agriculture

The funding opportunities for multi –actor collaboration are sufficient, to our opinion there is no need for other funding opportunities. The outcome of the Smart-AKIS inventory about farmers' needs and expectations should be shared with the national policy makers, as contribution to the update of the national innovation agenda's.

And the process of applying for project funding should be made simpler. Most farmers and also many companies are reluctant to participate because of all the bureaucratic rules before and the detailed reporting during and after project funding. ,

4.4. Smart Farming R&D agenda

- Validation of data from all types of sensors, so data are a reliable source of information for farm management measures.
- Cost benefit ratio, making clear that SFT's bring more money than they cost.
- Make SFT's plug and play. SFT's should help farmers to manage their farm in a better way. Specially SFT for crop management during the growing season, when farmers are very busy, should not take (too much) extra time. Time consuming SFT's are very discouraging for most of the farmers

5. Annexes

5.1. Minutes of the Regional Innovation Workshops

5.1.1. RIW1

SMART-AKIS 1st REGIONAL INNOVATION WORKSHOP
Ede, March 9th, 2017

Dates, venues and participants of the three workshops organised in March are presented in the table below:

Regional Innovation Workshops	Place and date	Participants (and group type)	No of SFT presented
Netherlands	March 9th Ede	46 (1/3 Industry, 1/3 research&advisors, 1/3 farmers)	8

Overview on the evaluation results in each country:

Regional Innovation Workshops	Interest	Organisation	Methodology	General comments
Netherlands	3.6	4.1	4.3	Put potential yield central instead of SFT and try to find out how and which SFT can help to reach this potential. SFT is a tool, not a goal

Top SFT selected for identifying potential transnational collaborative projects:

SFT	Netherlands
Prescription maps	X
Data management	X
Cloud farm	X
New spraying technique (based on magnatised spraying liquid)	X
Section control based on GPS	X
Soil sensors	X
Field mate 'internet of things' weather station	X
Autonomous weeder (onion and carrot)	X
Auto steering of machinery	X
Satellite images	
Multifunctional screes	

UAVs	
VRA	
Telecontrol in irrigation	
Crop protection	

Project ideas based on needs/barriers for identifying potential transnational collaborative projects:

Project ideas	Netherlands
Data valorisation: f.e. from data to prescription maps	X
Combine data from several sources	X
Soil scanning as basis for soil improvement	X
Create EU wide access to open source data	X
Demonstration 'online' (saving travel time)	X
Quality and production determination on field	X
Site specific input application	X
Early detection of pests and diseases	X
Controlled traffic farming	X
Harvest systems to lower labour	X
Moisture level in leaves	
Sensor for nutrient level in soil	
Sugar level determination in grape by drones	
Relation between farm size and SFT investment (ROI decision support tool)	
Regional version of Smart AKIS in the Balkans	
Training to advisory services in SFT	
Optimization of intra-plot design of irrigation system	
Irrigation in plots with slope	
Intra-plot fertirrigation	

RIW1 Detailed feedback

Please, provide feedback (tips, recommendations, what to do and not to do…) on the following:

- Procedure for organisation:
  - Selection of date, venue and logistics (rooms available, sizes…) Be sure to take a date that farmers are not busy in the field. We choose early March, that's ok for Dutch situation. Make sure that separate rooms are available for the group discussions
  - Description of communication channels mix used to disseminate call to Regional Innovation Workshops:
    - Registration tools used to register in advance participants to workshops (email, telephone, Google Form, etc). Participants could register on the website of Delphy. The address was mentioned in the invitation mail with a direct link to this page
    - Additional communication activities carried out in order to ensure a high level of participation. Information for the press, invitation through our own network and the network of specific contacts (farmers organisation, policy makers, branche of machine industry)
  - Tips and recommendations for other partners regarding workshop organisation. We did the first announcement a little more than 1 month before the meeting, sent the invitation and agenda two weeks before and a reminder 1 week before the meeting. Try to make clear what's in there for the different groups of stakeholders (why should they attend). Be aware that Smart AKIS is new for all of the people you invite and that there are many activities about smart farming.
- Conclusions on the workshop:
  - Participants:
    - ✓ Participation per actor group (farmers, companies, R&D)
    - ✓ General satisfaction on workshop and methodology: feedback from participants. Participants liked the presentations about specific SFT by the suppliers more than the general presentation about the result from the inventory. To my opinion, the inventory has disappointing results so far for the Dutch situation and therefore the added value from this part of the agenda was limited.
    - ✓ How have SFT been presented (presentations ppt, video, on field demo…). Which presentations have had more success? Mostly by ppt and video. Presentations that give clear information about a certain SFT and new/unknown SFT's had most success.
  - Discussion (already presented in the tables above, please revise them):
    - ✓ Needs identified. Needs are very divers, depending on the sector and the type of farm
    - ✓ Top SFT identified See table above
    - ✓ Potential project ideas Not too many clear project ideas, more general ideas. But you may not expect too much in this first meeting, the first introduction of SA to them.
  - Overall conclusions: We are satisfied with the positive reactions we got from the participants, especially from the SFT suppliers. But important to take an active role towards the stakeholders in order to make it clear that they can have a benefit from SA. In addition, quick replies on questions/remarks about the website are crucial in this respect. SA is there to support the interest of the stakeholders, not the other way around!

5.1.2. RIW2

SMART-AKIS 2st REGIONAL INNOVATION WORKSHOP
Wageningen, December 13

RIW2 Programme

Beste mensen,
We nodigen u hierbij van harte uit voor de tweede Smart-AKIS workshop op **13 december**, locatie Hotel de Nieuwe Wereld, Marijkeweg 5, 6709 PE in Wageningen. Tijdstip: 9-13.00 uur
Onderwerp van de bijeenkomst zijn precisielandbouw thema's waar ondernemers belangstelling voor hebben, maar waar ook nog veel vragen over zijn: hoe kan de teler meerwaarde generen uit de beschikbare data en technieken. Na een plenair deel gaan we de thema's in groepen uitdiepen en ideeën genereren voor praktijktoepassingen. Tot slot willen we kijken of de ideeën passen binnen subsidiekaders, zoals POP3, de onderdelen demonstratie & kennisoverdracht en innovatie bij samenwerking/EIP.

De onderwerpen worden in de groepen kort toegelicht door leveranciers van de technologie. Leveranciers die hiervoor interesse hebben kunnen dit vermelden bij aanmelding voor de bijeenkomst, er is nog beperkt ruimte hiervoor.

Aanmelden voor de bijeenkomst: https://DELPHY.nl/aanmelding-13-december-smart-akis/
Programma:

- 9.00 ontvangst met koffie
- 9.15 Start programma
- 9.35 Smart-AKIS, ontwikkelingen sinds de eerste bijeenkomst, toelichting op de website en de database met 'Smart Farming Technologies' in Europa, door Harm Brinks, DELPHY
- 9.35 Nieuwtjes van de Agritechnica, welke nieuwe toepassingen zijn hier geïntroduceerd en toelichting op de workshopthema's, door Herman Krebbers, DELPHY.
- 10.00 Welke subsidiemogelijkheden bied het POP programma, Kees Anker, Nationaal Coördinator EIP-Agri / Netwerk Platteland
- 10.10 Koffie en op naar de themabijeenkomsten
- 10.20 Start themaworkshops
  1. Spuittechniek en precisielandbouw, intro door P. Millenaars, Agrifac
  2. Van zone informatie naar plaats-specifiek handelen, intro door L. Bolderwijk, ABDrone/Dronewerkers
  3. Ontwikkelingen rondom Internet of Things, intro door C. van Strien, Atilas,
  4. Data management, intro door Jan Nammen Jukema, Agrometius
- 12.00 Plenaire terugkoppeling van de resultaten uit de groepen en afspraken over vervolg
- 12.30 Afsluiting en Lunch

Wie zijn uitgenodigd:

- Potentiële gebruikers: akkerbouwers, fruittelers, loonwerkers
- Leveranciers van precisielandbouwtechnieken
- Onderzoekers
- Beleidsmensen

Met vriendelijke groet,
Harm Brinks, h.brinks@DELPHY.nl
Herman Krebbers, h.krebbers@DELPHY.nl

Smart-AKIS:

Het Europese project Smart-AKIS wil de toepassing van smart farming technieken in de landbouw stimuleren. Belangrijkste activiteiten daarvoor zijn:

- het inrichten van database op internet met informatie over 'Smart Farming Technologie' die in Europa te koop is en waar telers snel en gemakkelijk gegevens kunnen vinden, www.smartakis.com
- bijeenkomsten met aanbieders van technieken en telers om wensen en knelpunten in de praktijk duidelijk te krijgen en ideeën te ontwikkelen voor nieuwe activiteiten en projecten om hiermee de toepassing van SFT te promoten.

RIW2 Power Point presentations

During the plenary session:

- Harm Brinks, DELPHY about Smart-AKIS, the website and the inventory and call to register more SFT's from The Netherlands. See also ppt.
- Herman Krebbers, DELPHY, impression from new SFT on the Agritechnica Hannover. See ppt for more information.
- Cees Anker, national coordinator Rural Development Program and funding opportunities. The actual situation in The Netherlands is that most of the provinces have funding opportunities for innovation projects and operational groups. Tender procedures are open ore will be open on the short term. For this reason we decided to include funding opportunities in the program. Many ideas were mentioned in the break out groups. The most promising ideas for project funding will be selected and we will identify the partners needed for such projects and the most promising funding opportunities. In fact, this is our RW3 instead of another meeting/brokerage event. Most interesting funding opportunities:
    - Project about knowledge sharing, training and demonstrations of proven techniques. Applicable for SFT with TRL 7, demonstration in operational environment.
    - Cooperation for Innovation. A funding opportunity for project about rather new SFT's with TRL 5 (technical validation in relevant environment
    - EIP/Operational Groups, projects dedicated to SFT's with TRL 6 (demonstration in relevant environment)

During the breakout sessions we discussed 4 precision agriculture themes:

1. From zone information to site specific application of inputs (pesticides, fertilizers, lime, organic matter). Introduction by Lex Bolderkamp, AB Drones and P. Mulleneers, Agrifac.
2. Internet of Things (IoT). What is IoT and what are opportunities for IoT applications in the near future. Introduction by C. van Strien, Atilas
3. Cloud Farming. What is cloud farming and how can farmers take profit. Introduction by Altjo Medema, DACOM

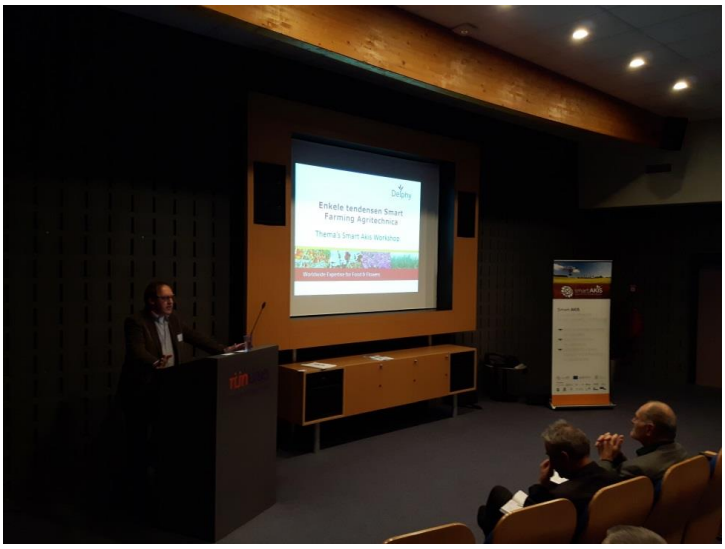
4. Data management. Farmers get more and more data, how can these data be managed for profit? Introudction by Jan Nammen Jukema, Agrometius, and G. J. de Kok.

Copies of the presentations will come later.

RIW2 Attendance Sheets

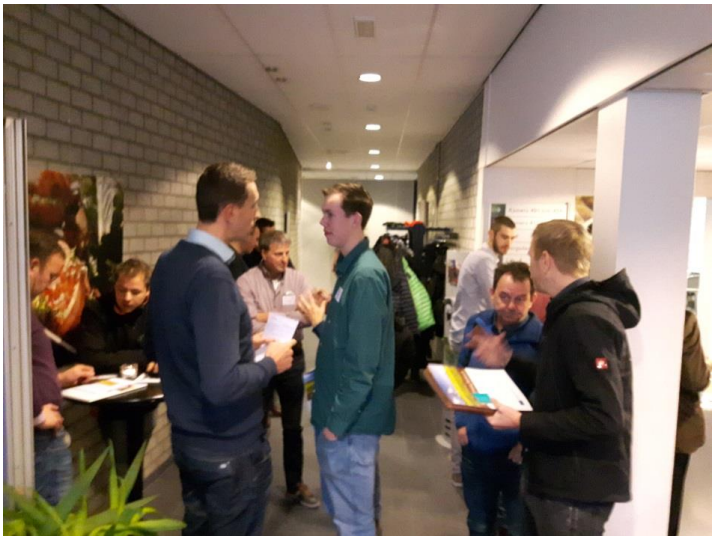
For confidentiality reasons, the list is not provided.

RIW2 Pictures



Herman Krebbers, presenting new SFT on Agritechnica

Break out group from zone information to site specific management



In the ‘walkways’

RIW2 Findings

Findings from the discussion about new ideas

After the plenary session we split up in four groups, each group discussing one of the themes mention earlier. Every session started with an 1 or 2 short inspiration presentations about the theme, by companies that have SFT’s on the market. The discussions were about project ideas for the theme at stake, but also several new ideas as well as barriers were mentioned. We also asked the people to think about the best possible funding opportunity (mentioned above).

A summary of ideas and barriers from the different break out groups:

Barriers:

- We see many different initiatives for data platforms, for example John Deere and Trimble have their own data platform. Exchange of information between the platforms is perhaps technically spoken possible but not convenient for farmers. And when farmers have machines/equipment from both companies it would be better that data could come together in 1 place.
- For farmers the added value of all these data is unclear. Focus is too much on data gathering instead of on creating added value on the data
- For certain management options different data layers are necessary, often on of the necessary data source is lacking, for example information about compaction below the top soil.
- For other applications just one data source is sufficient, for example biomass based dosing of haul killing in potatoes
- Broadband internet is a prerequisite for the operation of SFT in the field but is still not available in many rural areas. For many of the farmers present this was the strongest barrier to move forward with SFT in practice

- Quality of data. Sensors do collect data, the data are interpreted into pictures, but there is sometimes doubt if these pictures show the real situation. For example yield maps for several products are still unreliable.
- Costs of SFT's or the lack of economic analysis of the results of the application of SFT on SFT and on farm level. Sometimes the costs of SFT's are still (too) high, on the other hand farmers lack information about the financial benefits from SFT's.

  And from RW1:
- SFT often not easy to use, take a lot of effort to make it work in the field.
- 'Communication' between sensors, machinery, terminal and farm management systems should be standardised
- Make it plug and play for the farmer. Time is the bottle neck for a grower.
- Difficult for farmers to get access to subsidies due to complicated (EU) regulation and bureaucracy and administrative burden.
- Rules about flying drones and driving with autonome machines are tough.

Project ideas (some of them overlap)

- Combining and interpretation of data from different data sources/layers (i.e. yield map, soil scan, biomass pictures). Try to find correlations between different data sources and validation of these correlations in the field. Identify applications for SFT in practice
- Train farmers and advisors in the use of data gathered on a certain platform, for example the John Deere and Trimble platform. Make it more easy for farmers to use the data.
- Development of a data hub that can collect data from all kinds or sources and redistribute data to other parties that have the rights to receive these data.
- Create SFT demonstration farms, develop a SFT strategy for these farms, operate and demonstrate them. Collect and analyse economic data on costs and benefits of SFT (impact on yield and quality, input savings, labour savings, comfort, etc.)
- Many projects are still technology driven, develop a project based on what farmers want and then search the SFT's that can help and give assistance in making it work. Possible questions: optimize production within the strict regulation of EU Nitrate Directive (a real problem in some regions in The Netherlands), or how can I save on pesticide input.
- Soil compaction is a growing problem in Dutch agriculture. Especially the layer from 30-60 cm. The situation can differ from field to field and from zone to zone within a field. How can SFT help in imaging this problem and to solve this problem?
- Soil compaction can be measured with a 'penetro-logger'. In order to get good information many measurements should be taken in each field. The idea is to develop a robot for these measurements.
- Sensors, for example sensors that collect weather and soil moisture data, get cheaper and cheaper and have an internet connection. These data are important input for Decision Support Systems. Data can differ from field to field, so a sensor on every field really can optimize the outcome of DSS's. Idea is to start a project with a study group of farmers, they

install the sensors and within the group these data are discussed in order to optimise the use of the data for crop protection and irrigation management.

Automatic and zone specific irrigation management in fruit crops (apples) based on soil moisture sensors, connected to internet. Gather information about and test different sensors. Optimize coordinates of the spots where to place a sensor (identify different zones in the fields with help of crop or soil sensing techniques)

- More and more machines gather data, and machines get internet connected as well. This gives the opportunity to share these data directly. What kind of data become available and what can we learn from this type of data?
- Determine the optimal timing of soil preparation in spring with help of soil sensors (T and moisture content). Farmers should wait with soil preparation measures in spring until the field conditions are dry enough. For farmers with many different fields it is hard to monitor this 'by hand'. Sensors connected to internet could provide information about soil conditions and about the differences between all the fields. In this way a farmer has a DSS for where to begin first.
- Monitoring system for pests and diseases. Sharing data about pest and disease development in the region through internet can help farmers to optimize crop protection. These data can also be used as input for DSS's.
- Biomass or plant specific treatment of pesticides. First spraying machines come on the market that can steer every single nozzle. How can this technique be used in a practical way, taking in account the different cropping systems (potatoes, sugar beets, cereals, etc.). How to make a prescription map for this application? What input is necessary to optimize the use?
- Many farmers register crop data. Share all these data through internet/cloud farming and learn from each other.
- Apple counting by sensors. A prototype is developed, testing and further developing this prototype In practice.
- Some diseases are hard to determine in the field (for example bacterial diseases in seed potatoes and neck rot in onions). Develop a DNA based method for analysis that can be used on the farm (Bring the lab into the field). Such methods are developed in human health care)

Research

- Near Infra-Red is an interesting method for analysis. It is introduces for analysis of animal slurry. Interesting for site specific application of slurry. Problem is that the results are not reliable, more research is needed.

RIW2 Project Ideas

Project Idea 1

Category of project	Smart Farming Technology	Crop system
Choose between Innovation	*Choose SFT name following Inventory name and code*	*Choose from Arable*

Technology transfer ***Market uptake***	*Tree* *Vegetables* *Vineyards* *Grasslands*
Promoter/s name/s	
Short description of project	
Multi-actor collaboration needed	
Indication of the profile of partners sought after: ***Farmer*** ***Research*** ***Industry*** ***Advisory*** ***Others.*** ***Description of the collaboration sought after.***	

Project Idea 2

Category of project	Smart Farming Technology	Crop system
Choose between ***Innovation*** ***Technology transfer*** ***Market uptake***	*Choose SFT name following Inventory name and code*	*Choose from* *Arable* *Tree* *Vegetables* *Vineyards* *Grasslands*
Promoter/s name/s		
Short description of project		
Expected benefits		
In terms of yield, quality, diversity, .. categories from Smart-AKIS mapping survey.		
Multi-actor collaboration needed		
Indication of the profile of partners sought after: ***Farmer*** ***Research*** ***Industry*** ***Advisory*** ***Others.*** ***Description of the collaboration sought after.***		

RIW2 Evaluation

Information summing up the results from the Evaluation Form voluntarily filled in by participants.

An Evaluation Form in English is proposed but partners are free to tailor it to their needs and to use a local language form.

Interest	Average score	3.6
	More interesting presentations • 10 minute presentations from the stakeholders • Mc Grow spraying technique	
Organization	Average score	4.1
	Improvement areas • Coffee in the morning	
Methodology	Average score	4.3
	Improvement areas • Less presentations, more time for in depth discussions	
Smart Farming Technologies	Average score	3.3
	Top Smart Farming Technologies • Prescription maps • Data management • Cloud farm • New spraying technique (based on magnatised spraying liquid) • Section control based on GPS • Soil scanners • Field mate 'internet of things' weather station	
	Average rate of intended use of Smart-AKIS database	
Project Ideas	Average score	3.0

	Top Project Ideas • We didn't put a lot of attention to project ideas, more for the next meeting, a few things are mentioned: • Data valorisation: f.e. from data to prescription maps • Combine data from several sources • Soil scanning as basis for soil improvement • Standardize data between different suppliers • Create EU wide access to open source data • Demonstration 'online' (saving travel time)	
	Average rate of participants planning to take part on projects	>50%
Open suggestions	• Round table discussions were judged very positively • Work in small groups possitive • Too much arable, more attention for fruit crops • Focus on data implementation • Focus	

5.2. Research needs in Smart Farming

Needs for research from practice (EIP-Agri format) [1]

Title

Soil sensing data validation

This is the problem (summary in your language)

Akkerbouwers krijgen in hoog tempo de beschikking over meer data. Uit bodemsensoren (organische stof, pH, EC, bodemtextuur), gewassensoren (biomassa en stikstofopname), machine data (brandstofgebruik en bodemweerstand). Deze data vormen de basis voor managementmaatregelen. Voor veel van deze data geldt echter nog de vraag of de data klopt. Bodemsensing wordtd populair onder akkerbouwers, er zijn een paar types bodemsensoren op de markt. Onafhankelijk onderzoek is nodig om de data te valideren om als basis te kunnen dienen voor precisielandbouw maatregelen als plaatsspecifieke toepassing van organische stof, kalk, bodemherbiciden

Please briefly explain in your national language the problems you are experiencing in practice and which type of research (or knowledge) you need to solve them.

This is the problem (summary in English)

Arable farmers rapidly get access to more data. Data from soil sensors (pH, organic matter, EC, soil texture), crop sensors (biomass, N-uptake), machine data (fuel consumption, soil resistance). These data are the basis for management decisions. For these data the quality still is an issue. Soil sensing is getting popular amongst arable farmers, there are different types of soil scanner on the market. Independent research is necessary to validate the data, as basis input for precision agriculture. Measures like site specific application of organic matter, lime, soil herbicides.

Please briefly explain in English the problem that you are experiencing in practice and which type of research (or knowledge) you need to solve it.

Geographical scope

Austria — Europe

Please specify the geographical area/s where the need has been identified.

Keywords

Validation of soil sensing data

Agricultural sectors

- None - — Open field crops mainly

Choose the sectors your issue is relevant for (max.5 selections).

Additional information

Introduction of the application of smart farming technology goes slow ly. One of the issues is quallity of data. As long as farmers and advisors have good reasons to doubt the quality of data, this w ill hamper further introudction of smart farming

Please provide here any other relevant information concerning your initiative.

Attachments

When necessary, auxiliary files can be added

Needs for research from practice (EIP-Agri format) [2]

Title

Accurate as-applied maps

This is the problem (summary in your language)

Meer en meer precisielandbouwmachines zijn in staat om bewerkingen variabel uit te voeren aan de hand van een taakkaart. De meesten van deze machines kunnen daarna ook een as-applied kaart leveren, waar op staat hoe de taakkaart daadwerkelijk uitgevoerd is. Het blijkt namelijk dat de taakkaarten lang niet altijd zo uitgevoerd worden als gewenst, wat het gevolg kan zijn van een aantal oorzaken. Het blijkt ook dat deze as-applied kaarten niet altijd betrouwbaar zijn. Om de gebruiker in staat te stellen objectief te bepalen of zijn variabele toepassing het gewenste effect heeft gehad moet een betrouwbare as-applied kaart gebruikt worden en niet de invoer taakkaart. Er is daarom vraag naar duidelijkheid over hoe taakkaarten nou precies in de praktijk gebracht worden en hoe betrouwbaar de as-applied kaarten nou eigenlijk zijn.

Please briefly explain in your national language the problems you are experiencing in practice and which type of research (or knowledge) you need to solve them.

This is the problem (summary in English)

More and more precision agriculture machines are able to read prescription task-maps and use this information to do variable rate applications. Most of these machines also have the ability to produce an as-applied map, in which is indicated how the task-map is actually applied. It turns out prescription task-maps are not always executed as desired, which can be due to a number of reasons. Additionally, it turns out these as-applied maps are not always as reliable as desired. To be able to objectively assess the result of the variable rate applications, an accurate as-applied map should be used instead of an input prescription task-map. There is a need for research into how task-maps are translated to practice and the reliability of the as-applied maps, so that the user can determine reliably if the rates in his prescription map were correct.

Please briefly explain in English the problem that you are experiencing in practice and which type of research (or knowledge) you need to solve it.

Geographical scope

Austria

Europe

Please specify the geographical area/s where the need has been identified.

Keywords

As-applied
Variable-rate application
Crop care
Management efficiency
Assessment of measures

Agricultural sectors

- None -

Open field crops mainly

Choose the sectors your issue is relevant for (max.5 selections).

Additional information

Please provide here any other relevant information concerning your initiative.

Attachments

When necessary, auxiliary files can be added

Needs for research from practice (EIP-Agri format) [3]

Title

Reliable yield mapping

This is the problem (summary in your language)

Locatie gerefereerde opbrengstmetingen tijdens de oogst zijn essentieel om in kaart te brengen wat de invloed is geweest van de teeltmaatregelen die tijdens het groeiseizoen zijn genomen. Voor granen zijn redelijk betrouwbaar meetmethoden beschikbaar in praktijk, maar voor andere gewassen valt de beschikbaarheid en betrouwbaarheid van deze technieken flink tegen. Er is daarom onderzoek nodig naar betrouwbare meetmethoden om ook de opbrengsten van andere gewassen in kaart te brengen. Deze methoden moeten in staat zijn om de gemeten opbrengst te refereren aan de exacte locatie waar deze verkregen is. Hierdoor kunnen 1: verschillen in teeltmaatregelen in kaart gebracht worden en 2: verschillen in het perceel in beeld gebracht worden, die daarna desgewenst aangepakt kunnen worden.

Please briefly explain in your national language the problems you are experiencing in practice and which type of research (or knowledge) you need to solve them.

This is the problem (summary in English)

Geo-referenced yield measurements during harvest are essential in assessment of crop care decisions and their effectivity. Cereal yields can be measured relatively accurate, however yield measurement methods for other crops are often unreliable or even unavailable. There is a need for research into reliable yield measurement methods so that yields of these other crops can also be measured. These yield measurement methods should be able to relate yield to the exact location where this yield was obtained. This allows farmers 1: to assess the effectivity of the crop care decisions and 2: to identify zones in their fields which could require special attention.

Please briefly explain in English the problem that you are experiencing in practice and which type of research (or knowledge) you need to solve it.

Geographical scope

Austria European U

Please specify the geographical area/s where the need has been identified.

Keywords

Yield measurement
Intra-field variability
Effectivity assessment

Agricultural sectors

- None - arable crops

Choose the sectors your issue is relevant for (max.5 selections).

Additional information

Please provide here any other relevant information concerning your initiative.

Attachments

When necessary, auxiliary files can be added

Needs for research from practice (EIP-Agri format) [4]

Title

Reliable input measurements for PA

This is the problem (summary in your language)

Om precisielandbouw op de vierkante meter te kunnen toepassen zijn ook meetgegevens op deze schaal nodig. Agrariërs worden overspoeld met aanbieders van sensoren die claimen op dit schaalniveau betrouwbare metingen te kunnen doen. Hierbij ontstaat een tweeledig probleem.
Het eerste deel van dit probleem omvat het meetprincipe. Veel aanbieders meten namelijk niet direct de te bepalen grootheid, maar berekenen deze op basis van metingen van een indicator. Door de snelle groei van meetmethoden en het wegvallen van het Productschap Akkerbouw heeft de agrariër geen inzicht in welke meetmethoden betrouwbaar zijn en welke niet, met in acht neming van hun lokale omstandigheden. Er is dus vergelijkend onderzoek nodig dat de gegevens van deze sensoren vergelijkt met de echte waarde, om zo te bepalen welke sensoren betrouwbare meetgegevens leveren.
Een voorbeeld hiervan zijn de verschillende bodemsensoren die op dit moment gebruikt worden.
Het tweede deel van het probleem is de interpolatie van data. Vaak wordt er, om data te verkrijgen op vierkante meter niveau, geïnterpoleerd. Dit betekent dat er ‚zwart-wit gezien, data ‘verzonnen’ wordt om zo een kaart te krijgen met het gewenste detailniveau. De vraag is op welk detailniveau er gemeten moet worden om te voorkomen dat variatie ‘gemist’ wordt door de meting omdat er geïnterpoleerd wordt. Omdat dit per gebied kan verschillen dient er onderzoek gedaan te worden wat leidt tot richtlijnen per gebied, zodat efficiënt gemeten kan worden.

This is the problem (summary in English)

Square meter scale precision agriculture requires input data to be on square meter level as well. Farmers are constantly approached by companies claiming to have the sensors required to do accurate measurements on this square meter level. This causes a problem consisting of two aspects. The first aspect concerns the measurement technique used. Many companies do not directly measure the required quantity but measure a surrogate, which is correlated to the to be measured quantity. Due to the rapid growth of measurement techniques and the disapearance of the arable farming marketing board in the Netherlands, farmers no longer have overview on which measurement techniques are reliable and which are not, taking into account their local conditions. There is a need for research in which these measurement techniques are compared to the real value, so that a reliability and accuracy score can be given to each measurement technique. An example is the different soil sampling methods available in the Netherlands.
The second aspect concerns the interpolation of data. Often data is ‘made up’ by means of interpolation to be able to provide farmers with a square meter scale measurement map. The question is which measurement resolution is required to make sure no variation is missed and thus evened out by the interpolation techniques. As this can vary over different areas in the Netherlands, there is a need for research in which guidelines for effective measurement per area are established.

Geographical scope

Austria | EU

Keywords

Sensor
Measurement
Sampling
Interpolation

Agricultural sectors

- None - | Open field crops

Choose the sectors your issue is relevant for (max.5 selections).

Additional information

Please provide here any other relevant information concerning your initiative.

Attachments

When necessary, auxiliary files can be added

5.3. Project ideas from workshops

Create Project ideas [1]

Title (native language)

Slim beregenen

Title (in English)

Smart irrigation

Description

Grondwater in grote delen van Zuidwest Nederland is niet geschikt voor irrigatie van land- en tuinbouwgewassen vanwege het hoge zoutgehalte. Gebruik van leidingwater wordt in de fruitteelt gebruikt maar is duur. Beregenen op basis van gewasbehoefte, in afhankelijkheid van bodemkwaliteit en ontwikkeling van de fruitopstand is een manier om het gebruik te optimaliseren. Dit kan met een geïntegreerd systeem dat gebruik maakt van bodemvochtsensoren, gewasontwikkelling, en rekening houdt met weer en klimaat. Dit system kan worden uitgebreid met andere plaats-specifieke wortelsnoei en fertigatie.
Doel is optimaal beregenen tegen minimale kosten.
Problemen om aan te pakken:

- Meten van plaats-specifieke beregeningsbehoefte met bodemvochtsensoren en plaats-specifieke gewasgroei
- Aansturen van beregening op basis van bodem- en weer data

Innovatieve elementen:

- Plaastsspecifiek beregenen wordt in NL op dit moment nog niet gedaan.
- Sensoren zijn gekoppeld aan internet, data zijn input voor het model. Een dergelijke toepassing is nieuw voor NL

Doelgroep is fruittelers die op maat willen beregenen
Belangrijkste activiteiten:

- Testen en valideren bodemvochtsensoren
- Testen en valideren model voor beregenen

Please provide information in your national language to describe the background of your project (problems to be addressed, objectives, main activities, target groups, innovative elements of this action, expected results).

Description (in English)

Ground water in large areas of South West of the Netherlands is not suited for irrigation because of high salinity. Tapwater sometimes is used for fruit crops, but is expensive. Smart irrigation, based on crop need, soil quality and crop development helps to optimize irrigation and reduce costs. This asks for a system using soil moisture sensors, measuring crop development, weather and climate data. The system can be further developed for other site specific measures like root cutting en fertigation.
Goal is to optimize irrigation for minimum costs

- Problems to address:
  measuring site specific irrigation need with soil moisture sensors en measuring site specific crop growth
- Steering irrigation based on soil- and weather data

Innovative elements

- Site specific irrigation is new for The Netherlands
- Sensors are connected to internet, providing data for the model. This is new for The Netherlands

Target groups are all fruit growers with an interest in smart irrigation based on sensing information in an IoT setting
Most important activities

- Test and validate soil moisture sensors
- Test and validate irrigation model

Please provide information in English to describe the background of your project (problems to be addressed, objectives, main activities, target groups, innovative elements of this action, expected results.

Project coordinator is searching for…

Information on the new developments on soil moisture sensors/producers of these sensors
Partners in other fruit producing countries facing the same challenge
Partners with experience in smart irrigation in fruit crops

Provide information on what you are looking for (for example, specific expertise, partner in a specific location).

Geographical scope

Austria European union

Please specify the geographical area(s) where the project will (would) be implemented.

Keywords

Smart irrigation
Internet of Things
Soil moisture sensors

Agricultural sectors

- None - Fruits and other irrigated permanent crops

Choose the sectors the project is relevant for (max.5 selections).

Proposing person or organization

Harm Brinks, DELPHY

Include the name and address of the person or organization that proposes the project idea.

Contact E-mail

h.brinks@delphy.nl

Please provide the e-mail of a contact person for the project.

Expected starting date of the project

Month Jan Day 1 Year 2019

Expected duration

36

Please provide the expected duration of the project in months.

Additional information

Geographical scope will not be all Europe, but wider than just 1 country. All countries with fruits, where innovation in smart irrigation is a topic

Please provide here any other relevant information concerning your initiative.

Attachments

When necessary, auxiliary files can be added using this link.

Create Project ideas [2]

Title (native language)

Taakkaart generator

Title (in English)

Prescription map generator

Description

Please provide information in your national language to describe the background of your project (problems to be addressed , objectives, main activities , target groups, innovative elements of this action, expected results).

Description (in English)

More and more farmers acquire multispectral information about crop development. Handling of the data and transformation into prescription maps is rather complicated process. This process needs to be simplified for the convenience of farmers and advisors.
Project goal. The idea is to create an easy to handle prescription map generator for farmers, for precision agriculture applications.
Target groups are farmers and advisors in Europe who deal with data handling for making prescription maps for site specific field management.
Main activities:

- Identify and/or create prescription map generator
- Create an international user group for the map generator
- Test and develop the map generator
- Share experiences with the target group

Please provide information in English to describe the background of your project (problems to be addressed, objectives, main activities, target groups, innovative elements of this action, expected results.

Project coordinator is searching for…

Farmers and or advisers that are interested in simplifying the process of making a prescription map based on sensor data (yield mapping, soil of crop sensing data for example)

Provide information on what you are looking for (for example, specific expertise, partner in a specific location).

Geographical scope

Austria EU countries

Please specify the geographical area(s) where the project will (would) be implemented.

Keywords

Easy handling presription map generator
Sensing data

Agricultural sectors

- None - Crops generic

Choose the sectors the project is relevant for (max.5 selections).

Proposing person or organization

Harm Brinks, Agro Business Park 65, 6700 CA Wageningen The Netherlands

Include the name and address of the person or organization that proposes the project idea.

Contact E-mail

h.brinks@delphy.nl

Please provide the e-mail of a contact person for the project.

Expected starting date of the project

Month Jan Day 1 Year 2019

Expected duration

24

Please provide the expected duration of the project in months.

Additional information

Please provide here any other relevant information concerning your initiative.

Attachments

When necessary, auxiliary files can be added using this link.

smartAKIS
Smart Farming Thematic Network

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