D 3.3 LEARNING TAKEAWAYS FROM FIES

WP 3

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Author	Jürgen Vangeyte (ILVO) Anneleen De Visscher (ILVO) Grigoris Chatzikostas (BIOS) Milica Trajković (BIOS) Jovana Vlaskalin (BIOS) Luka Minić (BIOS) Marcos Álvarez Díaz (Gradiant) Ruth Muleiro Alonso (Gradiant) Luis Perez-Freire (Gradiant)
Contact details of the coordinator	George Beers george.beers@wur.nl

LIST OF ABBREVIATIONS

Abbreviation	Explanation
CC	Competence Center
DIH	Digital Innovation Hub
FIE	Flagship Innovation Experiment
IE	Innovation Experiment
RC	Regional Cluster
SAH	SmartAgriHubs
WP	Work Package
I&UK	Regional Cluster Ireland & UK
Sc	Regional Cluster Scandinavia
Fr	Regional Cluster France
NWE	Regional Cluster North-West Europe
CE	Regional Cluster Central Europe
NEE	Regional Cluster North-East Europe
Ib	Regional Cluster Iberia
I&M	Regional Cluster Italy & Malta
SEE	Regional Cluster South-East Europe

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PROJECT SUMMARY

Digital technologies enable a transformation into data-driven, intelligent, agile and autonomous farm operations, and are generally considered as a key to address the grand challenges for agriculture. Recent initiatives showed the eagerness of the sector to seize the opportunities offered by ICT and in particular data-oriented technologies. However, current available applications are still fragmented and mainly used by a small group of early adopters. Against this background, SmartAgriHubs (SAH) has the potential to be a real game changer in the adoption of digital solutions by the farming sector.

SAH will leverage, strengthen and connect local Digital Innovation Hubs (DIHs) and numerous Competence Centres (CCs) throughout Europe. The project already put together a large initial network of 140 DIHs by building on its existing projects and ecosystems such as Internet of Food and Farm (IoF2020). All DIHs are aligned with 9 regional clusters, which are led by organizations that are closely related to national or regional digitization initiatives and funds. DIHs will be empowered and supported in their development, to be able to carry out high-performance Innovation Experiments (IEs). SAH already identified 28 Flagship Innovation Experiments (FIEs), which are examples of outstanding, innovative and successful IEs, where ideas, concepts and prototypes are further developed and introduced into the market.

SAH uses a multi-actor approach based on a vast network of startups, SMEs, business and service providers, technology experts and end-users. End-users from the agri-food sector are at the heart of the project and the driving force of the digital transformation.

Led by the Wageningen University and Research (WUR), SAH consists of a pan-European consortium of over 160 Partners representing all EU Member States. SAH is part of Horizon2020 and is supported by the European Commission with a budget of €20 million.

EXECUTIVE SUMMARY

The SmartAgriHubs (SAH) project, under the Horizon 2020 program and led by Wageningen University and Research, aims at processing the digital transformation of the European Agri-Food sector. SAH uses a multi-actor ecosystem to build upon excellence, knowledge and innovation that is present all over Europe in startups, SMEs, business and service providers and end-users. Specifically, SAH aims at strengthening and maturing the services of Digital Innovation Hubs (DIHs) and Competence Centres (CCs) throughout Europe. The main purpose of DIHs and CCs is to support digital innovations in agri-food, in the form of Innovation Experiments (IEs). SAH already identified 28 Flagship Innovation Experiments (FIEs), part of 9 regional clusters, where ideas, concepts and prototypes are further developed and introduced into the market.

This specific deliverable (deliverable D3.3 "Learning takeaways from FIEs") focuses on the lessons learnt from the FIEs and Regional Clusters (RCs). The Annual Progress Reports from the 28 FIEs and 9 RCs (periodic reports) served as input for this analysis. Also a short questionnaire was conducted to list the points of attention and successes per region.

Results were analysed and conclusions were drawn related to the following topics:

- Budget
- Collaborations
- Communication
- Data collection and privacy
- DIHs and CCs
- FIE execution
- General conclusions
- Management
- Participants
- Technology

The SAH work packages, regional clusters, FIE coordinators and their partners can learn from this deliverable to continue or to improve their services, support and work in the current SAH project. Also future initiatives, such as the open call(s) organised by SAH or new future projects, and both new and current partners can benefit from these conclusions and should consider them to progress faster and circumvent some issues.

1. INTRODUCTION

The H2020 project "SmartAgriHubs" is coordinated by Wageningen University & Research. Several Work Packages (WPs) are developed to ensure a good progress and support of the project. Tasks of WP 3, directed by BioSense Institute and ILVO, leader and co-leader respectively, are amongst others to define activity plans for the Flagship Innovation Experiments (FIEs) and to identify synergies, reusable components and joint activities among the FIEs, based on common technological and non-technological aspects.

This deliverable D3.3 "Learning takeaways from FIEs" aims to give an overview of the lessons learnt from the 28 FIEs and 9 Regional Clusters (RCs) in order to be able to continue or improve the support, services and work of the several Work Packages (WP) of the SAH project:

- WP 1: The communication team of the SAH project will benefit from remarks and future requirements and requested support concerning communication and dissemination of the FIEs and RCs.
- WP 2: The final conclusions will be helpful for the design and development of the guidelines of the open call and future expansion. New partners can also benefit from the results to avoid certain problems and to be appropriately prepared.
- WP 3: Requested support, issues with the FIE execution and general lessons learnt or points of attention are very meaningful for this work package to ensure the progress and help of the several FIEs.
- WP 4: Information about the collaboration of FIEs with DIHs and the requested services was collected per region. Differences among regions, gaps in services and the requested maturity level will be very valuable for this work package.
- WP 5: Technological challenges and necessary improvements are reported as well. The requested trainings and demonstrations might be very valuable for this WP, supporting the Competence Centers (CCs).
- WP 6: The SAH management team can gain insight in the potential issues partners, subcontractors, FIE coordinators, RC leads and co-leads experienced. This can help them for both the current and future IEs to be able to support the participants and anticipate problems.

Also regional clusters, FIE coordinators and their partners can learn from the conclusions drawn in this deliverable for the further progress in the SAH project. Furthermore, both current and new partners can benefit from the results to circumvent and tackle certain problems when participating in future initiatives (within or outside the SAH project).

The deliverable results from the work in Task 3.3 "Technology Support and Synergies" and is related to deliverable D3.4 "Periodic evaluation of the IEs performance".

2. APPROACH & METHODOLOGY

2.1 SAH IE PROGRESS REPORTS

Work Package 3 developed a template for the annual progress report of the FIEs ("SAH_IE_Progress Report_M03_M16"). The template was sent to all FIE coordinators (half of January 2020). In the monthly RC meetings, organized and hosted by WP 3 management team, the template was introduced to the FIE coordinators and the RC leaders and co-leads. The FIE coordinators were asked to complete the template for their FIE together with the FIE partners. The final versions were submitted by the 1st of March 2020.

WP 3 was in charge of the collection of the completed templates, actively supported the FIE coordinators and partners and checked the quality of the reports. The progress reports were used for deliverable 3.4 "Periodic evaluation of the IEs performance", but were also useful for this deliverable 3.3 "Learning takeaways from FIEs".

Especially the following parts of the template were very valuable and thoroughly analysed:

- FIE-specific problems/challenges
- FIE-specific lessons learnt
- General impression from collaboration with DIHs
- Collaboration with other Flagship Innovation Experiments
- Plans for improvement

Based on the results, the FIE-specific problems/challenges and lessons learnt were categorized into topics related to budget, communication, data collection and privacy, FIE execution, management, participants or technology. All remarks were analysed and counted per FIE and per regional cluster, i.e. Ireland & UK (I&UK), Scandinavia (Sc), France (Fr), North-West Europe (NWE), Central Europe (CE), North-East Europe (NEE), Iberia (Ib), Italy & Malta (I&M) and South-East Europe (SEE).

The collaboration with DIHs (Figure 1) was evaluated and could range from a low maturity level of the DIHs (learning phase) to a very good collaboration within the FIE.

3.6.1. GENERAL IMPRESSIONS FROM COLLABORATION WITH DIH

What is your experience from collaboration with DIHs?	
Benefits for DIHs	
Additional services	
Services you would like to receive in near future	

Figuur 1: Section "General impression from collaboration with DIHs" from the SAH_IE_Progress Report_M03_M16.

The DIHs could benefit from this collaboration as they were able to showcase their capabilities, to improve their services or to be supported in their mission. Based on the results, future requested additional services concerned ecosystem (communication), technology (technological input), business (FIE execution, management, budget) or general requirements. The remarks were counted per FIE and per region.

The collaboration with other FIEs (Figure 2) could be only with FIEs within the RC, outside the region or non-existing. The phase of the cooperation was also checked (planning stage or already operational).

3.8. COLLABORATION WITH OTHER FLAGSHIP INNOVATION EXPERIMENTS

Flagship Innovation Experiment Name and Number	Common components, assets or approaches identified[2]	Planned integration of identified solutions[3]	Progress of implementation

**Please, add or remove rows if needed.*

Figuur 2: Section "Collaboration with other Flagship Innovation Experiments" from the SAH_IE_Progress Report_M03_M16.

The section "Plans for improvement" (Figure 3) was analysed per FIE. The "noticed gap(s) in technology" included info related to the categories data collection and privacy, FIE execution, participants and technology (Figure 3).

9. PLAN(S) FOR IMPROVEMENT

Noticed gap(s) in technology	[Please list and describe any noticed gap(s) in technology; text limit minimum 10 lines]
Need for more end-user(s)	[Please specify if you need more end-user(s); text limit minimum 5 lines]
Need for additional deployment site(s)	[Please specify if you need additional deployment site(s); text limit minimum 5 lines]
Need for additional services from DIHs and CCs	One possible additional service could be a mechanism or platform where SMEs can visit to find out about sources of funding (e.g. European Cascade funding schemes) or how they can get access to finance.
Identified training needs	
Identified useful benefits by end users/ farmers (other than the core FIE impact)	[Please, describe here if you have received any feedback from end-users / farmers on how your solution / product / service can bring additional benefit to users. This can be related to i) different application / implementation (e.g. in organic fields), ii) additional feature which implementation would not be difficult, but would bring additional benefit to end-user or iii) any other feedback you have received from your end users]

Figuur 3: Section "Plan(s) for improvement" from the SAH_IE_Progress Report_M03_M16.

Also the need for more end-users (yes/no), additional deployment sites (yes/no), trainings (yes/no) (Figure 3) and a planned extension of the FIE solution (yes/no) (Figure 4) were checked. A special question concerned the DIHs and CCs. Additional services were again categorized into ecosystem (communication), technology (technological input), business (FIE execution, management, budget) or general requirements (Figure 3). Additional benefits for end users/farmers were listed and classified into topics about communication, data collection and privacy, FIE execution and general advantages (Figure 3).

Possible Extensions to the Solution* *please specify functionality that would be "nice to have" in your solution(s) but is not planned to be developed*	
Functionality	
Technology /algorithms (if available)	
Provider	
Standards compliance	
Priority	
Other	[Please, feel free to add description of activity(s)/action(s) that, in your opinion, will enhance FIE performance; text limit minimum 10 lines]

Figuur 4: Section Plan(s) for improvement: possible extensions to the solution" from the SAH_IE_Progress Report_M03_M16.

2.2 SAH RC PROGRESS REPORT

The RC Annual Progress Reports were also used for this deliverable. The section "Intermediate connection between the regional DIHs, CCs, FIEs and WPs" was analysed (Figure 5).

1.2. INTERMEDIATE CONNECTION BETWEEN THE REGIONAL DIHS, CCS, FIES AND WPS M01 – M17

INTERMEDIATE CONNECTION – Internal institutions (inside SAH project)			
FIE	**DIHs**	**CCs**	**WPs**
FIE			
FIE			
FIE			

INTERMEDIATE CONNECTION – External institutions (outside SAH project)			
FIE	**DIHs**	**CCs**	**Other institutions / companies / funds**
FIE			
FIE			
FIE			

Figuur 5: Section "Intermediate connection between the regional DIHS, CCs, FIEs and WPs M01-M17" from the RC Annual Progress Report.

These tables were also thoroughly analyzed in Deliverable 3.4 "Periodic evaluation of the IEs performance". In this deliverable the potential connections with internal as well as external organisations were checked (yes/no) within the regions.

2.3 SAH RC QUESTIONNAIRE

In the conceptual phase of this deliverable, the idea was to collect input from several RCs during the Bucharest event. Unfortunately, due to the Covid-19 crisis all international events have been cancelled. A small questionnaire has been made for the RC leads and co-leads. They are in close(st) contact with the FIE coordinators and partners. The questionnaire enabled us to obtain the appropriate information. The RC lead and co-leads of the 9 RCs were requested to give their top 3 answers on two questions:

1. Which (general) concerns/issues/difficulties were often reported in your region?
2. Give an example of your best practices or some positive feedback.

The answers were summarized per region and categorized based on the results. The classification covered topics on communication, DIHs and CCs, general remarks, management, the open call, and the work packages. Two lists, namely "Top 5 points of attention" and "Top 5 successes", have been made.

3. RESULTS

3.1 SAH IE PROGRESS REPORTS

FIE-specific problems/challenges

In total, 66 remarks were counted and divided in 7 categories based on the content of the remark (Table 1). The 28 FIEs have reported challenges and problems related to only 1 or up to 4 categories. The amount of categories of the 9 RCs (I&UK, Sc, Fr, NWE, CE, NEE, Ib, I&M, SEE) ranged from 1 to 6. Most of the FIE-specific problems and challenges concerned the participants, technological issues or the execution of the FIE, followed by management-, budget- and communication-related issues. Only 3 remarks were about data collection and privacy. The number of FIEs and Regional Clusters per category are also shown in Table 1.

Table 1: Number (N) of FIE-specific problems/challenges of the 28 Flagship Innovation Experiments (FIEs) and 9 Regional Clusters (RCs)

Category	**N remarks**	**N FIEs**	**N RCs**
Participants	15	13	7
Technology	14	14	6
FIE execution	13	11	6
Management	7	7	5
Budget	7	7	5
Communication	7	7	4
Data collection and privacy	3	3	3

Participants

In the majority of FIEs the participants have to work closely together, which often turned out to be challenging and resulted in a certain dependency, e.g. waiting for response or a delay due to the only partner with the required sensors. Participants (and end-users) of the FIEs are often farmers, who sometimes lack the experience of working with technological tools. They are also often busy with their (mainly seasonal) farm-work, impacting their time to join meetings and workshops. Especially in FIEs where SMEs are linked to farmers (and depend on them for the tests and data collection) these issues arise. A pragmatic approach, in dedicated teams, seemed often necessary to circumvent and tackle problems. Also specialized technicians and employees were hired in the FIEs.

The willingness of the participants (mainly end-users) to cooperate in the experiments and join boot camps or workshops offered some problems.

Some FIEs also suffered from changes in staff in joining companies or new persons added to the FIE consortium.

One specific SAH partner did not respond anymore to questions and requests. After an official examination and evaluation process, the company will be removed from the project and a new partner will be added through an amendment.

Technology

Technological challenges have also been reported. The technological issues concern software issues, problems with (remote) internet or server connection (in the field), drone settings, etc. These problems are mostly very FIE- and technology-specific. All FIEs already solved these issues or made good progress to do so.

FIE execution

The outline of the FIE was often not yet clear in the starting phase of the project, which had a slightly negative impact on the execution of the FIEs. The focus and aims were sometimes not clear or the strategy had to be changed. Also definitions had to be designed and decisions on data collection and subsequent analyses had to be taken. This has led to some changes and modifications in the original Execution Plans of the FIEs.

The execution of the FIE was also impacted by the season. Drone flights can only be carried out in good weather conditions and also experiments on the field often depend on the growing season of the crops.

A lot of tasks were rather time-consuming. As this was unexpected and not calculated in the conceptual phase of the FIE, this caused some delays. However, the deadlines of the deliverables and milestones were not impacted.

Good advisory services were necessary (from the start) to support the FIE execution, but apparently these were not always available from the beginning.

Management

Management issues within the FIEs concern the reports and requests of the work packages of the SAH project. The complaints are the short deadlines and the amount of administrative and reporting demands.

Also challenges related to the general SAH project management were mentioned. A lot of partners lack experience with large EU projects, (signing) the contracts of the subcontractors caused some delays and the number of obliged meetings is rather high.

Budget

Concerning the budget, some FIEs reported an unclear division and availability of the budget (e.g. budget for workshops, direct personnel costs). Also budget shifts within companies and questions about leasing material occurred.

A clear cost-benefit calculation seemed required, especially for farmers. More support is requested in those FIEs, e.g. from CCs.

Communication

The communication within the FIEs and within the entire project was sometimes difficult, especially when scheduling meetings and collecting info from surveys. This can be partly explained by the following reasons: no prior collaboration among the partners exists, the companies are located far from each other, some partners have a slow reaction time and no common language is available. Support from the DIHs could be helpful.

Data collection and privacy

In a FIE a delay occurred in the provision of data to the FIE participants despite the permission of the farmers. In the meantime this GDPR challenge was solved. Also the importance of open source data and privacy was substantiated.

The necessity of an IP agreement among the participants in the FIEs was underlined.

FIE-specific lessons learnt

Sixty-five lessons learnt were counted (Table 2) and again classified according to the analysis of the FIE-specific problems and challenges in order to be able to compare and evaluate the progress.

Table 2: Number (N) of FIE-specific lessons learnt of the 28 Flagship Innovation Experiments (FIEs) and 9 Regional Clusters (RCs)

Category	N Lessons	N FIEs	N RCs
FIE execution	18	11	6
Participants	14	13	7
Technology	13	13	6
Management	7	7	6
Communication	6	6	4
Data collection and privacy	6	5	4
Budget	1	1	1

The 28 FIEs mentioned lessons in 1 to 4 categories and lessons from the RCs (I&UK, Sc, Fr, NWE, CE, NEE, Ib, I&M, SEE) ranged from 1 to 7 categories. The most frequently cited categories are FIE execution, participants and technology. Lessons concerned less often management, communication and data collection and privacy. Only 1 budget-related detection was described. The number of FIEs and RCs per category are displayed in Table 2.

FIE execution

Several FIEs described the added value of a market analysis. The importance of asking strategic questions and choosing the appropriate target group was also stressed.

The customer value should also be identified. The needs of the end-users are often not known or undervalued.

Beside the market analysis, a correct product identification (and promotion) is required. User-friendly instructions and online support about the application and maintenance of the technology are a prerequisite for the sustainability of the product.

The potential bottleneck of a too strong technical focus when developing a new technology was also reported as this can result in a too expensive product to support and maintain.

The implementation of the products was often more complex than expected and should follow a gradual approach with good communication of the obtained benefits. However, some FIEs already noticed the added value of their technology.

The necessity of good advisory services was acknowledged. Those services were used and turned out to be very helpful to arrange an integration of the technology in an early stage.

Participants

A large EU project requires a strong engagement of all partners of the FIE and of all staff within a company. People should be committed and both marketing and management personnel have to work closely together.

Difficulties occurred and lessons were learnt when selecting the appropriate companies and technology providers.

Several FIEs emphasized the importance of being (partly) independent and have partners in parallel roles. A strong dependency on one technology provider or outside suppliers and too much temporary contracts are inadvisable for a good progress of the FIE.

A good collaboration with the farmers, also with farmers from other regions and countries, and a strong willingness of them to participate in the FIE were described and seemed useful. However, farmers often lack the experience of working with technologies and digital tools are not frequently used, e.g. GPS. Employees are hired by the farmers to circumvent this issue and support them, but technological knowledge should be enhanced, especially equipment dealers, DIHs, agricultural advisors and SMEs should be encouraged and supported. It was also noticed that the agri business world is a small world. Besides, most of the stakeholders, e.g. SMEs and technology provides, are not aware of the reality and work of farmers. A bottleneck is to be stuck in old structures or be inflexible and unteachable. Business models of the companies should also be adapted accordingly.

Technology

A lot of technological improvements and lessons learnt were reported. The lessons were FIE- and technology-specific and concerned settings of cameras and drones, data collection and data structure, sensors, wireless networks, etc.

One FIE noted that the correct use of technological tools facilitates and improves the work and decreases the costs. Also one FIE emphasized the importance of interoperability when introducing a new technology to existing business systems, e.g. current IT systems and processes. This approach will lower the costs and limit time.

Management

Management-related experiences within the FIE are the advantages of having a good planning with input from different experts.

Lessons about the general SAH project management were described and concern the subcontractors. Some changes in the schedule occurred due to appointing several companies as partner-light.

Communication

The communication within the SAH project and within the FIEs was evaluated as very important, but not easy. Sometimes a physical meeting is more appropriate to make decisions, but difficult to arrange. Also a good contact between DIHs and CCs was emphasized as necessary.

Data collection and privacy

Some FIEs reported to have more lessons learnt in the near future after the analyses of their collected data. A good data repository on farms is very valuable, but if technology fails (on farms, in companies), no data can be gathered, revealing a certain weakness. The correct processing of a large amount of data, e.g. labeling, no bias…, was emphasized as well.

A GDPR issue brought new insights. Also another FIE mentioned the importance of data privacy.

Budget

The only lesson learnt related to budget was the positive association between a sufficient budget and the outcome of the FIE.

General impression from collaboration with DIHs

In total, 23 FIEs reported a very good collaboration with the DIHs participating in the FIEs. Digital Innovation Hubs from 5 FIEs are not yet mature hubs and are gaining experience. They have to broaden their network, enhance their availability, improve their services and support FIEs more in promotion and dissemination.

Benefits DIHs

Twenty-three FIEs mentioned that DIHs are improving themselves by participating in one (or more) FIE(s) of the SAH project. They can gather knowledge and experience. This is a great advantage especially for new DIHs.

Another benefit for DIHs, participating in the FIEs, is the support DIHs receive in carrying out their mission. Nine FIEs have described this.

Eight FIEs also emphasized the ability for DIHs to showcase their services and to gain visibility.

Additional and future services

Eight FIEs did not identify any future needs for services provided by their DIHs.

Additional services concerning the ecosystem were demanded from 12 FIEs. Connections should be encouraged and supported among FIEs within regions, but also between FIEs originating from other regions, but based on similar technologies, sectors, etc. Stakeholders will be able to learn from each other through these contacts and (cross border) collaborations. A digital tool or a platform for meetings and trainings could be helpful. Also information about collaborations of the DIHs with other entities inside and beyond the project should be given. Support in dissemination and promotion of the FIE is needed, e.g. help with (inter)national theme days, demonstrations, websites, etc. Furthermore, FIEs want to be informed about new developments within their DIHs.

Business-related services are mentioned in 10 FIEs. Help is needed for the market analysis, product identification and development of the strategy and new ideas. Also assistance in financial questions and funding opportunities of both public and private funding are welcome now, but also after the SAH project. Furthermore, administrative support is requested.

Technological support is asked in 9 FIEs. Infrastructure with good digital capacities, demo farms, input for data collection and services, advice about new applications and functionalities, technical knowledge and support for the validation of robotics are demanded.

Some general request (outside the SAH project) were formulated. Knowledge and expertise on applied agri-smartness should be enhanced. An innovation catalogue is asked. Capacity building in precision farming should be implemented and stimulated. Business cases should be developed and validated for SMEs. Also support in strategy and project development and concerning new business models for the entire agri-food sector are requested.

Collaboration with other Flagship Innovation Experiments

The current and future collaborations of FIEs within their own region and outside their regional cluster were analyzed.

Fourteen FIEs are only interested in collaborating with one (or more) FIE(s) within their region whereas eight FIEs also want to get in contact with FIEs from another regional cluster. No connections outside the region are made up till now whereas 6 FIEs already are in contact with FIEs within their regional cluster. Sixteen FIEs indicate to postpone the collaboration till the end of the project or did not yet schedule to contact the other FIE(s).

Six FIEs did not yet intend to cooperate with other FIEs.

Plans for improvement

Technology gaps

Eleven FIEs described technology-related gaps within their region. Ten FIEs reported the need for a better infrastructure, e.g. wireless internet on farms, and a better use and implementation of the digital products. One FIE emphasized the importance of developing user-friendly and easy-to-use technologies, especially for farmers, helping them to improve their work.

Three FIEs mentioned gaps and challenges related to the FIE execution. A delay occurred in one FIE and it is a hard to motivate and activate the stakeholders within the FIE. Results should be validated earlier in the project and integration environments should be supported.

Two remarks were described about the participants from FIEs. A different approach, related to the farmers and advisors, would have been chosen, e.g. involving them in an earlier stage, and the willingness of the farmers to use validated networks is questioned.

Also the necessity to extend the data model and analyses was mentioned and will be arranged very soon.

Twelve FIEs did not identify technology gaps.

End-users

Twenty-one FIEs indicated that there is no need to add more end-users.

More farmers (arable farmers and wine growers) are demanded in 4 FIEs.

Also machine producers and more end-users, with another level of digital literacy and technological knowledge, to test the technology with different supply chains and various IT systems and to extrapolate the results to other regions are asked.

The entire SAH network and EU ecosystem should be used, e.g. to launch the solutions to the market.

Deployment sites

Twenty-five FIEs will not increase the number of deployment sites.

Only three FIEs indicate the need for more deployment sites, in order to broaden their test region, to expand the test capacities of their prototype, and to test the technology with different existing IT systems and with users with different levels of digital literacy.

Additional services DIHs and CCs

Twenty-one FIEs did not request additional services from DIHs and CCs.

Seven FIEs formulated some extra services concerning business, i.e. the execution of the FIE (5 FIEs) and budget (3 FIEs), and ecosystem, i.e. communication (1 FIE). Also, a general challenge (2 FIEs) was reported, but no technology-related services were demanded. In the final stage of the project, help with the implementation of the tools, business models and with both further project and strategy development are demanded. Additional knowledge and experience is always welcome. A platform with information

about funding opportunities (also for SMEs) is also asked. The ecosystem-related question was about dissemination and promotion of the product. Furthermore, some DIHs and CCs should further refine their services and gain maturity. More information about CCs and also for CCs will be helpful.

Trainings

No trainings are needed for 24 out of 28 FIEs.

Some FIEs request trainings. These courses should concern communication and technological support. The benefits of using sensors should be clearly emphasized for stakeholders such as farmers, veterinarians and consultants. Workshops and lectures about digital farming are also asked to develop more skills. The need for technology-specific trainings, e.g. about a climate computer, an irrigation tool etc., was also stressed.

Benefits end-users

Additional benefits for the end-users, outside the core impact of the FIE, were formulated by 13 FIEs.

Topics related to communication, the FIE execution and data collection and privacy were mentioned. The ability to participate in workshops (and receive and give input) and to cooperate with SMEs as a farmer (and vice versa) are listed as great advantages. The developed tools might be useful for other sectors and production lines as well. Data awareness is created through this project.

Ten FIEs also described general advantages. Due to the use of the developed technological tools economic losses will decrease and ecological benefits will be gained, e.g. a better water consumption, a positive impact on soil, thistle weed control, etc. Also, an increased animal health and welfare will be observed. Experience and new insights can be derived from the participation in the FIEs, e.g. in ammonia emission and collaboration (low cost services when working together). Finally, a positive image for the entire agri-food sector, often suffering from a negative public opinion, will be acquired.

Fifteen FIEs did not identify benefits.

Extension to solution

Eighteen FIEs do not intend to extend their solution whereas 10 FIEs want to do so.

3.2 SAH RC PROGRESS REPORTS

Intermediate connection between the regional DIHs, CCs, FIEs and WPs

The connections of FIEs with DIHs, CCs and WPs within their region were analyzed. Nineteen FIEs already made new contacts with DIHs and CCs within their region, or contacted the WPs. DIHs and CCs already involved in their own FIE were not counted. Three FIEs were linked to DIHs, two FIEs to CCs and 19 FIEs often contact WPs (WP1, WP 2, WP 3, WP 4 or WP 6).

Also the connections of FIEs with DIHs, CCs and other organisations outside the SAH project were checked. Seventeen FIEs made (first) contacts with new DIHs, CCs or companies. Eight FIEs are connected to DIHs, 10 FIEs to CCs and 17 FIEs to new companies or institutions. Eleven FIEs are not yet in contact with new DIHs, CCs or companies.

3.3 SAH RC QUESTIONNAIRE

Points of attention

All regional clusters gave their top 3 points of attention. The 27 remarks were divided in 6 categories based on the content of the remark (Table 3). The number of categories per regional cluster ranged from 2 to 3. Most of the points of attention were general comments, followed by remarks related to management, communication and work packages. Two comments concerned the open call and 2 the DIHs and CCs.

Table 3: Number (N) of remarks of the 9 Regional Clusters (RCs)

Category	**N remarks**	**N RCs**
General	7	5
Management	7	4
Communication	5	4
Work packages	4	3
Open call	2	2
DIHs and CCs	2	2

General

General comments were formulated by 5 regional clusters. The lack of experience of some partners and subcontractors was a bottleneck or difficulty. The very project-specific terminology sometimes complicates presentations and especially short (elevator) pitches. The (up till now) low sustainability of the developed solutions after the end of the project is feared. Also a low productivity in agriculture and forestry were mentioned as points of attention. A GDPR issue occurred and the involved partners hope this will result in solving this data problem at the EU level.

Management

Difficulties with the contracts and payments are described. It was sometimes hard to adjust the execution plan to the project requirements. Reports and deliverables often had too short deadlines, had a high level of details and were time-consuming. The approach for the subcontractors (deliverables) was unclear in the beginning whereas the general deliverables of the project (WP deliverables) are often complicated and lack added value for some stakeholders (e.g. farmers). Finally the reports and meetings focus on monthly improvements instead of seasonal progress. The latter should be considered.

Communication

The need for trainings and demonstrations, preferable in native language, was emphasized in order to convince stakeholders, e.g. farmers, to use digital technologies. Also the general SAH communication might sometimes benefit from translations in native languages, especially when communicating with farmers. The RCs hope the portal will be used as the final contact list in the near future, e.g. for inviting all stakeholders to the annual conference. The challenge of merging the interests of all partners in their FIE was also described.

Work packages

Three regional clusters reported some comments concerning the work packages. More visibility is asked on the future tasks of the several work packages. The WPs should agree upon the work and make sure there is no overload. During the telco's of the work packages, e.g. the meeting of WP 1 with the regional clusters, time should be incorporated to exchange experiences and also sectorial sessions should be organized.

Open call

Specific requests and suggestions for the open call, e.g. they prefer the open call to be region-specific, were mentioned.

DIHs and CCs

Several non-interested DIHs were reported. A clear definitions and trainings for the DIHs and CCs were demanded.

Top 5 points of attention

1. WP deliverables should be clear and valuable and requests should have reasonable deadlines.
2. Communication with farmers will benefit from translations in native languages.
3. The lack of experience of several partners(-light) should be taken into account.
4. Regional suggestions for the open call should be considered.
5. Time to exchange experiences should be incorporated in WP telco's (with RCs).

Successes

A top 3 with success was also made by the regional clusters. Some regions only mentioned 2 successes. The 23 remarks were again categorized according to the content (Table 4). The number of categories per regional cluster ranged from 1 to 2. The majority of successes concern communication, followed by work package-related, general and DIHs/CCs-related comments.

Table 4: Number (N) of successes of the 9 Regional Clusters (RCs)

Category	**N successes**	**N RCs**
Communication	12	6
Work packages	6	5
General	3	2
DIHs and CCs	2	2

Communication

Six regional clusters emphasized the importance of good (inter)national events and were very happy with events within their region, but also outside their region, with a special mention of the annual SAH events. Also the regional cluster meeting in Brussels organized by WP 1 was very fruitful. The communication products offered by the SAH project, e.g. postcards, are very professional. Furthermore, participating in the monthly FIE meetings and organizing regular personal meetings with the DIHs, FIEs, SMEs, etc. seemed very helpful to follow the progress and give support if needed. Connecting to other regions ask advice and help was a very good idea.

Work packages

Several regions are very satisfied with the organization of the work packages, with a special mention of the good contact of WP 3 with the RC leads and co-leads, and the RCs and FIEs. They all work closely together resulting in a well-organized project.

General

It was noted that the funding of the SAH project is already well spent, especially FIEs and partners who are involved and engaged can benefit from this EU project. Also a good spirit and cooperation within the project was experienced.

DIHs and CCs

One RC is happy with the maturity level of the DIHs in their region. The cooperation between FIEs and DIHs creates synergies and is very supportive.

Top 5 successes

1. (Inter)national events are very important and fruitful for this project.
2. The project is well-structured with a good connection between WPs, RCs and FIEs.
3. The funding and resources of the project are already well spent.
4. The participation of RCs in the regular/monthly FIE meetings is very helpful.
5. More focused (f2f) meetings among RCs are demanded.

4. CONCLUSIONS

The results were summarized and compared. The SAH work packages, regional clusters, FIE coordinators and their partners can learn from this deliverable to continue or to improve their services, support and work. Future initiatives, such as the open call(s) organised by SAH or the development of new projects, can benefit from these conclusions and should consider them to progress faster and to circumvent some issues.

4.1 PARTICIPANTS

The participants of the SAH project have to work closely together within, but also outside, their FIE, resulting in a certain dependency. FIEs have already learnt to tackle this challenge by hiring partners in parallel roles and know they have to be committed. The project asks a dedication of the entire staff of the companies, including the marketing and management teams. Experience was gained by the selection of joining companies and technology providers. Some changes in personnel have caused confusion and issues in the past. A major problem with one partner is now being solved as this partner will be replaced.

The end-users within the FIEs are often farmers and a good collaboration and strong willingness to cooperate was noticed. However, when special IT infrastructure is required on the farm more struggle is noticed. And also the willingness after the project is questioned. Most of the farmers lack the experience of working with high-level technological tools and support is requested. Also the technical knowledge of equipment dealers, DIHs, agricultural advisors and SMEs should be enhanced. Due to the (mainly seasonal) farm-work, the farmers don't have enough time to regularly join workshops and meetings. A pragmatic approach, also with other end-users and participants, in dedicated teams can circumvent a lot of problems. On the other hand, the cooperation with other SMEs and participation in workshops offers benefits for the farmers (and other end-users) which should be emphasized. FIEs are admitting a different approach would have been chosen if they could start over, e.g. involving farmers and advisors in an earlier stage. The agricultural business is a small world and it appeared that technology-providers and other stakeholder are often not aware of the work and reality of farmers. Flexibility and inquisitiveness are key to solve this.

Only a few FIEs will increase the amount of end-users (with a different digital literacy and technological knowledge and from other regions), i.e. arable farmers, wine growers, machine producers, whereas the majority of FIEs already have a sufficient number of end-users within their FIE to develop and test their solution. The number of deployment sites was sufficient in the majority of FIEs. The entire SAH ecosystem still have to be further expanded, but is already very useful for the stakeholders.

4.2 TECHNOLOGY

Technological challenges have been reported in many regions. The problems are very FIE- and technology-specific and a lot of them are already or almost solved. All stakeholders will benefit from those lessons learnt about internet and server connection, drone and camera settings, sensors, data collection and data structure, etc. Interoperability is very important when introducing a new technology. Almost half of the FIEs are planning to extend their technology.

Although a lot of problems are solved and can be circumvented in the future, more support is requested. The need for a better infrastructure and demo farms, a better implementation of the digital products and the development of more user-friendly and easy-to-use technologies (especially for farmers) was emphasized. Also workshops about digital farming and technology-specific trainings will be very helpful.

The correct use of technological tools will facilitate and improve the work of the companies and lower the costs. Clearly explaining this, e.g. during workshops and trainings, will help to convince other stakeholders. The Innovation Portal of the SAH project can be a very valuable tool to allow partners to exchange their technological improvements and successes.

4.3 FIE EXECUTION

In the beginning of the project some teething problems occurred. The outline, focus and aims of the FIEs were not always clear, definitions had to be drawn and decisions on data collection and analysis had to be taken. The FIE partners learnt the importance and added value of a good market analysis (with strategic questions and an appropriate target group), the recognition of the customers' needs and a correct product identification and promotion (with user-friendly instructions, online support, using a pragmatic gradual approach). A too strong technical focus when developing a new technology should be circumvented. The added value and benefits of certain technologies was already experienced. These should be emphasized and will help to convince other stakeholders.

Several FIEs acknowledged and experienced (due to a lack) the necessity of good advisory services, helping to arrange an integration of the technology in an early stage. An early validation of the results is also important.

Some delays occurred due to unexpected time-consuming tasks and seasonal work (important for drone flights, experiments on the fields etc.). It sometimes seemed difficult to keep the participants motivated after such a delay.

4.4 MANAGEMENT

A lot of partners and subcontractors lack the experience of participating in a large EU project, e.g. for the (signing of the) contracts, payments, developing the execution plan, but they gain experience and some procedures, especially related to the subcontractors, are now going smoothly. The general deliverables are often complicated and lack added valued for some stakeholders (e.g. farmers). A pragmatic approach and practical summary might be helpful.

Management concerns within the FIEs were mentioned and should be taken into account. Some FIE coordinators and partners suffer from the amount of administrative and reporting (high-level and time-consuming) demands, short deadlines, the number of obliged meetings and the monthly instead of seasonal focus. The FIEs have learnt the advantages of having a good planning with input from different experts.

4.5 BUDGET

A clear cost-benefit calculation is necessary, especially for farmers, and more support is demanded from the CCs. The division and availability of the budget (for workshops, direct personnel costs) was in the beginning of the project the not clear and budget shifts within companies occurred.

FIEs reported to be happy with their budget which gave them, when involved and engaged, the opportunity to fulfill the aims of their FIE.

A platform or online tool with information about current and future funding opportunities would be very helpful.

Some regional requests concerning the open call should be considered.

4.6 COMMUNICATION

The communication within a large project is very crucial. The FIEs, RCs and WPs are working closely together and are organizing several meetings. Physical meetings are more constructive and appropriate to make decisions, but difficult to organize. The monthly meeting of the regional clusters is very helpful, but also time to exchange experiences among the clusters and sectorial sessions should be incorporated. The physical regional cluster meeting in Brussels received a very positive evaluation and should be organized more often. Attending the monthly FIE meetings and organizing several personal meetings seemed very fruitful for the regional clusters to follow the progress of the FIEs and give support if needed.

Some challenges and issues, related to meetings, emails and surveys, occurred because no prior collaborations of some partners within the FIEs exists, the companies are located far from each other and a slow reaction time of some partners exists. Especially when contacting farmers the communication should be in native languages. Also trainings and workshops in native languages should be organized. The very project-specific terminology sometimes complicates presentations and pitches.

The contact between DIHs and CCs is also very important and support of them is requested, e.g. for the dissemination and promotion of the technologies. Also workshops, clearly emphasizing the benefits of digital tools, and trainings about digital farming should be organized in order to convince stakeholders , also outside the SAH project, to use the developed technologies.

The Innovation Portal of the SAH project is a very useful tool and should be further expanded and used, e.g. as main contact list, for matchmaking etc.

Also the organization of and communication about (inter)national events is key in a large EU project. The annual meeting in Prague was very fruitful and participants are looking forward to the future meeting in Bucharest. The communication products offered by the project are very professional, e.g. the postcards.

4.7 DATA COLLECTION AND PRIVACY

Based on the input of the FIE coordinators, we know the majority of FIEs data are collected and data analyses are planned. Support for the extension of data models and analyses is requested. Through this process and also thanks to the results of the analyses more insights will be generated. A good data repository on farms is very valuable. A certain weakness of technological tools was also noticed, if the technology fails, no data can be collected. Furthermore, the correct processing of a large dataset was emphasized.

Data awareness is created through this project and several FIEs stress the importance of data privacy and IP agreements within the FIEs. In one FIE a delay occurred in the provision of data due to GDPR rules. In the meantime this issue is solved, but it would be good if GDPR issues could be arranged within the EU for future projects.

4.8 DIHS AND CCS

In general, a good collaboration with the DIHs was observed and the maturity level of the DIHs was satisfying. Only a few DIHs, actively participating in the FIEs, should grow and gain maturity. They should broaden their network, enhance their availability, improve their services and support, e.g. with promotion and dissemination of the technologies. In some regions, several non-interested DIHs are observed. A clear definition of a DIH is demanded and trainings to support them will be very helpful. Regular meetings with the DIHs turned out to be fruitful.

Additional services are requested from the DIHs and concern the ecosystem, e.g. making connections, based on similar technologies and sectors. A digital tool or platform for

meetings and trainings is requested. Information about funding should also be provided on this platform. The Innovation Portal can be the solution. More help is also demanded for dissemination and communication, e.g. websites, demonstrations, (inter)national theme days. FIEs partners also want to be informed about new developments and collaborations within and beyond the project of their DIHs. Business-related support is needed in market analyses, product identification, capacity building and development of a strategy, business models and new ideas. Assistance in financial questions, funding opportunities (both private and public funding), administration and the implementation of digital tools is also very welcome. Also after the project, the companies will benefit from this support. A low sustainability of the developed solutions is already feared. FIEs and companies also require a better infrastructure with good digital capacities, demo farms, input for data collections and services, advice about new applications and functionalities, technical knowledge and expertise for the validation of robotics, etc. In general, the DIHs are very helpful, but should further improve their services, enhance their knowledge and gain maturity.

Digital Innovation Hubs also benefit from their participation in the SAH project. They can gain knowledge and experience, they are supported in their mission within their region and they have the ability to showcase their capabilities to stakeholders and gain visibility.

A good contact between the DIHs and CCs is very important. Also CCs should further refine their services. More information (definitions, tasks, advantages) about and for the CCs is requested. More support is also demanded when making cost benefit calculations. The knowledge on applied agri smartness should be enhanced and an (SAH) innovation catalogue is welcome.

4.9 COLLABORATIONS

Half of the FIEs are only collaborating with FIEs within their own region whereas one fourth is also interested in connections with FIEs outside their region, but these contacts are not yet made. Remarkably, in this stage of the project, this process seems very region-specific.

The majority of FIEs is already in contact with new DIHs (3 contacts) and new CCs (2 contacts) within their region or often contacts the several work packages (19 FIEs). Connections to DIHs, CCs and companies outside the region were also made by the majority of FIEs, with 8 connections with foreign DIHs, 10 with CCs and 17 with new institutions and companies. Also more end-users from foreign regions were requested. Those collaborations also seem region-dependent and should be supported. The Innovation Portal and international (physical) meetings will enhance this process.

4.10 GENERAL

General advantages of participating in the FIEs of the SAH project are also formulated. Economic losses will decrease due to the use of technological tools and also ecological benefits will be observed, e.g. related to the water consumption, thistles, soil, etc. An increased animal health and welfare will be acquired. The participants will gain experience and new insights. The entire agri-food sector, suffering from a negative public opinion, will receive a positive image.

In general a good spirit in the SAH project is perceived. Several regions are very satisfied with the structure of the project, i.e. the WPs, RCs and FIEs. All work packages are working closely together resulting in a well-organized project. Some more visibility about the future tasks of the WPs for the FIEs is however demanded. The WPs should make sure no overload exists. Also regional requests and suggestions about the open call should be considered.