D3.2. Smart AKIS Regional Report

UK Innovation Hub
East of England

smart AKIS
Smart Farming Thematic Network

Document Summary

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Abstract

Three Regional Innovation Workshops were held in the East of England. A total of 179 stakeholders attended. The first workshop included technical presentations and then discussion on factors affecting SFT use and many farmers attended. The second focused on soil and water research with some related presentations and discussion about possible (soil and water) projects. The third workshop had presentations from a variety of funders and was considered very useful.
Policy and Knowledge Exchange as well as technical/economic aspects are important for farmers considering SFT.
Workshops and demonstrations are important as well as farmer-farmer contact.

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1. Executive Summary

- The partners involved in the regional innovation hub.

The UK (East of England) based Smart-AKIS partner, David Tinker & Associates Ltd, a micro business supporting agricultural engineering R&D also runs the European Society of Agricultural Engineers with 2000+ members around Europe.
The UK workshop organisation was sub-contracted to AgriTech East who used their existing membership, experience and booking system. AgriTech East runs similar events on a regular basis. Informal links with the Agricultural and Horticultural Development Board meant that their staff attended all workshops, providing facilitators, as well as attending the TIW2 and the final conference.
AHDB is increasing the SFT based Knowledge Exchange programme that it has to UK farmers.

- Regional level findings on the use of SFTs from WP2 survey.

The East of England farmers surveyed were mainly arable with a few field vegetable growers and were mainly adopters of SFTs. Farmers in this area were the most likely to consider that SFT would help comply with regulations and would expect SFTs to reduce harvest losses. These farmers, although having a high SFT adoption rate were not optimistic that SFT improved income. The local farmers also, as others in Europe, rely upon local farmers for advice. These farmers were most interested in auto-guidance based systems with drones/mapping/aerial imagery also important. These SFTs formed the basis for the technical presentations in RIW1.

- The communication strategy followed to engage target groups.

A programme for each workshop was prepared in good time and placed on the AgriTech East website alongside the Event-Brite registration. Information and a link to registration was sent out to newsletters from relevant organisations as well as individual emails and personal contacts from DTA and others.

- Summary of main findings from RIWs.

Many incentives to SFT adoption were grouped into Expert Knowledge and Policies along with practical use focussing on early disease detection, reduced input costs, simplicity of operation, technical improvements and easier transfer of data and information to/from contractors.

Barriers were often seen from the same items as incentives. Expert knowledge and policies included risks whether economic, uncertain data and recommendations, lack of cost/benefit and technical information. SMEs being involved in so much development mean that integrating equipment/systems with established players may be poor. Practical barriers included lack of support for older equipment/systems, complicated systems, keeping up with new developments, unhelpful regulations (e.g. Visual Line of Sight for drones), public perception of advanced (intensive) farming, technical factors such as poor battery life, equipment cost and poor connect-ability between equipment and a lack of cost/benefit examples.

- Summary of main recommendations.

a) Determining which SFT should be developed cannot be solely a “bottom-up” approach from asking farmers their needs. With such hi-tech SFT being developed; demonstrations, presentations, exhibitions and workshops are needed as Knowledge Exchange to help farmers.
b) The workshop format worked well.

c) The funding workshop was poorly attended by farmers (not unexpectedly) and if there had been call open at the time then perhaps more businesses would have been focussed on preparing proposals.
d) Having a workshop for "Finding the Funding" was appreciated as it gave the funders the opportunity to see what other sources and opportunities were available.

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

Regional Innovation Workshops	Place and date	Nº of participants per group: users (farmers, coops and agrifood industry), SFT industry, research, advisors & others (policy, etc.)
1st RIW	Elveden, Thetford, Suffolk. 10 May 2017	Users, 32: SFT industry, 28: Research, 10: Press, 2.
2nd RIW	Cranfield University, Bedfordshire. 14 Sept 2017	Users, 28: SFT industry, 27: Research 25
3rd RIW	King's Lynn Innovation Centre, Norfolk. 22 March 2018	Users, 2: SFT industry and finance/business advisers, 25.

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

KPI	Result
Nº of stakeholders participating in RIWs	179
Nº of SFT solutions presented in RIWs	12
Nº of SFT solutions adopted by practitioners	12
Nº of project ideas captured	
Nº of INNOVATION project ideas	*3*
Nº of TECHNOLOGY TRANSFER project ideas	*2*
Nº of MARKET UPTAKE project ideas	*1*
Nº of multi-actor projects funded	0 acknowledged
Nº of multi-actor cross-border projects started	0 as yet (3 potential)

2. Innovation Process

Communication Strategy

- Description of communication channels mix used to disseminate call to Regional Innovation Workshops:
  - Website(s): EurAgEng, IAgrE, Agri-Tech East
  - Newsletter (emailed): EurAgEng, IAgrE, Agri-Tech East, AEA and requests to e.g. National Farmers Union, Agri-EPI, and others
  - Magazine: None known. Press release sent to relevant journals and local newspapers. Three journalists attended events and published articles on information from RIW1 and RIW2.
  - Social media: IAgrE and Agri-Tech East
  - Presentation at other events:
    - Flyers, banners and session presentation at AgEng conferences in 2016 and 2018
    - Various occasions (c.5) at AgriTech East events including "pollinator", REAP and members days.
    - Short reminders at IAgrE branch and national meetings
  - Other organisation channels: Agricultural and Horticultural Development Board, ADAS, CTF Europe, all presenters were also invited to spread the details.
  - Telephone calls and/or individual emails and/or personal contact to key target groups:
    - To 30+ farmers interviewed as part of WP 2 "Methodology and standards for assessing farmers' interests in smart farming technologies"
    - Personal contact with relevant organisations/stakeholders at machinery shows including LAMMA (x3), Cereals 201X (x3), CropTec (x3), Agritechnica (x1)

- Registration tools:
  Organising of the workshops was subcontracted to Agri-Tech East who regularly organise similar events (c. 15 "pollinator" events, 1 week of technical events, 1 conference each year) and have used the Event-Brite on-line booking system for bookings, reminder/final detail emails and follow-up emails.

- Additional communication activities carried out to ensure a high level of participation are all given above.

- Calendar of RIWs and number of participants.

Regional Innovation Workshops	Place and date	Nº of participants per group: users (farmers, coops and agrifood industry), SFT industry, research, advisors & others (policy, etc.)
1st RIW	Elveden, Thetford, Suffolk. 10 May 2017	Users, 32: SFT industry, 28: Research, 10: Press, 2.
2nd RIW	Cranfield University, Bedfordshire. 14 Sept 2017	Users, 28: SFT industry, 27: Research 25
3rd RIW	King's Lynn Innovation Centre, Norfolk. 22 March 2018	Users, 2: SFT industry and finance/business advisers, 25.

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 RIW1 was driven greatly by the responses from the WP2 survey however it was also necessary to avoid duplicating content being covered at similar events and exhibitions either shortly before (e.g. LAMMA) or after (e.g. Cereals 2017 -sprayer demonstrations and seminars) and also including the AgriTech East events already planned.
  - The definition of the target groups to address on RIWs were based around "technology to whet the appetite of farmers" for RIW1 so targeted farmers and SFT providers with other parties (e.g. AHDB and ADAS) to help facilitate the workshop discussions. For RIW2 the approach was to show an

integrated systems core based on the requirements for soil and water (irrigation) and to attract a mix of farmers, SFT suppliers and researchers. The RIW3 was aimed at attracting those, mainly start-ups, SMEs and business advisers looking for information on funding further SFT developments. RIW3 included a major manager from John Deere's European Technology and Innovation Centre to talk on projects, collaborations and more and was an attraction for all groups. Farmers and users did not attend significantly. An unexpected outcome was that the presenters from the range of funders were all interested to hear about other funding sources and their procedures.

- The definition of the programme or agenda for each RIW was based on the WP£ guidelines provided for each RIW and then modified as appropriate to the local organisation and interests. Detail structure for the RIWs was led by the experience of Agri-Tech East (for Eastern England) and David Tinker (for SFT, national and European aspects). A focus was always to provide a session that would attract people to attend and feel that they had something of value and be amenable to joining the workshop/breakout sessions afterwards.

Selection of Smart Farming Technologies

- The method followed to select Smart Farming Technologies (SFTs) of interest to the regional stakeholders was driven by the type of SFT that farmers had indicated was of interest during the WP2 survey. However, the experience of AgriTech East and David Tinker was also a factor in selecting speakers who were interesting and appreciated by the audience and would give a feeling of "value for money".
- Listing of SFTs presented at the workshops:

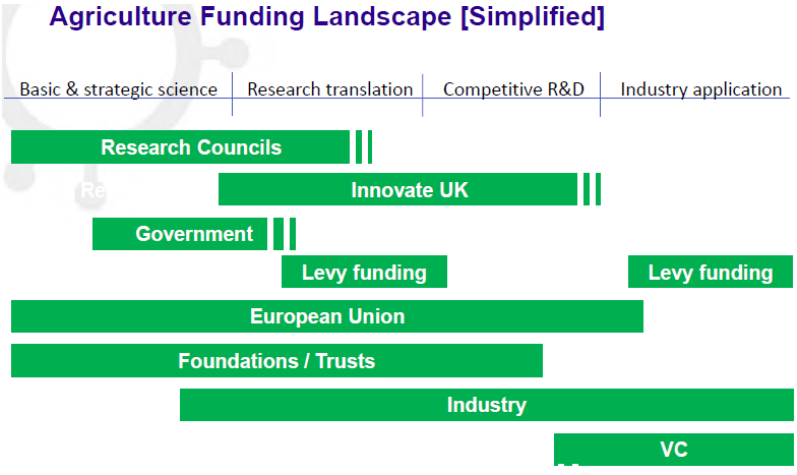
№	Name of SFT	SFT Category	Cropping system	Purpose
RIW1 1	Outfield - aerial imagery and analysis	• Product	• Tree crops (initially)	Mapping/quantifying flowers
RIW1 2	AgriVue - drone based images and analysis	• Product	• Arable and Vegetable	Plan nutrition, herbicide, drainage/cultivation
RIW1 3	Crop Angel drone	• In development particularly for legislation	• Arable and vegetable	Spot treatment with pesticide
RIW1 4	HexCam - drone based imagery	• Product	• Arable, vegetable, environmental	aerial imaging, surveying, mapping and inspection solutions
RIW1 5	Hummingbird Technologies	• Product	• Arable, vegetable	Aerial imagery analysis for crop management
RIW1 6	RTK Framing – auto-guidance correction	• Product	• Arable, vegetable	Provide auto-guidance to +/- 20mm year-on-year
RIW1 7	Omnia Precision Agronomy – agronomic solutions from data analysis	• Product	• Arable, vegetable, grassland	precision farming system using Multi-Dimensional Data Analysis
RIW2 8	National Institute of Agricultural Botany - research	• Research	• Arable, Vegetable, Grassland	Overview of measurement and analysis for farming decisions
9	Cranfield University: - partner in Crop	• Research	• Arable, Vegetable, Grassland	Overview of 2 (of 4) of UK's AgriTech Strategy research centres

	Health and Protection (CHAP) and Agricultural Engineering Precision (Agri-EPI) centres			
10	Soil-for-life	• Product/Research	• Arable, Vegetable, Grassland	Commercial/research knowledge exchange based "toolkit" for farmers to improve soil health, yield and agricultural sustainability
11	Delta-T-Devices – precision irrigation	• Product	• Arable, Vegetables, Trees	Sensors and systems for monitoring soil moisture for irrigation control
12	Precision Decisions – supplier of STs for variable rate	• Products	• Arable, Vegetable	Supplier of hardware, sensors, software for farmers to use FMIS and VR
13	Soil Moisture Sense	• Product	• Arable, Vegetable	Remote soil moisture and climate monitoring for decision support
14	Controlled Farming Europe	• Product (membership knowledge network)	• Arable, • Vegetable • Grassland	Support for members using or establishing permanent trackway CTF systems.

Sources of funding for Project Ideas

Funding is available from a variety of sources; mostly dependent upon the stage of product or systems development; whether still towards fundamental research or close to being commercially available. It also depends upon the type of body/collaboration requiring funding; public sector or commercial sector and the geographical area. The following are those involved at the RIW3.

The diagram below gives a simplified view of the sources of funding available within the UK against the level of research (TRL). (Taken from presentation by A Cureton, BBSRC). Levy funding relates to that provided through the Agricultural and Horticultural Development Board and VC is Venture Capital.



Funding source – grants and open calls

№	Name of grant (and link)	Funding body	Geographical scope	Eligible projects*	Eligible beneficiaries	Eligible expenses	Aid intensity (%)	Coming deadlines	Other info
RIW 3 1	Various calls www.gov.uk/government/organisations/innovate-uk including AgriTech Catalyst four AgriTech Centres, and Knowledge Transfer Partnerships See also https://www.gov.uk/government/publications/innovate-uk-delivery-plan-2017-to-2018 and https://apply-for-innovation-funding.service.gov.uk/competition/search	Innovate UK (Government agency)	UK and international involving certain developing countries	Must be business led, involve at least 2 partners and can include academic research. Various calls; including agri-food, open (all tech sectors), developmental	Businesses (SME and large), research organisations. Covers TRLs 3-7 only	Staff, equipment, travel and subsistence, project management	Variable depending upon closeness to market, size of business etc. Average figure of 50%	Variable	Popular but needs to be followed to catch specific calls.
2	Charitable supporting of agricultural engineering research and students etc www.dbt.org.uk See also www.afcp.org.uk/	Douglas Bomford Trust (a member of the AgriFood Charities Partnership)	UK and international e.g. PhD studies in UK	To individuals and organisations for e.g. studentships, university chairs, study visits, etc.	Organisations and individuals. UK connection, long commitment to engineering applied to agriculture and similar.	Travel, university fees, subsistence, etc	Variable; prefers part-funding,	Ongoing	
	Various e.g. Industrial Partnership Awards and "Stand-Alone" LINK https://bbsrc.ukri.org/funding/filter	Biotechnology and Biological Research Council (BBSRC)	Mainly UK; some developing country links.	Variety of grants to help promote fundamental research (may have been BBSRC funded) towards	UK company (or major UK links), collaborative with minimum 1 business		No more than 50% of project costs.	25 Sept 2018	

				commercialisation	and 1 academic partner.				
	European funding – still open for business! Organised through Enterprise Europe Network www.enterprise-europe.co.uk -Horizon 2020 -European Innovation Council Pilot (including SME Instrument and Fast Track to Innovation) -Eurostars	EC. Open to UK until end 2020 but negotiated settlement after then.	Various	Various	Most, SMEs, large businesses, academic and research organisations.		Up to 100%	Various	

**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
	R&D Tax Credits www.gov.uk/guidance/corporation-tax-research-and-development-rd-relief	HM Revenue and Customs	National,	Tax credits to offset against business expenditure on R&D related staff, equipment and expenses.	UK Businesses, large and small, working on innovative projects in science and technology.	Based on UK Corporate tax rate varied on company size etc.	Annually via submission of business tax returns	Not normally thought of as R&D funding but useful subsidy
	Business Angels https://angliacapitalgroup.co.uk/	Anglia Capital Group	East Anglia	Angel Investors in start-ups and early growth businesses with innovative technologies.	Innovative business. (Not just agri-tech sector)	Case by case		

**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
	Commercial and academic collaboration	Medium/large companies e.g. John Deere	National, international	Of benefit to major commercial partner	Case-by-case	Case-by-case	Case-by-case		Can lead to take-over

**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

Incentives were able to be grouped into Expert Knowledge and Policies. Regulations, traceability (including for assurance schemes) and public perception, subsidies, and involvement by SMEs and start-ups all can incentivise. Practical and in-field use around early disease detection, reduced input costs, simplicity of operation, technical improvements and easier transfer of data and information to/from contractors also act as incentives.

Barriers are often seen from the same items as incentives. Expert knowledge and policies particular includes risks. These can be economic, uncertain data and recommendations, lack of cost/benefit and technical information. Subsidies can be a barrier when they are not equitable across sectors, feeling amongst farmers that they could be "punished" either by public perception or economically if involved with SFT. SMEs being involved in so much development mean that integrating equipment/systems with established players may be poor.

Practical and in-field factors acting as barriers included lack of support for older equipment/systems, complicated, keeping up with new developments, unhelpful regulations (e.g. Visual Line of Sight for drones, chemical application), public perception of advanced (intensive) farming, technical barriers (e.g. poor battery life) and costs which can also lead to not being early-adopters, poor connect-ability between equipment and/or systems and an apparent lack of case studies including cost/benefit analyses.

3.2. Interest in existing SFTs – most demanded SFTs

As far as relevance is concerned the group agreed that an SFT has to be appropriate for the resources available, but they didn't show any strong bias to any particular SFTs or systems although drones, imagery and its analysis, crop status and soil moisture were the main topics discussed but followed on from a) the technical presentations and b) the area where we met is dry but suitable for field vegetables and sugar beet which ideally are irrigated.

Adoption and transfer caused a reasonable amount of discussion particularly around using networks for benchmarking and transfer of experience and research. There was some concern over potential jobs lost (needs to be balanced by number of openings for highly skilled technicians) and some discussion about de-regulation (and perhaps subsidies) where certain changes could help increase adoption rates although no definite examples were given.

3.3. Research needs in Smart Farming

There were many socio-type ideas discussed and, it could be considered that these are more appropriate for research discussion as technological solutions/developments will be raised by those closest to the need or to

a possible solution or new application of a technology.

Do we know how farmer behaviour and practice will change when info on SFTs is more available? What are good ways to promote Knowledge Transfer? Should research be manufacturer/supplier led? Or research led? Or farmer instigated? How best to develop new business models and value chains by new types and uses of SFTs? How better to commercialise technology? Will support roles (agronomist, equipment service and supplier etc.) change? Or even disappear?

There is the continual problem of how should researchers and government interact and how to minimise the funding gap for the good of the industry and getting SFT to the user. Should there be research into finding out why much of the current SFT in research doesn't become fully commercial?

Amongst ideas for practical / in-field-use were:
Need for ground truthing of SFT by linking innovators/companies/software developers with sufficient farmers to cover variety of soils and crops.
Determine what data is of most use to farmers and growers and pass to SFT developers to help target (more) appropriate innovation
Earlier detection (and response) to disease, weeds etc.
Further use of more on-machine-systems e.g. for blackgrass detection and immediate sprayer control that avoids separate imaging operation.
Continue research into localised and timely weather forecasting for farmers.
Consider whether different plant architectures, shapes, planting formats give better application results when using SFTs.
Improve the spectrum of cameras for more specific information and a popular one:
Develop autonomous vehicles.

With a more soil led discussion the following were common points.
Soil health and microbiology including effective use of nutrients by plants, root development, response to fertiliser, impact on taste (and nutritional value) of crops.
Effect of adding microbiology to hydroponic systems?
How can "smart technology" be used to measure soil health and microbiology?
Need to then link soil health to yield maps.
Related is the aspect of soil loss/erosion and the possibility of using Smart Technology to provide information to farmers to better their land for this and also improving soil capital.

3.4. Other relevant findings

The workshop, "Finding the Funding" was greatly appreciated by the various funder-presenters as they rarely get to hear about other funding opportunities and how these operate.

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	Socio-research	All	All	Improve understanding and paths for effective and efficient Knowledge Exchange between SFT suppliers, users and advisors	Pending (Levy funded, Innovate UK, EU)	Yes
2	Demonstration	Field sensors	Arable, vegetable, tree	Demonstrate use of low power wide area network for appropriate sensors. Commercial LPWAN system provider keen to use research project as demonstrator. Technical/commercial found.	Following up potential UK funding and collaboration e.g. Spain	Yes
3	Demonstration	Imagery	Arable, vegetable tree	Use information gathered from Smart AKIS farmer survey, innovation process and funding workshop to discuss with Smart-AKIS partner and prioritise project ideas and funding	Internal/VC/ Innovate UK / EC as appropriate	No
4	Farming "hub"	all	Arable, vegetable	Work with farms to benchmark, demonstrate and prepare cost-benefit for SFTs	AHDB just established "FarmBench"	No
5	Not all given. Includes soil drainage,	Not given (various)	Not given	The May 2018 workshop follow-up survey indicates that 9 attendees are discussing possible collaboration but still to finalise proposal and funding source	EC, Innovate UK, internal, BBSRC.	No

4. Recommendations

4.1. Sustainability and mainstreaming of Smart-AKIS results

The UK partner is a micro business and the owner, David Tinker, is aiming to retire when the Smart AKIS project is completed. He is in discussion with AHDB, an advisory body who have been involved with all the workshops informally, to take the results and build upon them for their benefit within the UK. One of the ideas from the RIW2, "farm hub" to demonstrate SFT and collect data for cost-benefit benchmarking, coincidentally, has been put into operation as the AHDB "FarmBench" business tool (https://farmbench.ahdb.org.uk/). AHDB have also been establishing a farmer Technical Advisory Group on precision farming.
Apart from attending, and assisting, in all the UK RIWs, relevant AHDB staff also attended the TIW2 and final conference.

The European Society of Agricultural Engineers (EurAgEng), which the UK partner ran, was involved with Smart AKIS for further dissemination and publicity of results and outcomes through conferences, newsletters etc. The operation of EurAgEng is being passed to a member of the CEMA secretariat, another partner of Smart AKIS, which will enable the continuing outcomes of Smart AKIS to be disseminated to the 2000+ EurAgEng members around Europe.

The UK subcontractor, AgriTech East, has indicated that they will work with several of the presenters that were involved with the Smart AKIS workshops, particularly those involved with funding. However, the strongest link is that AgriTech East and AHDB have a joint initiative to accelerate the adoption of agri-innovation in the field. A new joint position of 'Knowledge and Innovation Facilitator' has been created to help deliver a programme of new projects and strengthen links between farmers, researchers and industry, including SFT suppliers and developers.

The UK partner will encourage AHDB and AgriTech East, as well as the EurAgEng members at a special session during the AgEng2018 conference in Wageningen, to link to and make suitable use of the ongoing Technology Platform.

4.2. Adoption of Smart Farming Technologies

It is important to work closely with those organisations that are already known by the farmers and by the suppliers of SFT. The AHDB already has a strong network of knowledge exchange specialists and was informally involved with the UK's workshops. It is well placed to encourage further take up of SFT throughout the UK. In addition the AHDB is keen to be involved in research that would help knowledge exchange to be even more effective and efficient and to that end has initiated discussions to develop a suitable project.

4.3. Strengthening Innovation in Agriculture

The involvement of AgriTech East, as the organiser of the workshops, and with their network of members covering farming and growing, research, businesses both large and small, investors and others was arranged

as being a way to foster discussions amongst those interested in innovation-driven projects. Their remit is around the East of England and in due course similar organisations in other areas of the UK should be recruited.
One of the four AgriTech Strategy centres, the Agricultural Engineering Precision Innovation Centre, Agri-EPI, has been fairly recently initiated and has had some contact with Smart AKIS however further development of links is required which would require suitable funding so needing further discussion and collaboration.

4.4. Smart Farming R&D agenda

Short-term R&D:

a) Proving the cost-benefit and effectiveness of appropriate SFTs although this could be considered to be more "monitored demonstration" than R&D.
b) How to incentivise farmers to take up SFT especially if it, as soil health and erosion, can be considered for the public good. This may require measures within the CAP (and/or UK's replacement policy).
c) Need for ground truthing of SFT by programmes of research/validation involving innovators, companies, data analysts, researchers and farmers on a wide variety of soils and crops.
d) Earlier detection of weeds/pests/diseases for better use of pesticides (including by wider spectrum cameras/sensors).
e) Invariably better, more accurate and more localised weather forecasting
f) Autonomous vehicles. This is both short term, such as existing small weeders that seem to require appropriate legislation to be commercialised and, longer term, able to do more complex tasks.

Long-term R&D:

a) The RIW2 was focussed on soil and water management and the needs for R&D suggested by the four groups were quite consistently related to improving soil health, microbiology and erosion control including through sensing, data analysis and decision support. There are short term measurements and sensors that can be applied (earthworm counts is one www.sruc.ac.uk/info/120625/visual_evaluation_of_soil_structure) but for a comprehensive support tool for farmers this has to be considered as part of a longer term package.

5. Annexes

5.1. Minutes of the Regional Innovation Workshops

5.1.1. RIW1

SMART AKIS 1st REGIONAL INNOVATION WORKSHOP

"Smarter Not Harder: Open Innovation for Smart Farming"

UK

Elveden Village Hall, Thetford, Suffolk

10 May 2017

Appendix I Outcomes from breakout groups at "Smarter, Not Harder", Elveden 10 May 2017

David Tinker DTA Ltd / EurAgEng
9 June 2017

RIW1 Programme

The UK workshops are handled as a sub-contract of partner DTA / EurAgEng by AgriTech East. This independent, business-focussed cluster organisation, aims to improve the international competitiveness and sustainability of plant-based agriculture and horticulture.

Agri-Tech East brings together farmers and growers with scientists, technologists and entrepreneurs to create a global innovation hub in agri-tech. It has around 200 members and organises many similar workshops and events and a larger conference each year. Two UK member organisations associated with two Smart AKIS partners also promoted the event. These were the Institution of Agricultural Engineers (IAgrE), member of EurAgEng, and Agricultural Engineers Association (AEA), member of CEMA. Relevant contacts, including all farmers surveyed in WP2 had direct invites from DTA Ltd and other networks of advisers (AHDB, ADAS etc) on smart or precision farming also promoted the event.

Agri-Tech East

Event

Smarter, Not Harder: Open Innovation for Smart Farming

10th May 2017

Agenda

10:00 Registration and Coffee

10.30 Welcome and Introduction to SMART-AKIS

David Tinker, Secretary General, EurAgEng

Belinda Clarke, Director, Agri-Tech East

10.45 Presentations

AgriVue

CropAngel

HexCam

Hummingbird Technologies

Outfield

RTK

Omnia (Hutchinsons)

11:55 Panel Session

12:10 Lunch

12:55 Workshop

Breakout groups to consider ideas for new or evolved smart farming solutions using aerial imaging

14:00 Feedback from groups

14:30 Closing comments

In partnership with

smart AKIS Smart Farming Thematic Network

This workshop is the presented in partnership with Smart-AKIS, the European Network for Smart Farming. Smart-AKIS is conducting a pan-European survey to better understand what technology farmers are looking for, this provides a requirements specification for entrepreneurial companies looking to enter Agri-Tech. This workshop will provide an opportunity to discuss this further with farmers and producers, inspired by a number of quick-fire presentations from companies.

RIW1 Power Point presentations

A link to PowerPoint presentations will be included when the presenters are happy to make their presentations available on-line. The following is a quick report by Agri-Tech East.

"We enjoyed an overview of the current status of remote monitoring, sensing and precision farming at the recent *Smarter Not Harder: Open Innovation for Smart Farming event,* held in partnership with Smart-AKIS.

Quick fire presentations from 'old hands' such as RTK, who have seen rapid adoption of their technology which increases the precision of controlled traffic farming, through to new comers such as Outfield .

Aerial imagery start-up Outfield aims to offer a cost-effective drone service for farmers.

Orchard aerial image

Oli Hilbourne, Director of Operations says: "We are developing remote sensing data systems to increase farm efficiency. Current development work is focused on building tools for government land use audits and on estimating yields of fruit crops. However we are also looking to apply algorithms to disease detection in potatoes and arable crops."

Using lightweight drone aircraft, Outfield can scan up to hundreds of hectares of farmland per day, processing that data in the cloud to find answers to questions such as:

- Which of my apple trees will under-perform this year?
- Is the foliage cover of my potato crop adequate for this point in the season?
- Do these areas of pollinator seed meet my environmental obligations?
- Year to year, how is blackgrass spreading across my farm?
- Does my lettuce crop require thinning?

Oli continues: "Our particular focus is on computer visual recognition systems, drawing conclusions from remote sensing data faster and with more precision than the human eye. We are always looking to connect with new development partners, both commercial growers and researchers. If you want to find out more, please get in touch!"

Outfield joined AgriVue, Crop Angel, Hexcam, Hummingbird Technologies, Hutchinsons and RTK at the event.

A report for members is coming soon."

RIW1 Attendance Sheets

Attendance was through registration on the Agri-Tech East website using links from emails and Newsletters to drive potential attendees. Registration was done using Event-Brite only. It allows a maximum of registrants and a closing date to be set (registration was closed with 75 registrants accepted by May 4). Event-Brite also enables follow up by email to registrants 1 or 2 days before the event as a reminder, to provide directions, updated program details and a link to a list of expected attendees. The email list was used to thank attendees the day following the event and will be used to give attendees a report of the event, particularly of the break-out groups, and access to the presentations. The attendance sheets, below, were initialled by attendees (initialling is quicker, easier and enables a simpler form).

Email addresses have been captured during the on-line registration. Sixty-nine attended in total, 65 of the 75 registrants (the fine weather deterring some to be complete field-work etc) with four extras. Two Journalists attended. A press release in February went to appropriate trade and regional press and was in at least one article in a regional newspaper. This would have provided more publicity for the event.

Attendees were:

Farming	17
Equipment/service suppliers	28
Advisory	15 + 2 journalists
Research and related Business development	10

Some attendees were missed; others represented more than one group (e.g. farmer and supplier).

Actual scanned sheets with names have been removed.

RIW1 Pictures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RIW1 Findings

On top of the multi-actor collaborations that are to emerge from the RIWs, other outputs were expected as a result of bringing together stakeholders into the RIWs. One of the overall objectives of Smart-AKIS is to capture these outputs in order to produce recommendations for fostering the penetration of SFT in Europe.

This section provides a number of headlines, covering different aspects that emerged in the discussion in the three break-out groups. The information below is a short summary and a fuller coverage, with topics grouped together and simplified/expanded where appropriate is given as **Appendix I**. Each group had a facilitator and rapporteur. Because of the fine weather some attendees left early to do field operations, particularly chemical application, or to respond to customers. Tape recording wasn't tried as previous experience by Agri-Tech East showed that it can inhibit group members from becoming fully involved.

Findings regarding the needs and ideas identified in WP2

Given that several surveyed farmers and growers attended there would expect to be strong correlation between Report D2.2 and the break-out groups. However, as the Technical presentations centred on drones, image analysis and using the results this has biased the attendees to focus more on the "needs" from a view of using drones/imagery/analysis. The Appendix shows that "needs" can be grouped into Expert Knowledge such as showing that science and practical knowledge must correlate with recommendations; ground truthing is key for confidence and giving value.

Several aspects based around data collection from imagery and sensors show that although this is important for decision making it needs considerable care in use including that advisors have sufficient expertise. Data ownership is still considered an unanswered question.

Practical, in field-use shows that data and results is useful and can enable improved systems (e.g. CTF) but it needs to integrate fully, be timely and machines and systems need to aid operational improvements.

Ideas were much fewer, "seeing" what is going on underground with roots, how does cultivation influence crop growth and how to control the weather

Identification of barriers and incentives for adoption of SFTs.

Incentives were able to be grouped into Expert Knowledge and Policies. Regulations, traceability (including for assurance schemes) and public perception, subsidies, and involvement by SMEs and start-ups all can incentivise. Practical and in-field use around early disease detection, reduced input costs, simplicity of operation, technical improvements and easier transfer of data and information to/from contractors also act as incentives.

Barriers are often seen from the same items as incentives. Expert knowledge and policies particular includes risks. These can be economic, uncertain data and recommendations, lack of cost/benefit and technical information. Subsidies can be a barrier when they are not equitable across sectors, feeling amongst farmers that they could be "punished" either by public perception or economically if

involved with SFT. SMEs being involved in so much development mean that integrating equipment/systems with established players may be poor.
Practical and in-field factors acting as barriers included lack of support for older equipment/systems, complicated, keeping up with new developments, unhelpful regulations (e.g. Visual Line of Sight for drones, chemical application), public perception of advanced (intensive) farming, technical barriers (e.g. poor battery life) and costs which can also lead to not being early-adopters, poor connect-ability between equipment and/or systems and an apparent lack of case studies including cost/benefit analyses.

Relevance of SFTs regarding needs and ideas identified in WP2

The groups were much more interested in the technical/operational needs and often agreed strongly with the experts in D2.3 such as reducing inputs, reducing costs and needing to be easy-to-use (simple) and have good cost-benefit ratios. However, the groups didn't discuss the socio aspects such as education, farm-size, age or even cropping system. It is clear from the amount and type of discussion in the groups that farmers (and their suppliers and advisors) are very interested in the developments of SFTs but are concerned, and perhaps wary, of the risks involved (cost, time spent learning, keeping up with technology, being a first adopter and similar).

Relevance and interest on adoption and transfer of presented SFTs, ranking of the highest scored SFTs

As far as relevance is concerned the group agreed that an SFT has to be appropriate for the resources available, but they didn't show any strong bias to any particular SFTs or systems although drones, imagery and its analysis, crop status and soil moisture were the main topics discussed but followed on from a) the technical presentations and b) the area where we met is dry but suitable for field vegetables and sugar beet which ideally are irrigated.

Adoption and transfer caused a reasonable amount of discussion particularly around using networks for benchmarking and transfer of experience and research. There was some concern over potential jobs lost (needs to be balanced by number of openings for highly skilled technicians) and some discussion about de-regulation (and perhaps subsidies) where certain changes could help increase adoption rates although no definite examples were given.

Potential new uses for existing SFTs.

As such there were no potential new uses for existing SFTs. There were many where developing the scope of existing SFTs could benefit existing problems (soil moisture, earlier detection of blackgrass and other weeds and diseases. Yield potential modelling for "normal" crops rather than as current for high-value crops and correlating soil data with yield data. The use of collected data for wildlife interactions and environmental uses that affect farmers significantly such as the badger-Bovine TB

issue, flooding and also the availability or lack of, of the DEFRA maps (Dept of Agriculture and Rural Affairs – approximating to a Ministry of Agriculture) for
Many of these ideas and points are likely to be in current development and a thorough review might show that they are available, although perhaps not commercially (in the UK).

Potential inputs for research.

There were many socio-type ideas as well. Do we know how farmer behaviour and practice will change when info on SFTs is more available? What are good ways to promote Knowledge Transfer? Should research be manufacturer/supplier led? Or research led? Or farmer instigated? How best to develop new business models and value chains by new types and uses of SFTs? How better to commercialise technology? Will support roles (agronomist, equipment service and supplier etc.) change? Or even disappear?
There is the continual problem of how should researchers and government interact and how to minimise the funding gap for the good of the industry and getting SFT to the user. Should there be research into finding out why much of the current SFT in research doesn't become fully commercial?
Amongst ideas for practical / in-field-use were:
Need for ground truthing of SFT by linking innovators/companies/software developers with sufficient farmers to cover variety of soils and crops. Determine what data is of most use to farmers and growers pass to SFT developers to help target (more) appropriate innovation
Earlier detection (and response) to disease, weeds etc. Further use of more on-machine-systems e.g. for blackgrass detection and immediate sprayer control that avoids separate imaging operation.
Continue research into localised and timely weather forecasting for farmers and consider whether different plant architectures, shapes, planting formats give better application results when using SFTs. Improve the spectrum of cameras for more specific information and a popular one: develop autonomous vehicles.

RIW1 Project Ideas

Given the time and mix of attendees no Project Ideas were pitched. There may be some discussions going on in the background between various attendees about working together. A recent members-only meeting of Agri-Tech East allowed members to request and offer facilities for cooperation. Commercial farmers at this event were all very willing to offer crops and land for trials. The Smart AKIS pitch was to offer a way of collecting knowledge and disseminating results as well as attending the RIW1. THe second RIW will be held at a Univerisity and the current aim is to have more of a research focus, even involve some more potential funders, and to show off the new research facilities just being providedwhich, amongst other aims, will enable the development of new types of sensor for a wide variety of crops and growth stages. It will be appropriate to encourage project ideas at that event although it's know that many ideas will not be discussed openly in public. Te RIW2 will be followed by several Agri-Tech East meetings, including the Agri-Tech Week and REAP conference that will enable many follow-up conversations to RIW2.

RIW1 Evaluation

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

Interest	Average score	3.8/5
	All similarly scored. “Use of data”, “technology in farming especially drones”.	
Organization	Average score	4.4/5
	Improvement areas – None suggested	
Methodology	Average score	4.2/5
	Difficult to hear when all groups were discussing. Particular comments: ”Great format”, “Liked quick presentations”.	
Smart Farming Technologies	Average score	4.1
	Top Smart Farming Technologies: Use of data; Weed/disease identification; Mapping ; Drone use; CTF	
	Average rate of intended use of Smart AKIS database	3 used; 3 not used
Project Ideas	Average score	3.5
	Top Project Ideas	Funding, Collaboration
	Average rate in (% over all RIW attendees) of attendees planning to take part on projects	Not determined.
Open suggestions	Knowledge Transfer; getting ideas and technology more widely used.	

APPENDIX I

Outcomes from breakout groups at "Smarter, Not Harder", Elveden 10 May 2017

These points are developed from the notes taken at the three breakout groups during this event. The points have been combined, grouped and simplified. The groups included farmers, SFT suppliers, advisors, researchers and others and the comments here reflect this mix.

SFT – Smart Farming Technologies is a combination of Precision Agriculture, Farm Management Information Systems and Robotics/Automation and based on ICT applied to agriculture.

1) Needs and ideas

NEEDS

1) Expert knowledge

- The science, agronomy and farmers' expertise must correlate with recommendations from imagery
- Trust is needed between farmers' knowledge and data from the technology (imagery or other sensors)
- Need to codify current knowledge for so many players e.g. agronomist, equipment supplier etc.
- Transfer ideas from other industries e.g. recording apples based on cancer cell counting software!
- Ground truthing is key to give confidence in product and/or recommendations
- Ground truthing, for the most value, should be repeated e.g. throughout the season, not just once

2) Data collection from imagery and sensors.

- Collate current PA knowledge via a tool (database, inventory) for main players e.g. agronomist, equipment supplier, etc. *[see e.g. Rothamsted Research's CROPROTECT* https://croprotect.com *]*
- Collected data provides the opportunity to improve decision making -
- But care needed on how best to interpret the collected data
- It needs expert validation to influence in-field applications
- Do agronomists have right skills to interpret data?
- Better soil thermal & moisture measurement for crop stress / water management
- Soil probes have removed much guesswork and -
- Can lead to Precision Irrigation (but tech not yet available). *[Need to visit NZ to see available tech!]*
- Needs to interface with Internet of Things (to collect and better use all data sources)
- Need more cross fertilising into ag from other sectors e.g. using drones in oil & gas sectors
- A National data set of (good) data. Enabled with a Uniform Numbering System for every field
- Need to know who owns what data, including DEFRA's mapping
- Need systems that aid analysis and amalgamation of the data
- Generally how up-to-date does (different sorts of) data need to be for various field operations?

3) Practical and In-Field Use

- Imagery and other data need to, and can, improve the accuracy of applications
- SFTs need to integrate with other systems e.g. CTF, which leads to e.g. improved yield maps
- SFTs can enable new systems – e.g. CTF was enabled by RTK and auto-guidance
- Improved equipment and tools are needed to act on, and deal with, the quantities of data from imaging
- Quick, timely, analysis is essential for making management decisions from the data
- Need systems that aid in-field operations (as well as data analysis)

IDEAS

- Practical sensors to "see" underground (e.g. of roots, tubers not just moisture profile)
- What is the influence of cultivating depth on crop performance?
- How to control the weather!! *(Better localised and more timely forecasting)*

2) Incentives and Barriers for adopting SFTs.

INCENTIVES

1) Expert Knowledge and Policies

- Regulation: audit of chemical application areas, systemic approach to traceability
- Subsidies: could be used to incentivise or "nudge" adoption of good practice
- Traceability – improved by better practices
- Public perception benefits, especially for the consumer (a societal benefit), by accurate info on chemical use, traceability, provenance, carbon and water footprints, etc.
- Data recording e.g. for assurance scheme audits, is less onerous and cheaper when more automated
- SMEs and start-ups have novel (disruptive) ideas and can be more approachable/receptive

2) Practical and In-Field Use

- Early detection of changes in-field allow consideration of operation impacts and timescales
- Reducing input costs, while maintaining production, by using variable rate tech is a strong incentive
- There is a strong incentive for simplicity: equipment, user interface, software and data analysis
- Technical improvements e.g. Hydrogen fuel cells now arriving will extend drone flying-time and use
- Reducing other costs e.g. labour, fuel, crop loss
- For contractors, and contract farming, operations are better as field data transfers directly to and from equipment

BARRIERS

1) Expert Knowledge and Policies

- Risky to use SFTs. Farmers need confidence that there will be:
  a) cost/benefit advantage. Perhaps hard to quantify in early stages of use and uncertain about when economic return will occur
  b) accurate data collection by SFTs

c) accurate recommendations interpreted from the data
d) more (simple) technical information on advantages and results
e) support for choosing SFT of appropriate scale and cost (e.g. drone v satellite imagery)

- Subsidies: are not equitable across businesses and could de-stabilise market
- Feeling that farmers might be "punished" (public perception, economically) for taking risks with SFT
- SMEs and start-ups developing SFTs – barrier as may not integrate with existing market-leading SFTs

2) Practical and In Field Use

- Lack of support for older kit. Needs to be serviceable and kept up-to-date (upgradeable?) as it ages
- Needs to be simple to understand and operate: not overly demanding of time or expertise to learn
- How to keep up with (newer) technology: - cost, training, servicing of older tech, and time needed!
- Regulation: e.g. operation of drones and needing Visual Line of Sight, privacy, spraying regulations etc.
- Public perception of "robots" is unlikely to be as idyllic as for "traditional" farming
- Technical barriers e.g. battery life for sensors and drones
- Costs; these are currently considered high (*see cost/benefit comments*)
- Lack of confidence in costs and possible technical problems discourages being an "early adopter"
- Apparent poor inter-operability between components (poor "plug-n-play") whether hardware, software or data. Lacking common platforms. (*but see aims of AEF* www.aef-online.org)
- Apparent lack of case studies to provide support for cost/benefit analyses

3) Relevance and interest on adoption and transfer of SFTs (including new systems enabled by SFT *eg CTF)*

RELEVANCE

- Has to be appropriate for the resources available
- No strong bias shown towards any particular SFTs or systems
- SFT can help identify the problem but not always the solution, and not whether a specific SFT is relevant
- May deliver a "quick fix" rather than a "sustainable" solution
- Interest can be greater if user can trial SFT to appreciate its potential and value

ADOPTION AND TRANSFER OF SFT

- Use networks for benchmarking and transfer of experience and research e.g. UK's Yield Enhancement Network (shows only 65% of potential yield is achieved)
- Concern over potential jobs lost (*needs to be balanced by number of openings for highly skilled technicians*)
- De-regulation: -could changes in certain regulations increase adoption rates?

4) Potential new uses for existing SFTs.

1) Practical and In Field Use

- Soil moisture measurements and modelling to allow for more effective irrigation
- Early detection of disease in crops to allow for targeted fungicide applications
- Blackgrass weed detection – ideally of small plants i.e. one leaf, to target and control it very early
- Yield potential models – currently more cost effective for high value crops e.g. lettuces, apples etc.
- Correlate crop imaging data with soil data
- Autonomous vehicles (robotics)

2) Data collection and analysis

- Wildlife interactions: active bird scaring, census of deer and rabbits, badger trails on livestock farms
- Environmental uses (e.g. 3D maps of flood volumes areas)
- Improved availability of DEFRA maps

5) Potential inputs for research.

- Do we know how farmer behaviour and practice will change when info on SFTs is more available?
- What are good ways to promote Knowledge Transfer? E.g. via extension service, networks etc.
- Need for ground truthing of SFT by linking innovators/companies/software developers with sufficient farmers to cover variety of soils and crops
- Should research be manufacturer/supplier led? Or research led? Or farmer instigated?
- Understand how to develop new business models and value chains by new types and uses of SFTs
- Find from farmers and growers what data is most useful for them and at what cost?
- Pass this information to SFT developers to help target (more) appropriate innovation
- How to detect problems (disease, weeds etc.) earlier
- The good experiences with e.g. Yara-N Sensor should encourage more on-machine-systems e.g. for blackgrass detection and immediate sprayer control that avoids separate imaging operation
- Determine impact on energy use *[chemical fertiliser can be about 50% of all energy use in ag]*
- Continue research into localised and timely weather forecasting for farmers
- Do different plant architectures, shapes, planting formats give better application results when e.g. using drones?
- Improve and/or focus the spectrum of cameras for more specific information
- Develop autonomous vehicles
- Help to commercialise technology (loans to developers and “early adopters”)
- Interaction between researchers and government and minimising the funding gap for the good of the industry and getting SFT to the user

- Will support roles (agronomist, equipment service and supplier etc.) change? Or even disappear?
- Seems to be much SFT on the edge of breaking through but hasn't yet. Should there be research into finding out why it doesn't become fully commercial?

6) Further Notes.

- Interpretation of data is key
- Need to ask…is the provision of data for the agronomist or the agronomy for the farmer?
- Pooling of information and collaboration is important at this stage and could be further fostered
- Should we be aiming for resource use efficiency or higher yields for our farm businesses?
- Cross fertilise initiatives eg link Smart AKIS and AHDB events
- Establish prizes/incentives to identify needs in precision farming

5.1.2. RIW2

SMART AKIS 2nd REGIONAL INNOVATION WORKSHOP

"Smarter Farming for Soils Health and Water Management"

UK

Cranfield University, College Rd, Cranfield MK43 0AL Bedfordshire, UK

14 September 2017

David Tinker, DTA Ltd / EurAgEng / Smart AKIS
25 October 2017

RIW2 Programme

The UK workshops are handled as a sub-contract of partner DTA / EurAgEng by AgriTech East. This independent, business-focussed cluster organisation, aims to improve the international competitiveness and sustainability of plant-based agriculture and horticulture.

Agri-Tech East brings together farmers and growers with scientists, technologists and entrepreneurs to create a global innovation hub in agri-tech. It has around 200 members and organises many similar workshops and events and a larger conference each year. Two UK member organisations associated with two Smart AKIS partners also promoted the event. These were the Institution of Agricultural Engineers (IAgrE), member of EurAgEng, and Agricultural Engineers Association (AEA), member of CEMA. Relevant contacts, including all farmers surveyed in WP2 had direct invites from DTA Ltd and other networks of advisers (AHDB, ADAS etc) on smart or precision farming also promoted the event.

How can "smart agriculture" help farmers improve the health of their soils and optimise water use efficiency? That's the question tackled in the second partnership workshop with the SMART-AKIS EU Smart Farming platform and AgriTech East (www.agritech-east.co.uk).

Automated irrigation scheduling and remote soils monitoring are already in commercial use on some farms – but the innovation pipeline is brimming with new ways to help growers make best use of some of their key resources. With a series of short talks from industry and academia you'll hear how these technologies are being used on farms, as well as having the opportunity to have your say about the practical aspects of embedding these new practices in your business and what you want to see the future hold. We'll also be considering data transmission between on-farm devices, the cloud and the grower and how this information can lead to greater knowledge about crop performance and the well-being of soils.

This event will feature introductions to exciting companies with innovative new technologies already in the market and some of Cranfield's research. There will also be a visit to see some of the research facilities at Cranfield after the workshop.

Agenda

10:00 Registration and Coffee

10.30 Welcome and Introduction
An innovation network for farmer-tech collaboration **- Belinda Clarke, Director, Agri- Tech East**
Smart AKIS Project: Innovating smart farming technologies in future projects **- David Tinker, Secretary General, EurAgEng**

10.45 Research Insights
New ways to measure crops and translating data into profitable decision making **- Eric Ober, National Institute of Agricultural Botany (NIAB)**
Innovations in soil management research: the Crop Health and Protection (CHAP), and Agricultural Engineering Precision (AgriEPI) Innovation Centres **- Prof Jane Rickson, Cranfield University**

11:45 Company Presentations
Soil for life – A big data approach to soil health **- Jonathan Tole, Soil-for-life**
Recent Innovations in Precision Irrigation **- Tony Peloe, Delta-T Devices**
Remote soil moisture & climate monitoring- making an informed decision **- Tim Blyth, Soil Moisture Sense**
Exploring the Precision in Soil Mapping **- Clive Blacker, Precision Decisions**
Controlled Traffic – Smart Farming in Action **- Tim Chamen, CTF Europe**

12:45 Lunch

13:15 Workshop
An opportunity for farmers and technology developers to share their ideas and insights around the innovation needs of the future; the risks, opportunities and challenges for commercial uptake of these new products and services

14:15 Workshop Feedback

14:30 Closing comments

14:45 Optional tour of Cranfield University research facilities

16:00 Close and depart

RIW2 Power Point presentations

A link to PowerPoint presentations will be included with follow-up information to the attendees shortly. This link will be available only to the attendees (and relevant Smart AKIS partners).

RIW2 Attendance

Attendance was through registration on the Agri-Tech East website using links from directed emails, Newsletters and a press release to drive potential attendees to visit the registration site. Registration was done using Event-Brite only. It allows a maximum number of registrants and a closing date to be set. Event-Brite also captures email addresses and enables follow up by email to registrants 1 or 2 days before the event as a reminder, to provide directions, updated program details and a link to a list of names and affiliations of expected attendees. The email list is being used to give attendees a report of the event, particularly of the break-out groups, and access to the presentations. The attendance sheets, below, were marked when attendees collected their badge and information pack. Initialling had been done at previous RIW1 but this had still caused delays during registration.

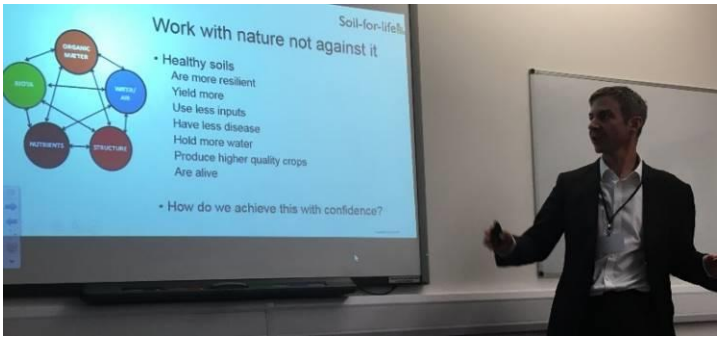
The on-line registration gathered 95 names. 71 of those arrived with a further 6 non-registered for 77 attending the workshop (including a journalist – Professional service).
Background of attendees: (Note 1 attendee had two interests as a SFT supplier and farmer)

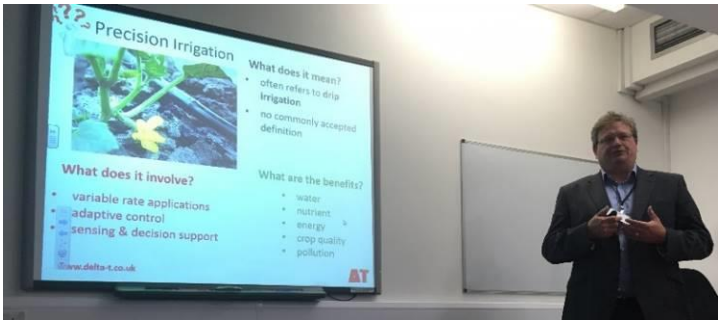
Farmer / farming company:	10
Smart Tech company:	20
R&D including (PhD) student:	25
Professional services:	7
Advisory:	18

Actual scanned sheets with names have been removed.

RIW2 Pictures

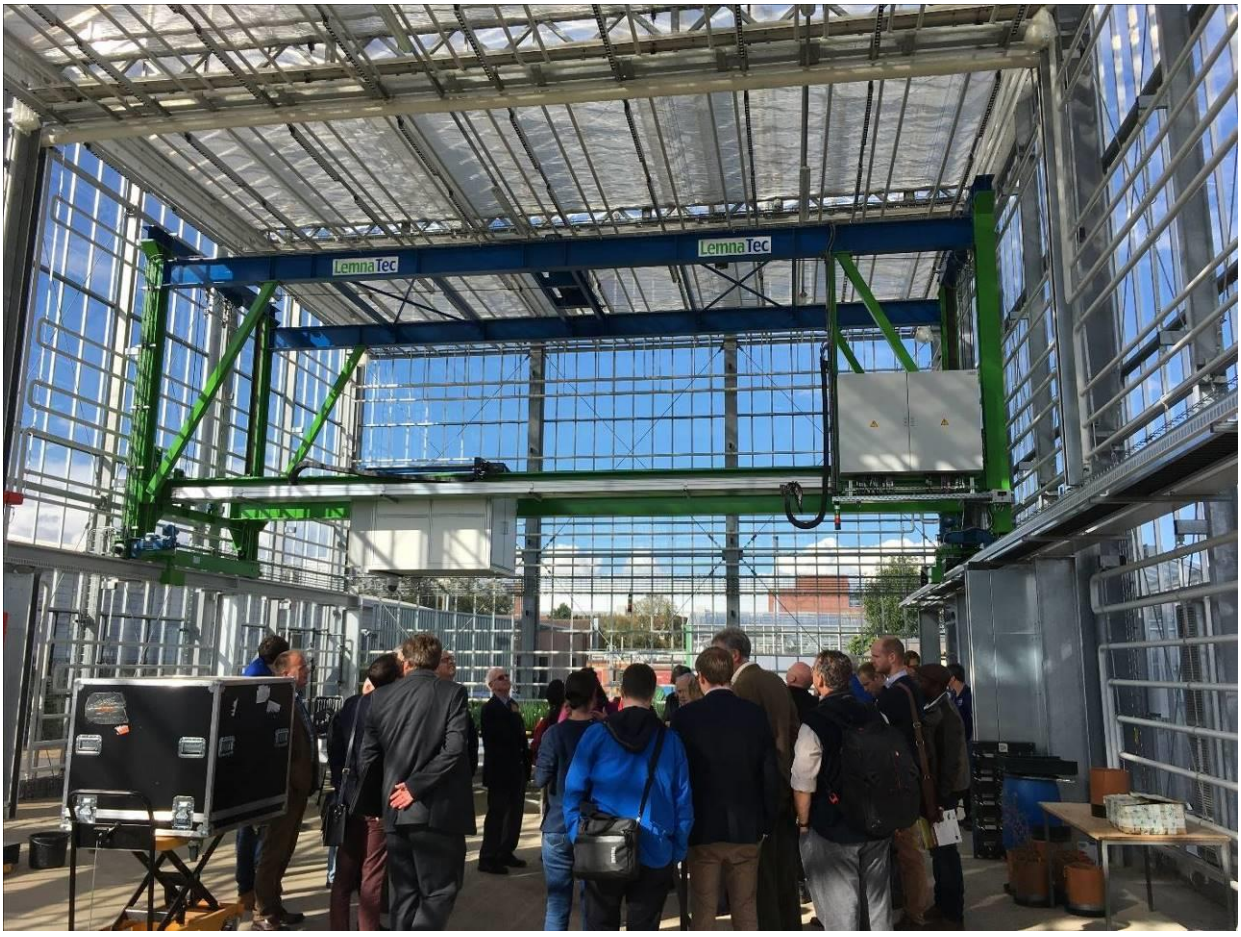
Presenters; Prof Jane Rickson, Jonathan Tole, Tony Peole and Clive Blacker.






Future possibilities
HandsFree Hectare
An Innovate UK funded collaborative feasibility study between:
Precision Decisions
Harper Adams University

Visit to the soil-bin and soil erosion facilities and, below, the new greenhouse at Cranfield University which will provide information for sensor development.



RIW2 Findings – Project Outlines

On top of the multi-actor collaborations that are to emerge from the RIWs, other outputs were expected as a result of bringing together stakeholders into the RIWs. One of the overall objectives of Smart-AKIS is to capture these outputs in order to produce recommendations for fostering the penetration of SFT in Europe.

This section provides a number of headlines, covering different aspects that emerged in the discussion in the six break-out groups in the afternoon workshop. The information given below is a full copy of the discussions in the workshop groups. It has not been feasible to reduce the information without losing the context or thinking paths. Each group had a facilitator and rapporteur. Much of the discussion centred around soil health and water management since the technical presentations and the focus of Cranfield University's work had given this a strong emphasis and was considered to be a topic that would attract a variety of farmers, technical companies, advisors and researchers. In this framework the workshop discussions are by challenges and needs and are addressed particularly around resource efficiency.

Project Outlines for UK Innovation Workshop

Participants in each workshop group discussed possible project ideas and some then used the suggested outline headings to provide more discussion and information. However the groups had different levels of discussion, for instance, around possible issues and other information was also collected. Some Groups suggested more than one idea; other groups allowed ideas to coalesce and merge. Each Workshop group is given its own number. An individual attendee also outlined a proposal. Unsurprisingly the groups vary in the information and detail and the facilitators and organisers have edited the outcome for clarity and consistency. In all cases further discussion, investigation and development of any of the ideas is required as well as a suitable funding source (to be addressed in RIW3).

Note that common themes were the idea of a cluster of farms being used for data collection, trials, demonstration and particularly focussed around the topic of soil health which can be considered currently as ready for a breakthrough into using Smart Farm Technologies.

Project Outline Group 1 Tim Chamen

1. "Improvement in Soil Capital"
2. "Capturing NDVI from a UAV".

Only the first topic was discussed in any detail, the second suggested but no time to discuss.

Objectives of "Improvement in Soil Capital"

The key objective of what would be a long-term publicly-funded project would be to provide a route map for farmers to allow them to achieve an improvement in the health of their soils. This "health" would need to have close linking with crop improvement and/or easier transition from one crop to the next in terms of soil manipulation, as well as farm profit. The question was asked, "what is a healthy soil?" and can this be related to increased yields, lower inputs and greater farm profit? Without this linkage, there would be little incentive to gain improvement.

Ideally, a "road map" would be developed for each farmer to follow. Benchmarking could provide an important part of the process with local scale "best practice" farms demonstrating what could be achieved and how. The five cornerstones outlined by Jane Rickson in her presentation would form a

key part of the improvement process as would “big data” that could feed into the project. In addition, data generated by the project could enable some ground truthing of “big data”.

Soil health indicators easily measured by farmers would be needed. These could include the Visual Evaluation of Soil Structure, VESS, www.sruc.ac.uk/info/120625/visual_evaluation_of_soil_structure, earthworm counts and possibly the introduction of an App that would recognise certain soil structure features from exposed soil surfaces. Other possibilities could include a theta probe (Delta-T supply) used to measure volumetric water content alongside gravimetric. From these two measures, bulk density and water-filled pore space could be determined from calculation. These measures would be needed at the outset to determine the level of improvement achieved over any given period and would be achieved by following a process – a series of tests and options with a simple management model designed to help the farmer make improvements, whether this was through different tillage options, compaction management or other courses of action.

These measures could be part of a process which helps farmers educate themselves, (much as outlined in a recent television programme to reduce obesity). If successful, the benefit to UK farming, the environment and water quality would be enormous.
A farmer, Piers Sheddon, agreed that he would put in a fair bit of time to measure and improve his soils.

Project Outline Group 2 Prof Jane Rickson
Brief description of background/issue to address.

The discussion started by considering whether soil erosion is a problem in terms of on-site loss, loss of organic material and economic damage and how do farmers value this. There is also the off-site impact of sediment in water courses and similar factors.

There are new technologies coming out that measure and survey erosion and a project that encompasses these could be proposed.
Solutions (focus of a project) are:

1) Trying to change farmer attitude and change the “poor land management” to focus on sustainable aspects.
2) Develop economics driven by new data to determine gross margin.

This would then lead to considering

a. Revised or even new (cultivation) systems,
b. whether existing improvements such as no-till are really a “sticking plaster” giving relatively short-term improvements
c. multi-purpose techniques such as beetle banks that offer soil erosion mitigation as well as other benefits
d. and include socio aspects on how to incentivise farmers to act strongly for the public good and utilise soil erosion control systems that provide economically worthwhile, effective and sustainable solutions.

Project Outline Group 3 Lynda Deeks
Brainstorm of Topics for proposals.

- Measurement of soil biology - what does it mean?
- Sequestered Carbon
- Soil health, evaluating the level of compromise (how much is lost due to tillage practices)
- Remote measurements of soil structure
- Remote measurements of rooting level
- Lack of benchmark to use this information
- Benchmark for nutrients (what nutrients are plants missing)

Development of Selected Topic – Measurement of soil biology – what does it mean?

Description of problem

- How do we pull it apart? Worm count OK, but what about sandy soils? For e.g. nematodes. What does it mean? Interpretation and application.
- Diversity means good thing, usually. Soil more resilient.
- We have an ability to analyse soil biology in detail but do not really understand what the data means with regards to soil health**.** Therefore, we need to advance our understanding of soil biology so that we have a better idea of what the data means
- Benchmark for soil health (however if it's based only on worm count then sandy soils will be always at the bottom)

Possible solutions

- Better interpretation of soil biological data to inform growers as to what their data means to them and their management practices

Partners needed

- Farms/land managers with different soil types
- Farms with different farming and cropping systems and rotation
- Partners who can undertake a range of soil biological analyses and that are interested in the development of new techniques and improving interpretation of analysis
- Expertise, with a range of soil biological expertise – although this could be built through workshops

Project outline

It is possible to analyse the diversity of soil biology using techniques including DNA sampling, but there is uncertainty as to what the complexity of the data means and especially how it can be used to inform land managers, so they can adapt their land management in a beneficial way.

The project would assess the current level of knowledge and use this to develop and validate an interpretational tool that could be used by farmers to assess their impact on their land.

Objectives

- To produce a recommendation system that farmers can use to inform their land management practices for differing soils, practices and crops
- To provide a tool or guidance that could be used to help manage and manipulate changes to achieve a better soil health
- Understand what changes/differences are linked e.g. the pivotal 5 soil components

Participants and roles

- Academic – to lead interpretation
- Independent expertise – to lead interpretation
- Laboratory – development of cost effective methods of soil biological interpretation
- Industry – Access to land and trialling systems

Tasks/activities

- Field trials undertaken across a range of soil types, crops and rotations
- Benchmark appropriate to a range of soil textures and land management practices
- Development of a system that will help farmers interpret soil biological parameters appropriate to their soils and crop types.

Duration and estimated budget

- In-field experiments will require a minimum of 7 years to ensure a whole crop rotation
- Potentially could be speeded up if have enough repetition of soil and land management practices but may be limited by climatic and topographical differences
- Could use lab facilities e.g. Soil Health Facility (CHAP) to speed up the rotational cycle.

Expected benefits/impacts

- To make it more efficient
- It needs to be a driver, not reactive measure
- To demonstrate improvement in order for a farmer to get paid for ecosystem services e.g. will benefit the farmers/land managers in the future when their payment(s) are linked to building “natural capital” as a means to demonstrate that their actions have had a positive benefit.
- Policy driven by science
- Understanding, if we have a healthy soil, what is the biology that makes it good?
- Dealing with the soil (cause), not treating the symptoms
- Collecting and collating data YES. But, if it can’t be measured and benchmarked, then without it we can’t know if we have made any improvements.

Project Outline Group 4 (Lizzie Sagoo)

General: This group, as others, wanted to discuss issues related to soil biology and although these are not yet well linked to smart technology it does show that there is a potential demand for soil health related SFT (ATP bioluminescence was mentioned). Research in this area can probably be considered as difficult and costly as there are still questions to be answered on what soil biology results mean to farming practices and just how the soil biology can be directly influenced or is it better to try and foster conditions that encourage 'life' in the soil which we also know represent good farming practice, i.e. increase soil organic matter content, avoid soil compaction, use minimum tillage etc?

Notes from general discussion

- Main area of interest for the group is soil microbiology
- How to measure & improve it?
- What should we be doing
    - How effectively can plants use nutrients?
    - Will changing soil microbiology impact on quality of food produced?
    - Impact on root development?
    - Impact on other things like response to fertiliser?
- Isobel Wright gave example of this sort of work on-going in NZ vineyards
- Group noted that we know taste of crops like potatoes varies between different soils. Does the soil biology influence this taste?
- What about protected crops growing out of soils – will adding microbiology to growing media impact on taste?

Other topics –

- Health value of food – flavour & taste.
    - Factors that affect this.
- What is potential to measure soil microbiology using 'smart' technology? One member of group noted that there is potential to do this – ATP bioluminescence – and could be done on-line. *(There is considerable push for better, very fast, cheap, microbiological testing for food safety e.g. salmonella, campylobacter, that may have value for measuring soil health indicators. Another area for cross-industry collaboration? - DT).*
- Link to yield mapping – does 'more' microbiology mean better yields?

Tony Coleman has an interest in irrigation water and water use – he noted that we need to consider if this is acceptable to the retailer. Consider potential impact of salinity?

Possible Project Outline

- *Impact of soil microbiology on the crop, i.e. impact on response to fertiliser, root development, crop nutritional quality etc.*

Objectives

- *Identifying optimum soil microbiology for different crops.*
- *How can you manage crops/the soil to 'improve' soil microbiology*
- *Important to consider impacts across a rotation*

Participants and roles

All members of the group indicated interest in being involved in a project in this area –

- *Tony Peloe (Delta-T) – interested in how to collect the samples*
- *Philip Adams (Material Change) – would be interested in this type of project if it considered impact of applications of organic materials*
- *Matt O'Hagan (M&S) – supply change interested in sustainability – they want to help growers and could act as facilitator*
- *Emily Pineda-Sampson (G's) – interested in crop yield & quality*
- *Isobel Wright (Lincoln Uni) – could be a project partner delivering field work*
- *Jess Farrant (Hutchinsons) – could help with KT*
- *Tony Colman (UEA) – has links to southern Africa*
- *Richard Crowhurt (journalist) – could help with KT*
- *Eric Ober (NIAB) – could offer trials support*

Project Outline Group 5 (Paul Hill)

Summary:

Soil Health and Management is a large topic and more knowledge is needed on the current state. Likely that increased collaboration across organisations is beneficial especially:

a) To promote existing available data and analysis
b) How to ensure farmers understand what is happening on their land.

This would appear to need experimental and demonstration farms to show, by trial and experiment, on a field scale (not plots) and on longer scale than typical 3 years.

Benchmarking of data between farms especially across sectors and communicate the improved practices widely.

General Notes

- Interpretation of data – complexity and control/security of data – how to share? How to present the interpretation to farmers in a useful way? Resource small start-ups.
- Soil Improvement – how much is it going to cost/Benefit?
- How to get groups/organisations to work together? Profit sharing? UK Government investment?
- UN figures quote 60% poor soil health.
- Additional problem of run-off into water.
- Consider education/data management/compatibility to make information easier to use for farmers
- UK Government could take some of the subsidies (Pillar CAP) and use it to develop Big Data Platform to push and pull farmers into a suitable information system.
- Use of contractors – how does this affect local knowledge about soils, timing of operations etc.

- Role of cover crops – farmers already have knowledge -but, often, research projects too short term. Trials are being conducted by farmers all the time
- How best to get the research to farmers?
- How to Commercial value of data and fear of sharing data
- Back to demo farms? Place to showcase, conduct longer term trials. Still not relevant to all farmers
- Need people to spread the word – big data
- Great Soils Project – major AHDB Strategy to 2020 covering all areas. Needs to work with other organisations
- Sharing, capture and disseminate through social media, WhatsApp groups, etc to encourage collaboration.
- Create a feedback channels to farmers

Project Outline Group 6 (David Tinker)

Short description of background/ issue to address:

Discussion flowed but generally coalesced around a way of enabling farmers and other actors to collect, interpret and make use of information, particularly related to environmental and crop interaction.

Such a system could involve a single farm, but a cluster of farms would be preferable, and the information collection would encourage "benchmarking" (wherever soils, crops and other environmental factors allowed).

For convenience this was called a "Smart Hub".

Objectives and activities:

1) Economics. A prime objective must be how the system could be seen to offer a valuable return to the farmers and actors involved for the time and resources required. This would be best served by showing economic benefits. These would differ for different farming systems; arable (broadacre) would be expecting to see improved yields (as quality is fairly fixed), vegetable production would profit from quality and yield improvements. All sectors would benefit from improved resource (labour, inputs, soil and other environmental factors benefitting the crop).
2) In addition, the "Smart Hub" would enable
    a. Field Labs and
    b. include demonstration and training for the members (farmers and other actors).
3) Publicity and Public Relations. The farmers, adviser(s) and technical support businesses would be enabled to show the benefits of the improved practices, technical systems and data linkages on those factors of importance to the public and others. This would include environmental benefits, traceability, greenhouse gases, wildlife and more. Suggested that this could enable a "CEO" to be available to tell and promote the "story" of benefits to all by improved farming.

4) Technical and Advisory. Such a "Smart Hub" would more readily enable data collection, transfer, and, especially valuable, interpretation for the farmer members to respond to and the technical and advisory members to have access to data and results to improve analysis, algorithms and recommendations for farming practices.
5) Economic Benefits. Always consider the cost effectiveness of advanced, and alternative, technologies and practices.

Not all names of the group were collected but some noted include Daniel Kindred (ADAS), Clive Blacker (Precision Decisions / farmer) and Nick August (farmer).

Project Outline 7 (Tim Reynolds, Anglia Ruskin University tim.reynolds@anglia.ac.uk for more information).

Description of Background/issues

- Common framework for data description such as a practical deployment of NASA SWEET ontology

Objectives

- Enable shared data
- Enable automated discovery of data
- Enable translation from global character sets.

Participants and Roles

- Practical deployment of NASA SWEET ontology frameworks

Tasks/activities.

- Build demonstration Smart-Virtual-Farm to demonstrate the Smart-ag semantic web.

Expected duration and budget

- Around £200k project costs (4 PhD studentships) and £100k for global dissemination.

Expected benefits/impacts

- Anticipate 12.5% additional margin for every farmer

Note: investigate the possible synergies with systems such as VALERIE, Smart AKIS and EIP-Agri supported ontologies and the ideas from Project Teams within AEF www.aef-online.org/the-aef/project-teams.html#/About

RIW2 Evaluation

Information summing up the results from the Evaluation Form voluntarily filled in by 23 attendees.

Interest	Average score	4.0/5
	Jane Rickson's presentation mentioned most often as most interesting to attendees' work. But all mentioned and positively. Opportunity to discuss with different "actors".	
Organization	Average score	4.1/5
	Improvement areas – **Better signs**! Extra time for networking! Extra time for presentations!	
Methodology	Average score	4.0/5
	General comment "good format including breakouts". Extra network time AFTER presentations to determine which presenters to talk to. More information before could have been useful for the breakouts. Sound-microphone to overcome air-con. Longer to give more information. Longer (all day) on the project workshops.	
Smart Farming Technologies	Average score	4.2
	Ranked SFTs. All similar; "data management, "Soil for Life" and soil moisture just top overall. Ideas to take home	
	Average rate of intended use of Smart AKIS database	12 used/intend to use; 8 not used
Project Ideas	Average score	4.0
	More time needed to finalise ideas. Soil topics popular. Need to be aware of things already being done.	
	Attendees interested to take part in projects. One academic team particularly keen to follow up ideas.	10/19 interested 2/19 not interested
Open suggestions	Can we learn from other cultures/industries? Focus on applied solutions with commercial outcomes. Emphasise data – how to translate and distribute especially to give a consistent message to grower.	

Although there were several positive comments about having the project ideas breakouts there were comments about the difficulty of determining sufficient project details, including structure, in the limited time and without having funding agencies (public, private or charitable) there to focus the size and type of project (and likelihood of successfully being funded). An objective of RIW3, with presentations from all the types of funder, and outlining successful projects, will be on the content needed when proposing projects for funding.

RIW2 Visit to Facilities

Linking to the involvement of Cranfield University as a partner in two of the UK's Centres for Agricultural Innovation as part of the Agri-Tech Strategy an option to visit some of the large facilities was included. The facilities support the research and development work of the Agri-EPI (The Agricultural Engineering Precision

Innovation Centre www.agri-epicentre.com) and CHAP (Crop Health & Protection http://chap-solutions.co.uk) centres.

The visits were made to the University's large soil bin and soil erosion labs and to the new Integrated Soil Health greenhouse, with its large soil modules that allow for consistent soil tillage and growing plants and moving them into particular research areas. The greenhouse has been designed to play a role in the development of crop sensors by using a gantry system.

The visits were well attended and offered an insight into the research facilities required for certain agri-tech research projects.

5.1.3. RIW3

SMART AKIS 3rd REGIONAL INNOVATION WORKSHOP

"Finding the Funding – The Research and Business Guide to Smart Agri-Tech Finance"

UK

King's Lynn Innovation Centre, Innovation Drive, King's Lynn, Norfolk, PE30 5BY, UK

22 March 2018

David Tinker, DTA Ltd / EurAgEng / Smart AKIS
25 April 2018

RIW3 Programme

The UK workshops are handled as a sub-contract of partner DTA / EurAgEng by AgriTech East. This independent, business-focussed cluster organisation, aims to improve the international competitiveness and sustainability of plant-based agriculture and horticulture.

Agri-Tech East brings together farmers and growers with scientists, technologists and entrepreneurs to create a global innovation hub in agri-tech. It has around 200 members and organises many similar workshops and events and a larger conference each year. Two UK member organisations associated with two Smart AKIS partners also promoted the event. These were the Institution of Agricultural Engineers (IAgrE), member of EurAgEng, and Agricultural Engineers Association (AEA), member of CEMA. Relevant contacts, including all farmers surveyed in WP2 had direct invites from DTA Ltd and other networks of advisers (AHDB, ADAS etc) on smart or precision farming also promoted the event.

Funding is complex and this event will sign-post the best opportunities for funding agri-tech in the third partnership workshop with the SMART-AKIS EU Smart Farming platform and AgriTech East (www.agritech-east.co.uk).

Together with Smart-AKIS Agri-Tech East will demystify the process by presenting and discussing the different routes and providing insider tips. We're also hearing from Dr Thomas Engel, John Deere's Manager Technology Innovation Strategy who will be discussing John Deere's role in helping to bring new innovations to market.

The public, private and charitable sectors have a range of support mechanisms to help agri-tech R&D, business growth, travel, training and to facilitate collaborations. In this final workshop in partnership with Smart -AKIS, we'll be looking at some of the options available for smart farming innovation and development – for which other areas of agri-tech can also be eligible for support.

This event will introduce you to local and national funding streams and provide case studies to inspire development of new Smart Farming innovations and help make your technology business or farm smarter.

Proceedings will start by showcasing a selection of funding opportunities from public, private and agricultural charities. By the end of this session you will have a feel for which instrument is the right one for your needs – be it discovery research, development of a new technology, or growth of your agri-tech business. We'll also

look at the different requirements from the public and private sector and how angel and venture capitalist investors view agritech innovations. We'll also be hearing from the small but influential agricultural charities offering support to farmers, scientists and engineers for new research, travel and training to tool themselves up with the latest in smart farming.

Programme:

10.30 Welcome and Introduction

Finding the Funding - *Belinda Clarke, Director, Agri-Tech East*

Chair: *Rob Merrall, President, IAgrE and Merralls Consulting Ltd*
Email: rob@merralls.com

BBSRC – supporting UK research, translation and impact
Andy Cureton, Head of Business Engagement, BBSRC
Email: andy.cureton@bbsrc.ac.uk Twitter: @BBSRC

Innovate UK and the agri-tech funding landscape
Andrew McLay, Innovation Lead, Primary Agriculture, Innovate UK
Email: Andrew.mclay@innovateuk.gov.uk Twitter: @Innovateuk

Finance from agri-charities
Alan Plom, Secretary, Douglas Bomford Trust
Email: alam.plom@gmail.com Twitter: @BomfordTrust / @AlanPlom

Making the most of UK R&D tax credits
Chrissie Freear, Innovation Incentives Group,Senior Manager, PwC
Email: christalle.freear@pwc.com Twitter: @freear_chrissie / @PwC

Asking the Angels
Hannah Smith, Business Manager, Anglia Capital Group
Email: Hannah@angliacapitalgroup.co.uk Twitter: @AngliaCapital

European funding – (still) open for business
Roger Hetherington, Senior Innovation Advisor, Enterprise Europe Network
Email: r.hetherington@eeneast.org.uk Twitter: @EENEAST

Collaborations with industry
Plenary speaker: *Collaboration and Partnering with John Deere*
Thomas Engel, Manager, Technology Innovation Strategy, John Deere
Twitter: @johndeere

14.00 Panel discussion with speakers
14.30 Networking
15.00 Event close

RIW3 Power Point presentations

A link to PowerPoint presentations has been made available to all attendees only.

RIW3 Attendance

Attendance was through registration on the Agri-Tech East website using links from directed emails, Newsletters and a press release to drive potential attendees to visit the registration site. Registration was done using Event-Brite only. It allows a maximum number of registrants and a closing date to be set. Event-Brite also captures email addresses and enables follow up by email to registrants 1 or 2 days before the event as a reminder, to provide directions, updated program details and a link to a list of names and affiliations of expected attendees. The email list is being used to give attendees a report of the event, particularly of the break-out groups, and access to the presentations. The attendance sheet, below, was marked when attendees collected their badge and information pack (non-attendees shown).

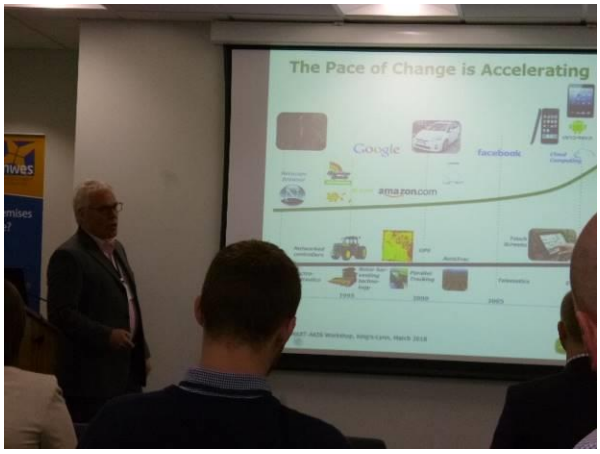
Organisations represented (*contacts can be brokered on request*)
Acre; Agriculture and Horticulture Development Board; Cambridge Consultants; Collison and Associates; R Cooke & Son; CRM Agricommodities; Crop Intellect; Farming Data; Greenwoods Solicitors; Institute of Agricultural Engineers; Olombria; Outfield; Rural Broadband; Richardson Milling; Scarab Solutions; Smith Institute; Spearhead International Group Ltd; Weather Logistics Ltd

The on-line registration gathered 28 names. 26 of those arrived with a further 1 non-registered for 27 attending the workshop. Only 2 could be considered as from a farming company / business while most of the others were from agri-tech businesses or finance/business advisers.

The actual scanned sheets with names have been removed.

RIW3 Pictures

Presenters; Dr Andrew Maclay, Dr Alan Plom, Dr Thomas Engel, Panel Discussion.



Lunchtime networking

RIW3 Meeting Discussion

Is it a golden time for funding? This was one of the questions asked at the final workshop, in a series of three, organized by Agri-Tech East in partnership with Smart-AKIS, a HORIZON 2020 European project, which aims to link farmers and new technologies across Europe.

And, judging by the wide range of funding opportunities showcased at the workshop, it would appear to be so.

Delegates were introduced to six different funding paths ranging from grants provided by UK Agri-Charities, BBSRC (Biological and Biosciences Research Council), Innovate UK (Government organisation for part-funding development projects including in agri-tech), European funding and on to Business Angels and how HMRC (Her Majesty's Revenue and Customs – UK's Ministry of Finance) can offer support through tax credits when companies undertake Research and Development.

By the end of the morning session, delegates were much more aware of which funding stream was likely to be the most appropriate for them, as speakers explained the criteria and project stage that particular funds could support. What they all had in common was a clear need for a well thought

through project with a concise and feasible business plan. Both Alan Plom from the Douglas Bomford Trust and Hannah Smith, a business manager at Anglia Capital Group dealing with business angels, also stressed the importance of having committed and enthusiastic people involved in projects too.

Contacting the various organizations and finding out more about the options and deadlines is easily done through their websites. It will be important to sign-up to newsletters to be aware of when funding calls are available.

During the afternoon Plenary, Thomas Engel, Manager for the Technology Innovation Strategy at John Deere based in Kaiserslautern, Germany, gave a really interesting presentation stressing the necessity and significance of collaboration and cooperation in innovative projects, even for a global company the size of John Deere. Thomas pointed out that there is a growing impact of the "outside world" on John Deere products, and showed the number of partners in the JD Operations Center. Agricultural engineers are working more and more with designers, software and hardware specialists, artificial intelligence experts as well as agronomists and more.

Three points he made were:

- Site-specific farming (Variable Rate Technology) will grow in importance;
- Partnering through the cloud using cloud based connectivity, including John Deere FarmSight, will become more common.
- Data belongs to the farmer – he can share it with whomever but it belongs to the farmers. Many companies are already sharing data.

Dr Engel also touched on the various European networks that provide technical support such as the Alliance for Internet of Things Innovation – including the Working Group 6 for Farming.
Finally he stressed that there is a need to attract specialists into the agri-food sector and not just let them leave and work for Google and Amazon!

The closing session of the event was a panel discussion with all presenters answering questions from the floor. In essence, "yes there can be a lot of paperwork involved, but don't forget you are spending either public or other people's money", there are organizations that can help you, and at least until December 2020, Europe is indeed still open for business!

From the organisers talking with attendees, feedback from the presenters, and the Evaluation, – below, the topic of the event, although unusual, was very well received and those that attended, although fewer than the previous Regional Workshops, were obviously delighted that they came.

RIW3 Evaluation

Information summing up the results from the Evaluation Form voluntarily filled in by 10 attendees.

Interest	Average score	4.4/5
	"all good and interesting"; Innovate UK, Tax credits,, EU funding, JD, Angels all liked by several.	
Organization	Average score	4.8/5
	"Well done & thanks, "superb", "all good", would like to see presentations on the web (but attendees get copies). Location so new that bit challenging to find it.	
Methodology	Average score	4.4/5
	Generally no improvement needed although did miss the Smart AKIS partner and chance for demo of the platform.	
Smart Farming Platform	Average score	4.0
	Only been used by 2 but 7 are now planning to try it.	
Interest in Sources of Funding discussed	Average score	4.5
	Innovate UK was either being used or would be used by 5. BBSRC, Angels, EU, R&D Tax Credits and Charities all mentioned	
Open suggestions	"Thanks" x3, "thought provoking", "very useful", "well worth attending". "Pity no demo of platform".	

5.2. Research needs in Smart Farming

Needs for research from practice (EIP-Agri format)

1:- Title

How to get the best from Know ledge Exchange?

This is the problem (summary in your language)

We know that farmers listen to farmers, attend demonstrations, read journals but still some developments are very slowly adopted (CTF), yet others can be quite quick (auto-guidance). What can be done to make all Knowledge Exchange more effective and get to the "roots"?
There is a need to improve the understanding of why farmers do not take up SFT rapidly. How to convince early-adopters to invest in SFT and how to encourage rapid and widespread adoption are questions that would enable advisory bodies to have an increased impact.

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)

As above

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

Farmers, advisors, technology, techniques, farming systems, Precision Agriculture, Knowledge Exchange

Agricultural sectors

- None -

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. See below

2:- Title

Use of Low Power Wide Area Network

This is the problem (summary in your language)

Rural areas frequently have poor mobile phone and/or broadband connections and especially so in fields. There can be conceived applications using relatively low rates of data flow from field to farm to support decisions on e.g. traficability of fields, need for irrigation etc. Low Power WAN includes “Internet of Things” and using long life, long distance (several kilometer) in-field sensors.

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)

As above

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

LPWAN, NB-IoT, in-field sensors, decision support, field operations, remote sites

Agricultural sectors

- None -

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. See below

3:- Title

Prioritising internal project ideas for SFT start-up.

This is the problem (summary in your language)

A start-up micro SME, Outfield Technologies Ltd (www.outfield.xyz) is having success with an SFT collecting and analysing images and has other ideas for developing as projects but not sufficient labour and financial resources to tackle all. This is not an isolated example of such a happening.

To help decide the priorities of the ideas they intend to a) work with a Smart AKIS partner, to use the relevant project results (e.g. innovation processes, farmers' needs survey) and Technology Platform (e.g. for competing products, previous research, etc). This will be followed by drafting a project plan showing what ideas are most beneficial, the research that is needed, who would be suitable partners for collaboration, funding likely to be required and potential source(s).

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)

As above

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

Micro SME, Start-up, prioritise research and development ideas, prepare proposals, market survey, published research, research partners

Agricultural sectors

- None -

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. See below

5.3. Project ideas Research needs in Smart Farming

Create Project ideas

1:- Title (native language)

How to get the best from Know ledge Exchange?

Title (in English)

How to get the best from Know ledge Exchange?

Description

See below

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)

PROBLEM: We know that farmers listen to farmers, attend demonstrations, read journals but still some developments are very slowly adopted (CTF), yet others can be quite quick (auto-guidance). What can be done to make all Knowledge Exchange more effective and get to the "roots"?
There is a need to improve the understanding of why farmers do not take up SFT rapidly. How to convince early-adopters to invest in SFT and how to encourage rapid and widespread adoption are questions that would enable advisory bodies to have an increased impact.
OBJECTIVES:

1) Consider aspects of research into practice and what works best
2) What are the fundamental aspects, including social science, that impact on KE?
3) Form a consortium of suitable partners to improve effectiveness of KE and extend to advisors working on SFTs.

ACTIVITIES:

1) Study fast and slow examples of adoption of SFTs e.g. CTF (slow) and auto-guidance (fast)
2) Short literature review to check what has been done (and recommendations for further work).
3) Use literature review to decide possible partners particularly on social science aspects.
4) Develop and validate training programme.
5) Apply and promote techniques for advisors, technology developers and system developers.

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…

Initially time is required to ascertain what has been done (brief literature review) and partners, in UK and EU that would be interested.
Other agri-research / advisory organisation considering needs for improved KE, especially applied to precision agriculture / SFT.
Possible social science researchers with appropriate experience.

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

Geographical scope

Austria

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

Keywords

Farmers, advisors, technology, dissemination techniques, farming systems, Precision Agriculture, Knowledge Exchange

Agricultural sectors

- None -

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

Proposing person or organization

Agricultural and Horticultural Development Board, UK

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

Contact E-mail

harley.stoddart@ahdb.org.uk

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

Expected starting date of the project

Month Jun Day 1 Year 2019

Expected duration

2 years

Please provide the expected duration of the project in months.

Additional information

Much more discussion is required before partners and proposal can be drafted and source(s) of funding investigated.
We are looking for

a) international and UK knowledge from research organisations that may have suitable results to build on and/or form joint project
b) and experienced social scientists

Please provide here any other relevant information concerning your initiative.

Attachments

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

2:- Title (native language)

Use of Low Power Wide Area Network in agriculture

Title (in English)

Use of Low Power Wide Area Network in agriculture

Description

See below

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)

PROBLEM: Rural areas frequently have poor mobile phone and/or broadband connections and especially so in fields. There can be conceived a variety of Applications requiring a relatively low data Flow from field to farm to Support decisions on e.g. trafficability in fields, need for irrigation etc. Low Power WAN includes "Internet of Things" and the use of long-life, long distance in-field sensors.
OBJECTIVE: A manufacturer (presently confidential) of a recently introduced commercial LP-WAN system is interested to study applications for its use. This proposal is to determine a suitable existing research project able to make good use of this LP-WAN system to demonstrate its capability for use, initially, in agricultural research and then in commercial agriculture. This includes validating its suitability.
ACTIVITIES: To study existing, UK based, agricultural SFT published project information from e.g. Smart AKIS Technology Platform, BBSRC projects, Institute reports etc. and determine a) suitable application, b) potential widespread use, c) potential for publicity. Arrange for LP-WAN system to be incorporated in the project.

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…

Current agricultural/horticultural projects offering a suitable application for using a Low Power WAN to collect data.

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

Geographical scope

Austria

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

Keywords

Low Power WAN, technologies, research projects, agricultural/horticultural field applications, data acquisition, data transfer.

Agricultural sectors

- None -

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

C Lee, Futureneering Ltd, Cowley Road, St John's Innovation Centre, Cambridge, CB4 0WS, UK

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

Contact E-mail

charles.lee@futureneering.com

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

Expected starting date of the project

Month Jul Day 1 Year 2018

Expected duration

18 months

Please provide the expected duration of the project in months.

Additional information

More investigation and discussion is required before suitable collaborators and an appropriate existing research project suitable for a demonstration of LP-WAN can be agreed, project drafted and source(s) of funding, if needed, investigated. A potential collaborator has been found.

Please provide here any other relevant information concerning your initiative.

Attachments

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

3:- Title (native language)

Prioritising internal project ideas for SFT start-up.

Title (in English)

Prioritising internal project ideas for SFT start-up.

Description

See below

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)

PROBLEM: Common to many start-ups with an existing successful product, a micro SME (Outfield Technologies Ltd www.outfield.xyz) is having some success with its initial products. It has many other ideas for developing as projects but not sufficient labour and financial resources to tackle all.
OBJECTIVE: This start-up initially needs assistance to help prioritise which projects it should develop. This is not an isolated example of such an event.
ACTIVITIES: To help decide priorities they intend to

a) work with the Smart AKIS partner and use the relevant project results (e.g. innovation processes, farmers' needs survey) and Technology Platform (e.g. for competing products, previous research, etc) as well as other available information to prioritise their ideas.
b) This will be followed by drafting a project plan and determining what research is needed, who would be suitable partners for a collaboration, funding likely to be required and potential funding source(s).
c) This is a combination of business and technical assessments.

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…

Currently the business plans to work with an expert having access to relevant information to determine how to prioritise Outfield's ideas and then prepare project proposal(s).

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

Geographical scope

Austria

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

Keywords

Start-up, internal ideas, business case, technical case, market survey, project proposal.

Agricultural sectors

- None -

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

J McDougall

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

Contact E-mail

jim@outfieldtechnologies.com

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

Expected starting date of the project

Month Jul Day 15 Year 2018

Expected duration

3 months

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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SMART AKIS PARTNERS: