DELIVERABLE 3.1 INNOVATION EXPERIMENT GUIDELINES

WP 3

15th February 2019

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement № 818182

smartagrihubs.eu

DOCUMENT IDENTIFICATION

Project	**SmartAgriHubs**
Project Full Title	Smart Agri Hubs
Project Number	818182
Starting Date	November 1st, 2018
Duration	4 years
H2020 Call ID & Topic	DT-RUR-12-2018: ICT Innovation for agriculture – Digital Innovation Hubs for Agriculture
Website	smartagrihubs.eu
File Name	D3.1 IE Guidelines_Final
Date	23rd January 2019
Version	2.0
Status	Final
Dissemination level	Public
Author	Grigoris Chatzikostas (BIOS) Dragana Matic (BIOS) Milica Trajkovic (BIOS) Diederik Van Damme (ILVO) Peter Rakers (ILVO) Jürgen Vangeyte (ILVO) Anneleen De Visscher (ILVO) Marcos Álvarez Díaz (Gradiant) Ruth Muleiro Alonso (Gradiant) Luis PEREZ-FREIRE (Gradiant)
Contact details of the coordinator	George Beers george.beers@wur.nl

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 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 start-ups, 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.

EXECUTIVE SUMMARY

The aim of this document is to present the main foreseen guidelines for successful implementation of Innovation Experiments. The guideline needs to be followed by all mentioned actors.

This guideline shortly presents methodology that will be used in the course of SmartAgriHubs project in terms of distribution of roles and responsibilities, reporting, communication, meetings and similar aspects. The used methodology has been tested in various similar European projects, but based on gained experience, was tailored to best fit to SmartAgriHubs' ecosystem.

Considering the diversity of the consortia and different background of partners, this guideline introduces the main characteristics of SmartAgriHubs project including:

- Work Packages objectives -WP1: embedding and ecosystem building, WP2: Funding opportunities, WP3: fostering replicability and services reusability, WP4: support DIHs on their way to enlargement, WP5: competence centres fostering.
- Roles description – coordinator, deputy-coordinator, Scientific Coordinator, Executive board, Project Steering Group, Strategic Guidance Board and, most importantly for implementation of Innovation Experiments – roles of Regional Clusters (leaders and coleaders), IE leaders and DIHs.

The following topic that is of great importance for IE leaders is the interaction both with the relevant WPs as well as among IEs. Some basic instructions are provided, so potential confusion is eliminated. Those instructions include communication channels, mailing lists, and management of meetings (both online and physical). The roles and responsibilities for each activity are foreseen and described in detail. The special focus is on responsibilities of EI leaders. This aspect was highlighted with the main aim to assure proper implementation of planned activities in due time, consistent monitoring and evaluation of the conducted work as well as to maximize possibilities for fruitful collaborations establishment among IEs, CCs and DIHs across Europe.

This document provides an overview of tentative reporting periods, scope of reports, meeting management procedures and tools that will facilitate an efficient communication at the project level. The contribution of partners is foreseen as well.

At the end of the document, all IEs are summarized and presented in a very informative manner.

TABLE OF CONTENTS

PROJECT SUMMARY 3

EXECUTIVE SUMMARY 4

LIST OF ABBREVIATIONS 6

LIST OF FIGURES 6

LIST OF TABLES 6

1 INTRODUCTION 7

2 APPROACH & METHODOLOGY 8

3 RESULTS 9

3.1 GENERIC CHARACTERISTICS OF THE PROJECT 9

3.2 FLAGSHIP INNOVATION EXPERIMENTS -SPECIFICITIES AND CROSS-FERTILIZATION POTENTIAL 29

4 CONCLUSIONS 74

ANNEX 1 75

LIST OF ABBREVIATIONS

Abbreviation	Explanation
CCs	Competence Centres
D3.1	Deliverable 3.1
DIHs	Digital Innovation Hubs
EU	European Union
FIEs	Flagship Innovation Experiments
IEs	Innovation Experiments
KPI	Key Performance Indicator
RCs	Regional Clusters
RIS3	Strategies for Smart Specialisation
SAHs	SmartAgriHubs
SMEs	Small Medium Enterprises
TRL	Technology Readiness Level
WP	Work Package

LIST OF FIGURES

Figure 1 SmartAgriHubs Management Structure 9
Figure 2 Relation between DIHs, WPs, RCs and IEs 12
Figure 3 Regional Clusters as the intermediate connection within SmartAgriHubs project 20

LIST OF TABLES

Table 1 SmartAgriHubs WPLs & WPCLs 15
Table 2 Regional Cluster Leads and Co-leaders 17
Table 3 Brief overview of roles and responsibilities 19
Table 4 reusable services and sustainability potential 23
Table 5 Meeting types 26
Table 6 Meeting Management Responsibilities 27
Table 7 WP3 deliverables overview 29
Table 8 SmartAgriHubs Meeting Agenda template 75
Table 9 SmartAgriHubs Meeting Minutes template 76
Table 10 SmartAgriHubs Report template 77

1 INTRODUCTION

SmartAgriHubs is dedicated to accelerating the digital transformation of the European agri-food sector. It will consolidate, activate and extend the current ecosystem by building a network of Digital Innovation Hubs (DIHs) that will boost the uptake of digital solutions by the farming sector. This will be achieved by integrating technology and business support in a local one-stop-shop approach involving all regions and all relevant players in Europe. The heart of the project is formed by 28 flagship innovation experiments (FIEs) demonstrating digital innovations in agriculture, facilitated by DIHs from 9 Regional Clusters (RCs) including all European member states. Concurrently, SmartAgriHubs will improve the maturity of innovation services of DIHs so that digital innovations will be replicated across Europe and widely adopted by European farmers. A lean multi-actor approach focusing on user acceptability, stakeholder engagement and sustainable business models will boost technology and market readiness levels and bring user adoption to the next level. This will be enhanced by synergetic effects between SmartAgriHubs and RIS3, since SmartAgriHubs will work in lock step with European regions to maximize the return of European investments, including regional structural funds and private capital. SmartAgriHubs' inclusive structure and ambitious targets will bring the entire European ecosystem together, connecting the dots to ensure global leadership for Europe in the AgTech market.

Innovation Experiment guidelines (D3.1) is the first deliverable generated by the WP3. WP3 is dedicated to the Monitoring & Evaluation of Innovation Experiments, both flagship and experiments resulting from the open calls. The goal of this WP is first to ensure that all the Innovation Experiments will focus on the development of relevant services by DIHs. Secondly, this deliverable's objective is to serve as a unique guidelines handbook that will ease Innovation Experiments execution in aligned, unified and timely manner as well as to ensure the smooth progress of the operations.

This document is consisted of five main chapters, including the Annexes. This introductory chapter brings brief overview on entire document and presents its purpose. The chapter two describes methodology and contextual background used for establishment of the IE guidelines. The third chapter describes roles and responsibilities within the SmartAgriHubs project; communication channels that will be used, followed with their purpose; the way how, when, and why meetings will be organized and held and how the work conducted in the course of SmartAgriHubs project, on Innovation Experiments level, will be reported, followed with deadlines.

2 APPROACH & METHODOLOGY

SmartAgriHubs defined a well-balanced set of 28 FIEs, putting the emphasis on DIH services reusability. The selection imposed the necessity of having IEs with ideas diversity, tackled intra-border challenges, properly addressed contribution to the major digitization challenges in the agri-food sector and ideas that demonstrate the variety in approaches to use innovative digital solutions and competences.

Having in mind huge number of actors involved, SmartAgriHubs complexity and dynamic operational environment, WP3 aimed to create simple and easy-to-follow procedures (set of guidelines) that are tailored for Innovation Experiments, in order to meet the project needs and objectives, paying special attention to include interactions among engaged actors, tasks and activities.

For the proper guidelines' establishment, good practices and lessons learned from previous successfully implemented projects have been used as a starting point. Proved-to-be-effective and efficient project management tools, such as collaborative online platforms are used and tailored for the SmartAgriHubs Innovation Experiments execution. Diverse methods were engaged for different segments of planning and setting the mode of operation that can fit to each Innovation Experiment, regardless the IE sector, goal, objectives, geographical coverage or specific challenges. The term `guidelines` refers to the manner and method of operation that has to be followed by Innovation Experiments.

As a final result, WP3 has established instructions that will be applied to all Experiments

IE generic guidelines support the general SmartAgriHubs organization structure and IE execution instructions, which are:

- role description,
- communication channels,
- meetings management and
- reports and deadlines.

In addition, in order to facilitate the cross-fertilization and synergies creation between Innovation experiments, all selected IEs are briefly presented in this document. This way, while reading and introducing with the general rules and responsibilities in the projects, IEs will start exploring the individual characteristics and challenges of other FIEs and their distinctive nature.

3 RESULTS

3.1 GENERIC CHARACTERISTICS OF THE PROJECT

For better understanding SmartAgriHubs' organizational structure, it is important to perceive the overall management structure, as shown in the Figure 1. It was adopted by the consortium to ensure the successful and on time implementation of all project activities.

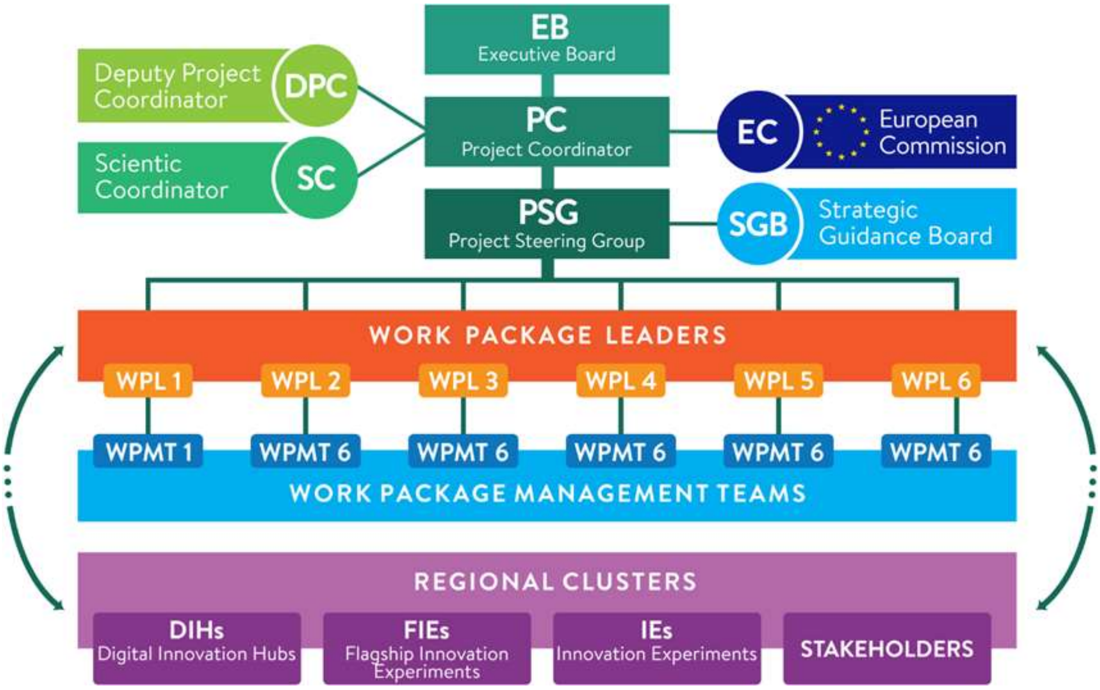


Figure 1 SmartAgriHubs Management Structure

Considering the fact that the most important segment of the project are IEs and assuring their successful implementation is the priority for overall consortia, all Work Packages, supporting teams, regional clusters and DIHs are focused on assisting IEs in their planes implementation. To better understand the relations and roles division at the highest project level, following paragraphs are bringing short overview on every segment of the project's management structure.

SmartAgriHubs has in total 6 Work Packages (WPs). Each WP has unique list of objectives that are listed below.

WP1 DIH Ecosystem Building objectives:

- Ecosystem building: WP1 helps existing DIHs in all European regions strengthen and expand their network, so that they can fulfil their mission to enable, support and develop an increasing number of Innovation Experiments. They need to support start-

ups and SMEs by connecting them to relevant stakeholders and expertise at a regional and national levels;
- Collaboration and knowledge sharing: In connection with other WPs, WP1 strives to build trust and to facilitate knowledge sharing within and between DIHs to broaden their capacities and services. DIHs can learn from one another, so as to better identify, address and convey the needs of the farming community;
- Communication and dissemination on two levels:
  - On project level, WP1 organises and implements SmartAgriHubs' communication strategy and activities to raise awareness about the project and disseminate its results;
  - Since each region has its particularities, WP1 provides support to DIHs to help them connect and engage with stakeholders from the agri-food chain. Their objective is to raise awareness about their services, attract innovators, mainstream the knowledge developed, and disseminate the results from Innovation Experiments to key stakeholders and interested parties at regional and national levels.
- A web-based interactive Innovation Portal will be developed to support these objectives.

WP2 Network Expansion by Open Calls objectives:

- Consolidate communication channels in close collaboration with WP1 and WP4, and based on the existing networks, to identify and attract relevant new stakeholders;
- Development of specific expansion pathways that are corresponding to regional, economical and sectoral requirements for creating new Innovation Experiments (IEs), Digital Innovation Hubs (DIHs) and Competence Centres (CCs) based on the results elaborated in WPs 3, 4 and 5.
- Elaborating best alternatives for carefully selecting from different strategic approaches like needs related calls, innovation-based funnelling, regional expansion and joint initiatives to help companies becoming more competitive with improved business/production processes, products and services using digital technologies.
- Connecting to and matching with other funds from regional public or private stakeholders, also allowing for joint activities and combination with SmartAgriHubs open calls for network expansion.
- Organizing targeted open calls to expand, validate and strengthen the network of Agri-Food DIHs

WP3 Monitoring & Evaluation of IEs objectives:

- To define and set-up a detailed plan of activities for all IEs
- To monitor and evaluate the activities of IEs based on predefined KPIs

- To identify synergies, reusable components, and joint activities among IEs
- To significantly advance the TRLs of IEs through broad demonstration/validation campaigns
- To maximize the market impact of the technologies developed in the IEs

WP4 DIH capacity building and monitoring objectives:

- WP4 aims to ensure that all DIHs have the capacity to develop and deliver an adequate portfolio of relevant, value adding and applicable innovation services in a one-stop-shop formula for end-users.
- Through capacity building WP4 contributes to the creation of pan-European added value of the project by building a strong and sustainable network of DIHs in the agri-food sector.

WP5 Competence Centres (CC) objectives:

- Map the digital technology field and useful digital technologies for SmartAgriHubs and users.
- Create a catalogue of existing CCs, in collaboration with Regional Clusters.
- Carry out competence profiling and "White spot" analysis to identify new knowledge exchange and business opportunities in other CCs not traditionally working in agriculture.
- Coordinate and manage the network of CCs to meet challenges and satisfy the needs identified by DIH and their community of users on a continuing basis. Create ease of access (by DIH and IE) to a high-quality pan-European network of CCs.
- Identify synergies and efficiencies among CCs (agri and non-agri) and their networks of users as well as best practices for knowledge exchange in the digital CC community.

WP6 Project Management objectives:

- To achieve the project goals on time and within budget
- Ensure adequate coordination between the work packages, regional clusters and DIHs
- Ensure transparent and effective decision making; using new opportunities and based on DIH's feedback
- Assure the multi-actor approach as leading principle for adequate involvement of relevant partners and stakeholders
- Develop Cooperation and synergy with other projects and initiatives (regional, national, EU and outside EU) on Digitization in Agriculture and on DIHs

As it can be seen, the role of every WP is to provide support to involved DIHs, CCs and IEs, each from its relevant domain – WP1 for embedding, WP2 for Funding opportunities, WP3 for fostering replicability and services reusability, WP4 supports DIH on their way to enlargement, WP5 focuses on competence centres. IEs can be connected to one or more

DIHs and use services form one or more CCs. This way, Regional Clusters gather all mentioned players. Figure 2 explains relation between WPs, DIHs, RCs and involved IEs.

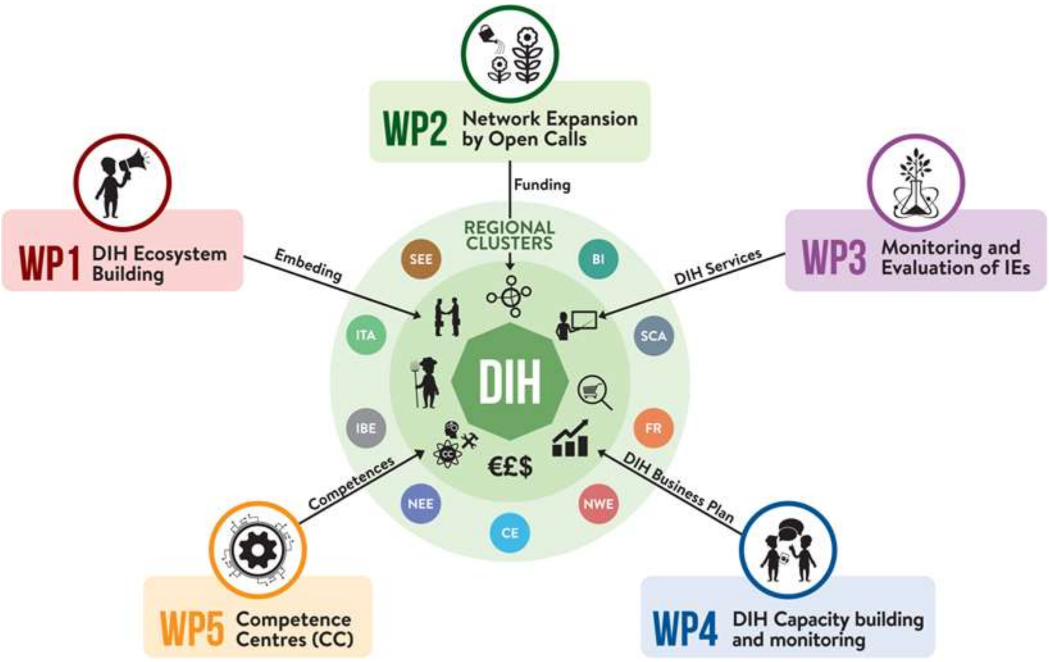


Figure 2 Relation between DIHs, WPs, RCs and IEs

General roles and responsibilities are presented in the subchapter 3.1.1.

3.1.1 Role description

Having in mind SmartAgriHubs complexity, precise role description is a must in order to avoid misunderstandings and work overlap. That is the reason why every position has precisely described its obligations and authority area. Following paragraphs are bringing description of the main position, followed with appointed persons. For the IE implementation, this info is needed for the overall understanding of the project dynamics but is not necessary for the work execution in the field. Organizational structures that are of particular importance for IEs and that have a direct influence on experiments will be stressed.

Project Coordinator (PC)

The Project Coordinator (PC) is **Dr. George Beers** from Wageningen Research, highly experienced in managing international research and innovation projects and coordinating large scale initiatives. The PC is the single point of contact between the EC and the Consortium. In this function, the PC is signing the Grant Agreement on behalf of the consortium as well as coordinate potential updates and amendments of the contractual documents (i.e. in relation to administrative, financial and technological matters). If required, the PC will organise meetings of the executive board as ultimate decision body to make critical decisions in case of related issues. However, the PC shall not be entitled to act or to make legally binding declarations on behalf of any other Party.

Pursuant to the Grant Agreement, the PC is responsible for the following tasks and functions:

- Overall management of the project with the support of the different management bodies, specifically supported by the dissemination and exploitation manager, Chairing the Project Steering Group (PSG), the Executive Board (EB) and the Strategic Guidance Board (SGB),
- Preparation of the meetings and decisions of the Project Steering Group, timely collection and preparation of financial statements, including financial audit certificates, from the Parties for transmission to the Commission,
- Ensure prompt delivery of all deliverables identified in the contract, including reporting on achievements, hardware, software and data or requested by the Commission for reviews and audits in accordance to the contract general conditions, including the results of the financial audits prepared by independent auditors.

If one or more of the Parties is/are late in submission of project deliverables, the coordinator may submit the other Parties' project deliverables to the European Commission. To the extent that serious concerns regarding the financial soundness of one or several Parties exist, the coordinator has the authority to require the appropriate letter of comfort to prove that the corresponding Party is able to fulfil the financial obligations with regard to the Contract and the Consortium Agreement. Until this is provided, the coordinator is entitled to refuse the disbursement of the financial contributions of the Commission to this Party. Furthermore, the coordinator has the right to retain any payment if a Party is late in submitting or refuses to provide deliverables. Of course, with respect to the contractual management, the coordinator will also take care for:

- Prepare a Consortium Agreement among beneficiaries;
- Administer Community financial contribution regarding allocation between beneficiaries and activities, in accordance with the grant agreement and decisions taken by the consortium;
- Support to keep records and financial accounts making it possible to determine at any time what portion of the Community financial contribution has been paid to each beneficiary for the purposes of the project, including distribution of financial resources to beneficiaries;
- Planning & preparation of meetings, including preparation of the minutes of general meetings.

Deputy Project Coordinator (DPC)

Grigoris Chatzikostas from BioSense Institute is a Business Developer in the field of advanced ICT technologies for the agri-food sector. In the past 15 years he has managed projects exceeding the total value of 95M EUR. In SmartAgriHubs, he will act as Deputy

Project Coordinator with main task to organize and facilitate coordination between RCs, DIHs and Innovation Experiments in all 9 regions.

Scientific Coordinator (SC)

Dr. Sjaak Wolfert from Wageningen Research is Senior Scientist in the field of Data Science and Information Management in the Agri-Food business. He has an outstanding experience as scientific coordinator of (inter)national projects on public-private innovation partnerships and was president of the European Federation of ICT in Agriculture (EFITA). His main role in the project is to ensure the quality of the plans and results and to be a high-level ambassador of the project in international networks and conferences.

Executive Board (EB)

The Executive Board (EB) is composed of representatives of each beneficiary holding signatory power in their organisations and/or being authorised to commit her/his organisation to the decisions of the EB. Meetings of the EB will be organised on demand of the PC, PSG or SGB. EB meetings will be organised by the PC, preparing all relevant information enable consensus EB decisions. EB decisions are documented, especially in case of contractual consequences for agreements. EB meetings can be organised as physical, online (e.g. Telco) or offline (e.g. email) meetings or combinations thereof, responsible for:

- Support the PC in fulfilling all obligations towards the EC and to ensure that the work meets requirements;
- Fundamental changes of the planned work/deliverables that will also be coordinated with/proposed to the EC;
- Decide as the last instance for the resolution of conflicts or for a fundamental reorientation of the project, which cannot be agreed on the other project management levels and to decide major changes to the contract to be suggested to EC.

EB has a quorum when two third of all beneficiaries are present. Decisions of EB are expected to be taken by consensus. If consensus cannot be reached, decisions will be taken by a majority vote. In voting, each Party shall have a number of votes equal to the percentage that its Project share bears to the total of all the Project Shares of the Parties. In the event of tie, the vote of the PC will decide.

Project Steering Group (PSG)

The Project Steering Group (PSG) consists of the PC, DPC, SC, and one representative from each Work Package (i.e. usually the WPLs). It will have bi-weekly telephone conferences and meet at least every three months in a one day face-to-face meeting and if necessarily followed by a project workshop. Prime tasks of the PSG are to monitor progress, analysing and approving the results, deciding on corrective actions proposed, where appropriate, recommending contractual changes, and provision of proper administration of the project (providing project management support regarding technical, financial and/or exploitation/

dissemination issues, as appropriate, proposing changes in work shares and related budget). Moreover, the PSG is also responsible for:

- supporting the coordinator in fulfilling obligations towards the EC and ensuring that all work meets use case demand,
- monitoring the project's budget in accordance with the contract and reviewing and proposing to the partners' budget shifts,
- in case of default of a partner agreeing on actions to be taken against the defaulting partner, including a request to the Commission for an audit, or for the assistance of the Commission, and making proposals to the other partners to assign the tasks of the defaulting partner, and if appropriate to agree upon a new entity to join the project for that purpose.

Any decision that requires a decision on PSG level must be identified as such on the pre-meeting agenda. The PSG will decide by simple majority, document their meetings/decisions within minutes that are made available to all partners.

Work Package (WPL) and Work Package Management Teams (WPMT)

For each individual work package, a **Work Package Leader** (WPL) and **Work Package Co-Leader** (WPCL) are appointed. WPLs and WPCLs have been chosen on the basis of their specific expertise and their multiannual experience of team work at international level. WPLs will manage and monitor the progress of the tasks of their WP through a continuous intermediation with the Task Leaders. The WPL is chairing the Work Package Management Teams that will make WP related decisions and prepare input for the PSG/PC.

WP	WPL	WPCL
WP1 DIH Ecosystem Building	Edwin Hecker (S&P)	Peter Paree (ZLTO)
WP2 Network Expansion by Open Calls	Harald Sundmaeker (ATB)	Sjaak Wolfert (WR)
WP3 Monitoring & Evaluation of IEs	Grigoris Chatzikostas (BIOS)	Jurgen Vangeyte (ILVO)
WP4 DIH capacity building and monitoring	Frank Berkers (TNO)	Judit Anda Ugarte (CAPDER)
WP5 Competence Centres (CC)	Cynthia Giagnocavo (UAL)	Ahmed Issa (IPA)
WP6 Project Management	George Beers (WR)	Grigoris Chatzikostas (BIOS)

Table 1 SmartAgriHubs WPLs & WPCLs

Strategic Guidance Board (SGB)

The Strategic Guidance Board (SGB) represents a strategic decision-making body in SmartAgriHubs that will make final decisions on the Innovation Experiments implementation alternatives. At proposal stage, each FIE defined its focus and prepared an initial detailed planning with respect to both the supply and the demand side, specifying most probable solution alternatives in terms of efforts and costs based on most recent state-of-the-art. However, as innovation is at a high pace, it would not be serious to assume that all detailed plans and decisions made in the proposal or kick-off phase remain adequate in terms of features, effort and costs. New solutions, business models and related alternatives will come up that will require a response of SmartAgriHubs team. The initially planned effort and costs that were allocated to the related focus areas and specifically that part of the budget that was not finally assigned to a specific implementation partner (i.e. also including the open call related budget) will be carefully planned and decided by the SGB at the related Milestones.

The SGB involves high level senior representatives with both a supply and a demand side background, highly familiar with the agri-food sector as well as with technology potentials. These are usually individuals not belonging to SmartAgriHubs beneficiaries to assure independent decisions but making binding decisions. Therefore, SmartAgriHubs assigned related costs for the payment of preparation, travel, meetings and reporting. An initial commitment for SGB participation was given by the following individuals: Valentin Opfermann (Copa-Cogeca), Sara Djelveh (CEMA), Eduardo Cuoco (IFOAM EU Group) and representatives from FIWARE Foundation and Rabobank.

For the successful experiments’ execution and maximization of results impact, following project bodies are of great importance for IEs:

Regional Clusters` Leaders (RCLs) and Regional Clusters` Co-Leads (RCCLs)

To revise previously written, SmartAgriHubs Work Packages (WPs) operate at EC level. The Digital Innovation Hubs (DIHs) are established at regional level throughout Europe. The innovation actions in the project are executed as Innovation Experiments (IEs) that are initiated and endorsed by DIHs and also active in a specific region. The Regional Clusters (RCs) are the intermediate connection between the regional DIHs and IEs and the central WPs.

For each Regional Cluster, a **Regional Cluster Leader** and **Co-Leader** have been appointed, as presented in the Table below.

Regional Cluster	Regional Cluster Leader (RCL)	Regional Cluster Co-leader (RCCL)
Iberia	CAPDER (Judit Anda Ugarte)	Consulai (Luis Mira da Silva)
UK & Ireland	TSSG (Hazel Williams & Kevin Doolin)	I4Agri (Andrew Lazenby)
France	Pays de la Loire (Anne-Claire Branellec)	ACTA (Adrien Guichaoua/ Samy Ait Amar)

Regional Cluster	Regional Cluster Leader (RCL)	Regional Cluster Co-leader (RCCL)
Italy & Malta	Emilia-Romagna Region (Sofia Michelli)	Coldiretti (Ambra Raggi)
Central Europe	LKÖ (Florian Herzog & Martin Hirt)	WirelessInfo (Karel Charvat)
North West Europe	MSG (Hubert Gerhardy)	ILVO (Jurgen Vangeyte & Peter Rakers)
South East Europe	AUA (Spiros Fountas & Nikos Mylonas)	PRO-AGRO (Viorel Marin & Adina Cristea)
Scandinavia	Seges (Nicolai Fog Hansen)	LUKE (Liisa Pesonen)
North East Europe	ZSA (Inga Berzina)	PSNC (Raul Palma)

Table 2 Regional Cluster Leads and Co-leaders

The RCs will contribute by:

1) Identifying and maintaining a list of all DIHs in the region (related to WP4);

2) Periodically collecting basic information for each DIH in the region using templates provided by the core team (related to WP4);

3) Contacting DIH's in the region and Collecting ideas for monitoring the Innovation Experiments in the region, using templates provided by WP3;

4) Monitoring the region for funding schemes in their region that might offer opportunities for leverage with the SmartAgriHubs Open Calls (WP2).

The Regional Clusters (RCs) are the intermediate connection between the regional DIHs/CCs and IEs and the central WPs. Building the network of the Regional Clusters is key to form a flourishing eco-system around the Digital Innovation Hubs throughout Europe. The coordination part of the tasks to support the RCs are performed in WP6, whereas WP1 supports the Regional Clusters in the building and expanding of their regional ecosystem.

Innovation Experiments leaders (IELs)

The RCLs and **IELs** shall coordinate the day-to-day work for the realisation of innovation experiments. This work goes beyond the coordination of a pure validation of technological choices, sustainability and replicability. They have to carefully explore and to harmonise the work defined in the initial plans with new industry and business processes and innovative business models validated in the context of the pilots. The IELs are reporting in a structural way organized and monitored by WP3, with an active involvement and operational support of RCLs that are responsible to provide required input, identified issues and change requests to the PSG and WPs.

Major responsibilities of Innovation Experiment leads can be classified into 4 main groups:

1. Innovation Experiments Execution Plans activities execution
    1.1. To run and execute IE activities as defined in IE Execution Plans (IE EPs),
    1.2. To assure activities execution alignment with defined duration and cost in IE EP,
    1.3. To report all deviations from the IE EP to the WP3,
    1.4. To keep track on activity success indicators and periodically (or on demand) report to the WP3.
2. Collaboration with DIHs/CCs
    2.1. During IE execution, IE lead should initiate and maintain the collaboration(s) with DIHs and CCs,
        2.1.1. DIHs are expected to give access to the latest knowledge, expertise and technology (through CCs),
        2.1.2. Cross-border collaboration is strongly encouraged,
    2.2. During IE execution, IE lead should initiate and maintain the collaboration(s) with other Innovation Experiments, considering the replicability aspect of IE(s).
3. Key Performance Indicators
    3.1. To assure reaching defined activity success indicators,
        3.1.1. KPIs related to the IE impact will need to be measured and reached in order to validate the IE,
    3.2. To periodically or on demand update WP3 on all KPIs status.
4. Deliverables and Milestones
    4.1. All deliverables and milestones defined in the IE's EP need to be done/achieved as stated – both respecting the deadline and envisioned scope and budget
    4.2. Deliverables related to the Subcontracted parties will serve us a payment-related documentation,
    4.3. WP3 will monitor IE deliverables and milestones.

Following table summarizes roles and responsibilities of main roles and responsibilities in the project:

WPLs	WPCLs	RCLs	RCCLs	IELs
Manage and monitor the progress of the WP tasks and activities	Support WP leads in WP management, task execution and progress monitoring	**Act as an intermediate connection between the regional DIHs, IEs and WPs**	**Support RC leads in RC management**	**Along with RCLs, coordinate a day-to-day work of FIEs, validate technological choices, sustainability and replicability**

WPLs	WPCLs	RCLs	RCCLs	IELs
Collaborate and support other WPs	Share responsibility for proper and timely WPs tasks execution	**Detect and build network of DIHs and CCs in the region, for both new and operating**	**Collect data from their specific regional coverage**	**Report to WP3 on FIEs progress and other relevant topics**
Have a close collaboration with Task Leaders	In charge of co-coordination of WPs activities	**Monitor their region for funding schemes**	**Share responsibility for proper and timely RC activities execution aligned with previously internal role distribution**	**Participate in project meetings and events**
Chair the Work Package Management Teams	Participate in project meetings and events	**Actively involved and supportive to FIEs (e.g. to provide required input, identify issues etc.)**	**Participate in project meetings and events**	**Collaborate with WPs**
Prepare and present input for the PSG/PC	Prepare contribution for deliverables and reports	**Share knowledge of the region needs diversity and institutional settings**	**Prepare reports and contributions for deliverables**	**Prepare needed input for project deliverables and reports**
Participate in project meetings and events		**Monitoring learning and future continuation**	**Support RC leads in RC management**	**Make sure prepayment deliverables are properly prepared and submitted**
Prepare deliverables and reports		**Participate in project meetings and events**		
		Prepare reports and contributions for deliverables		

Table 3 Brief overview of roles and responsibilities

SmartAgriHubs aims to builds a strong, multi-layered network of agricultural Digital Innovation Hubs (DIHs) and Competence Centres (CCs) to exchange knowledge and create a pan-European market for digital solutions for farming and food production. Following picture presents the relation between IEs, DIHs, CCs, services that will be provided by SmartAgriHubs project and innovation portal (related to RIS3 platform).

Figure 3 Regional Clusters as the intermediate connection within SmartAgriHubs project

As the picture above presents, IEs operate through the Regional Clusters, which act intermediate connection between the regional DIHs and IEs and the central WPs. Building the network of the Regional Clusters is key to form a flourishing eco-system around the Digital Innovation Hubs throughout Europe. This approach facilitates the cross-fertilization between different agricultural sectors and technology domains, with the main aim to foster digitization in agri-food sector.

Digital Innovation Hubs (DIHs)

All FIEs are closely linked to the DIHs and their services. Regarding technology services, FIEs will require technical support, experimentation testing, demonstration, and validation. The business services are associated to finance and funding access, market intelligence, business support and development, and commercial infrastructure. Mentoring, community building, training, dissemination, and accelerating adoption are required ecosystem services.

In order to accelerate the reusability of DIH services, following table brings brief overview of services that are connected to each Innovation Experiment. This table can serve as a starting position for IE coordinators while exploring the possibilities of other involved DIHs and capacities for joining efforts with other IEs. Please, have in mind that this table has indicative character and that the information might be changed in the future.

No.	FIE name	DIHs service reusability	DIHs service sustainability
1	Farm Sustainability Audit	Developed methods will be used in other countries where similar models are used.	Deployment of the outputs within the Sustainable Dairy Assurance Scheme will ensure platform availability in the future.
2	Sustainability tool for remote assessment and management of farmland - STREAM	Teagasc will reuse and further develop this approach for companies facing the same challenge. Reusability can be extended to the drone technologies.	This approach aims be included in the suite of services that are already attracting investments for accreditation standards in food production systems.
3	Digitizing farm machinery produced by SMEs	Gained knowledge will be added in the Scandinavian DIHs services and manuals. Also, aim is to spread to other European regions.	IE objectives are part of Scandinavian farming political agenda, ensuring that results will have demand many years after project completion, financed by a user-fee.
4	Adopting digital technologies by farmers		
5	Digital tool and knowhow for valued grain chain	DIH models and technical solutions will be open to reuse and further modification for different Scandinavian regions.	Beneficial cooperation between the DIHs and CCs based on information exchange and increased customer demand.
6	Co-creation of value and innovations in horticulture – AgriFarmLab	Aims to expanded from the initial Vendée département to the whole Pays de la Loire region and other western French regions.	During project they will seek for additional support from regional and national funds to straighten up capacities for the network.
7	Information system and DSS tool for cereals cultivation – Digi-PILOTE	It is expected that the service will be widely deployed in France due to Digifermes DIH activities.	Service will be a commercial offer, developed by ACTA & Arvalis to be widely deployed, with help of other DIHs.
8	Decision support tool for digifarmers – STRATE-GEEK	Economic organizations will reuse IE results in their consulting activities.	Access to indicators developed in API format can be free or paid.
9	Deep learning and hyperspectral imaging – AI4AGRICULTURE	The technology services are reusable by the participating DIH Imec and Flanders Food.	To ensure sustainability services will be charged.
10	Smart data use on arable farms - Farmcube	Most of the digital services are generic and can be reused in other agricultural sectors.	Ownership comes at a cost, so farmers will pay for the toolsets.
11	Pig health assessment based on applied sensors – SmartPigHealth	Services that improve pig health and reduce the use of antibiotics will provide useful information to be used of other DIHs.	The business model ensures that the prediction model has ongoing development and supply on market.

No.	FIE name	DIHs service reusability	DIHs service sustainability
12	Improving responsibility in livestock production – DIG-ITfarm	Model used to show that intensive large-scale farming will be interesting and valuable to be used by other DIHs.	By charging for provided services, the DIH will be more sustainability and less depending on governmental funding.
13	Ammonia Emission Monitoring Network - AEMON	The business model involved can be shared with other DIHs.	DIH will attract a number of tech suppliers. Services of the DIH will be charged.
14	Mower-robot for Vineyards	Service reusability foreseen in wine regions. Technology can be used for other orchard cultures or vegetable gardening.	After reaching market maturity, activity funded via national or international subsidy programs, SMEs will distribute the product.
15	Precision farming on small-scale farms	DIH aims to get international applicable solutions. Web Handbook will increase benefits to all DIHs and graduate students.	Farmdok will offer service to its wide customer base, financing themselves through licence fees of premium app users.
16	E-services using drones for quantity buyer	Services have a reusability potential to be deployed in the wide geographical area and various crop type.	Some services may require state budget, other will be offered commercially or as public-private partnership.
17	On-line DSS for optimizing fertilizers – PULS for fertilizers	Aggregated real-time data, location -dependent data, crop demand, economical, scientific and experimental data are reusable.	The sustainability of the services after the end of the project could be based on a subscription fee.
18	Autonomous Greenhouses – smart micro farming and smart large-scale production	Services developed at DIH Agro Poland will be available for free to other DIH or public units while maintaining the data anonymity.	Data services and preparation of simulations for selected environments and crops provide profit.
19	Bee monitoring and behavior prediction	Services will be reused in all Latvian bee keeping community in cooperation with DIHs from NEE RC.	Low amount of existing bee monitoring systems and large market potential are base for this service large scale business.
20	Ground Water and meteo sensors	With open API integration with other DSS tools is feasible and that ensures service reusability.	DIH is collaborating with the commercial companies that are offering these services to the market with a global target.
21	Sensoring and AI algorithms for early crop disease detection -SAIA	FARM2030 will set a base for a future reusability of the service which can be enriched in the future, with additional algorithms and initiatives.	Aim is to maintain sustainability through national or governmental funds, data licenses and royalties, services contracted fees per service level.

No.	FIE name	DIHs service reusability	DIHs service sustainability
22	Iberian Irrigation Portal	Iberian Peninsula top priority is efficiency and effectiveness of water use, so developed services reuse to other regions is a necessity.	EU CAP priorities make these services highly relevant and demanded. Commercial exploitation is based on compensation.
23	Data-Intensive Dairy Production	Rolled up services have a reuse potential by other DIHs focused on the dairy sector.	DIH expects to receive support from Galician R. Government (grants, contract programme and ecosystem building).
24	Implementation of ICT in aquaculture - AquacultuER4.0	Since aquaculture is lacking behind in terms of ICT solutions and tools deployment, these services have a great potential of reusability.	Technologies and services will be offered through the network of cooperatives, fairs, and events.
25	Data driven and precision-based management in vineyards - VINPREC	The proposed IE is suitable for any other DIH and it is not bound to a specific crop.	Applications will be offered to France and Spain as most important wine producers.
26	Digitizing Leafy Vegetables	The results will be tested and reused by other DIHs to increase impact on the European sector of leafy vegetables.	Economic growth projections of this agricultural sector are predicting high interest and potential for this service type.
27	Animal Identification with IoT	Deployed services easy to replicate and extend to other regions, since they will be exposed as standardized REST interface.	Other DIHs and the associated SMEs will be interested to pay to acquire the IE resulted services.
28	Decentralized trust in agri-food supply chains	Developed experience can be used in most other DIHs, even not related to Agriculture.	New services development that will be part of DIH portfolio and services.

Table 4 reusable services and sustainability potential

3.1.2 Communication channels

Considering the complexity of the project and the number of different (direct and indirect) partners, SmartAgriHubs will try and make the best of web tools, both for internal and external communication. To maximize data security and knowledge exchange, the project has decided to make use of two different tools: i) a website (for external communication and connection to social media), ii) a secured and collaborative file repository (SharePoint)

The collaborative and secured file repository

The collaborative file repository is a secured extranet dedicated to the project and only accessible to registered SmartAgriHubs members. It is designed for sharing and archiving information, and ensuring traceability during the construction of SmartAgriHubs Deliverables, as well as during entire project implementation. It will be used primarily by WP leaders, team leaders, Regional Cluster Leaders and Co-Leaders as well as by Innovation Experiments Leads. All consortium members will have access to the file repository; they will be able to download there the reports and deliverables as well as other resources (logos, templates, slides from consortium meetings, etc.). This file repository is based on SharePoint.

Access to the collaborative file repository:

You will be able to get access through this link (please save it in your bookmarks).

For any new access please contact project coordination team smartagrihubs@wur.nl

Any document produced in SmartAgriHubs must be uploaded to the collaborative file repository so that the members of the project can have direct and secured access to the last updates.

All the documents posted in the collaborative file repository are considered confidential. Before providing credentials to Innovation Experiments team members, they will receive detailed instructions on usage material that is stored on the collaborative platform (SharePoint). In addition, the instructions will cover following topics: reusability of provided material (e.g. templates); possibility and authorized tailoring to specific IE's needs (e.g. promotional material); the confidentiality level (e.g. the difference between publicly presented demonstration event outcomes and IE execution plan, etc.).

Different pages are available on the collaborative file repository to help you in your work. They are listed on the homepage with direct links. Among them you will find:

- News
- Calendar: all level meetings announcements can be found in the project calendar
- Documents: deliverables, Grant Agreement, Minutes of Project Steering Group (PSG) meetings; documents established during proposal preparation phase;
- Discussions;
- Members help
- Owners help
- Subsites for each Work Package (WP)
    - WP1 (DIH Ecosystem Building): all templates needed for internal and external use (logo, templates, etc.) and meeting minutes
    - WP2 (Network Expansion by Open Calls)
    - WP3 (Monitoring & Evaluation of Innovation Experiments): agendas and meeting minutes – on RC level and IE level

  - WP4 (DIH capacity building and monitoring)
  - WP5 (Competence Centers)
  - WP6 (Project Management)

In order to facilitate communication between WPs and IEs, all material that comes from IEs (e.g. meeting minutes from internal meetings, reports, deliverables, etc.) will be stored in special folder under WP3 subsite. At the same time, IE team members will receive an authorization for access to other WP's subsites, where they will be able to find information relevant for successful project implementation.

To respect visual project identity and traceability of the information, project members are insisted to use the available templates for all internal communication concerning SmartAgriHubs.

E-mail communication

For direct, daily and frequent communication, email correspondence is highly supported. For this purpose, special email lists are created, containing special groups of SmartAgriHubs actors. Namely, those lists are:

- WP (co)leaders
- RC (co)leaders
- FIE coordinators

Those lists can be found on the collaborative platform.

Platforms for online meetings

Different platforms will be used for substitution of physical meetings such as: GoToMeeting, Skype, WebEx, etc. The coordination and the set-up of online meetings can be done through the use of doodles or timesheets.

Physical meetings

Minimum once a year physical meeting will be conducted. They represent an outstanding opportunity for evaluation of SmartAgriHubs project progress, meet the whole ecosystem and discussion on potential places for improvements.

3.1.3 Meetings management

For adequate collaboration among vast number of partners proper meeting management is a necessity. Accordingly, WP3 has defined several meeting levels and patterns, particularly relevant for appropriate Innovation Experiments execution, and in addition it supports the project monitoring and accountability.

Meetings are used to discuss and address relevant topics of the IE execution, follow the progress of implementation, collaborations between DIHs, CCs (both considered as IE partners) and IEs, etc. Depending on the meeting level, different attendees are involved with different responsibilities in terms of reporting. Each attendee has a defined role to ensure appropriate participation and preparation. The overview of the meetings details is given in the table below.

Meeting features / Meeting level	Regional Cluster level meeting	IE level meeting
Meeting participants	RC lead RC co-lead IE lead WP3 representative	IE lead IE partners
Meeting frequency	At least once per month	At least once per month
Meeting Agenda & Minutes prepared by	WP3 representative	IE lead
Use of Meeting Agenda & Minutes templates	Obligatory	Obligatory
Scheduling responsible	WP3 representative	IE lead
Meeting scope	• Strengthening the collaboration between WP3, RCL, RCCL and IE coordinators • Allowing a bottom-up approach to problem solving • WP3 is constantly updated on the IEs' status • Assuring monthly communication between RCLs, RCCLs and IE coordinators within the assigned RC	• Easing the coordination of the IE • Assuring the follow up of the activities • Allowing the IE coordinator to solve possible problems on time • Assuring constant KPIs evaluation for each IE • Ensuring collaboration between DIHs, CCs, collaboration and replicability

Table 5 Meeting types

For the meeting scheduling, WP3 recommends the use of the doodle tool. The meeting Agenda and minutes templates are given as an Annex to this deliverable. Additionally, they need to be uploaded to the WP3 folder and adequate subfolder in the collaborative platform SharePoint.

Regarding the meeting responsibilities, please see the overview below.

RC leads	RC co-leads	IE lead
• Actively participate in RC level meetings	• Actively participate in RC level meetings	• Initiate and organize its IE meetings
• Regularly provide updated information about DIHs/CCs in their region	• Regularly provide updated information about DIHs/CCs in their region	• Develop meeting Agenda (mandatory use of template)
• Follow up IEs activities	• Provide contribution on their specific region needs and trends, as RCLs do for their regions	• Responsible for meeting minutes (mandatory use of template)
• Provide updates related to national and/or regional digitization initiatives and funds	• Share responsibility in RC management activities based on previously established internal responsibility distribution	• Upload meeting Agenda and minutes to the dedicated folder on collaborative platform
• Monitor IEs progress, analysing the results and KPIs, decide on needed corrective actions		• Meeting scope: activities execution, IEs KPIs, DIHs/CCs services, collaboration and replicability, etc.
		• Participate in RC level meetings together with RCL/RCCL

Table 6 Meeting Management Responsibilities

3.1.4 Reporting and deadlines

Considering how large this project is in terms of number of partners, budget, diversity of activities and geographical and thematic coverage, the project needs to establish strict, but effective procedures for monitoring and evaluation and to provide a solid foundation for implementation of corrective measures, if needed. Therefore, SmartAgriHubs foresees two levels of reporting:

- For IE monitoring purposes
- For SmartAgriHubs reporting to the European Commission

When it comes to progress monitoring, every IE needs to follow the deliverables and milestones indicated in their Execution Plan. As previously described, the IE Lead is responsible for delivering indicated deliverables and proving milestones achievement on time using the provided templates.

How files are organized, and allocated names has a substantial impact on the traceability of those files subsequently and the ability to determine their content. Filenames therefore need to be allocated consistently and should be provided with a descriptive name so when organizing files, it is obvious where to find specific data and what the files contain.

Accordingly, files and working documents naming should follow naming convention described below:

- Use _ instead of space
- Preferably not exceed 255 characters
- Document related to IE should start with IE_# of the experiment_document name (e.g. IE_28_internal meeting minutes_March2019)
- if the document is modified it should contain version number and the date of last modification
- IE Lead will ensure that the relevant and the most updated version of the document is uploaded to the SharePoint

For project parties that are involved through Wageningen subcontracting procedure, IE deliverables will be baseline for instalment payment.

Regarding milestones, the IE Lead is requested to provide relevant means of verification, so that WP3 (and the entire project) can be check that the IE is progressing according to schedule.

If there is a clear reason deviation is acceptable, but should be announced well in advance, in a written form to the relevant WP3 representative, accompanied with the request for change (e.g. delay).

The second very important aspect of the IE reporting is the obligatory contribution to the projects' high-level reporting to the European Commission. Annex 1 of this document brings templates that need to be used by all IEs, in order to assure uniformity and consistency. In order to assure proper planning and adequate resource allocation on RC, RC-CL and IE levels, the following table briefly presents main deliverables, where contribution might be required. In case that a deliverable contains information regarding some specific aspects of the work conducted on RC/IE level, WP3 will provide all needed templates and requests well in advance, so IEs will have enough time for preparation.

This information is indicative, and a certain flexibility will be asked in order to run SmartAgriHubs as smoothly as possible.

Deliverable Number	Deliverable title	Type	Dissemination level	Due date*	Deadline for potential RCs and IE contribution*
D3.1	IE guidelines (or protocols, or procedures)	Report	Public	M3	N/A
D3.2	IE execution plan	Report	Confidential	M6	Done

Deliverable Number	Deliverable title	Type	Dissemination level	Due date*	Deadline for potential RCs and IE contribution*
D3.3	Learning takeaways from FIEs	Report	Confidential	M18	M17
D3.4	Periodic evaluation of the IEs performance	Report	Confidential	M18	M17
D3.5	IE Technology requirements identification	Report	Confidential	M11	M10
D3.6	IE Common challenges analysis and technology reusability exploitation	Report	Confidential	M24	M23
D3.7	Report on maximization of IEs market take-up	Report	Confidential	M36	M35
D3.8	Success stories from IEs	Report	Public	M36	M35

Table 7 WP3 deliverables overview

**M1 = November 2018*

The above listed deadlines do not include all the deadlines of the project. Other work packages might need information or documentation from RCLs, RCCLs and IELs. In this case, WP leaders or co-leaders of the respective WPs will contact WP3 representatives who will distribute information and requirements to the relevant RCLs, RCCLs and IELs. In other words, all the communication will be centralized in order not to burden IEs with a lot of different emails and requirements and to strengthen the efficiency and effectiveness.

3.2 FLAGSHIP INNOVATION EXPERIMENTS - SPECIFICITIES AND CROSS-FERTILIZATION POTENTIAL

Innovation experiments are conducted through DIHs enabling access to the latest knowledge, expertise and technology (through CCs) for any business by testing and experimenting digital innovations relevant to its products, processes or business models. IEs are playing a crucial role in network expansion for SmartAgriHubs and thus strengthen the network of DIHs and CCs in numbers and quality of services. SmartAgriHubs has identified a critical mass of dedicated, pan-European so-called Flagship Innovation Experiments (FIEs) through its network of regional cluster leaders. Every FIE needed to fulfil following criteria:

- High-level innovativeness of the experiment,
- Endorsement of FIE by an existing DIH and dedication for developing/improving specific DIH services,
- Allocation of at least 75% of the budget to SMEs,
- Every FIE needs to follow multi-actor approach, bringing together end-users (e.g. through farmer's associations or similar organisations) and technology providers (either a CC or AgTech SME),
- application for other funds is welcomed.

Based on above criteria, SmartAgriHubs included just those FIEs that addressed all requirements completely. All 28 Flagship Innovation Experiments are divided into 9 Regional clusters, aiming to contribute to the agri-food sector specific challenges. Beside brief description, below table brings each FIEs' responsible persons, sector, goals, objectives and challenges.

Following tables contain concise description of all FIEs, including region, sector, responsible persons, and FIEs' goals.

SMART AGRI HUBS | UK & Ireland

Regional Cluster Lead	Hazel Williams (TSSG)
Regional Cluster Co-Lead	Andrew Lazenby (I4Agri)
WP3 Responsible	Jurgen Vangeyte (ILVO)

FIE #	FIE name	FIE lead
1	**Farm Sustainability Audit**	**Laurence Shalloo (TEAGASC)**

Sector	 Livestock
FIE general goal	Currently, the Irish dairy industry is focused on sustainable intensification and expansion. The overall goal of this FIE is to identify key sustainability metrics and to facilitate benchmarking and improvement of sustainability at a farm and national level. The combination of on-farm sensors, existing farm data, internationally recognized models, integrated databases and various key players in Irish agriculture will facilitate quantification of sustainability metrics and future deployment of benchmarking methodologies.
FIE short description	This FIE will leverage a recently funded Irish national government research and innovation initiative (worth €40 million over 6 years) in the area of big data, data analytics and precision agriculture. Using up to 200 dairy farms as 'Development and Deployment Farms' this FIE will develop and implement an on-farm sustainability audit system for milk production in Ireland. The basic thrust of the FIE will be to measure a range of sustainability related parameters on these farms, develop metrics and benchmarks around these data, and then provide useful and real-time information back to the farmer so that sustainability can be monitored and improved. The information will also be available to milk processors and marketing agencies to assist with telling the sustainability story of milk production to the ultimate consumers of the products. The unique Teagasc advisory (extension) and education service, with 45,000 clients, linked with the research program will facilitate the roll-out of the service. One example will be the benchmarking of individual and groups of farmers for the sustainability metrics with comparable farms or farms in the top 5% of farmers.
FIE specific objectives	This Innovation Experiment will develop a technology and data-based platform to improve the sustainability of pasture based dairy systems in Ireland. • The service will operate at the individual farm level by allowing farmers to monitor and control the sustainability of their production systems across a range of sustainability metrics. • The unique Teagasc advisory (extension) and education service, with 45,000 clients, will facilitate the roll-out of the service, and will use the information to enhance its sustainability programs. • The information will also be available at a regional (e.g. milk processor level) and national level. It will be transferable to pasture or intensive dairy production systems throughout Europe and beyond.
FIE specific challenges	• To integrate databases, capture data and deploy models to quantify sustainability metrics in grass-based systems of milk production related to ○ Energy use ○ Water use

	○ Nutrient use efficiency ○ GHG emissions ○ Animal welfare • Develop a farm sustainability benchmarking system to allow farmers to be benchmarked across various sustainability metrics • Develop a system that allows individual farmer data to be aggregated (with their permission) at a milk processor or national level	
FIE #	FIE name	FIE lead
2	**STREAM: Sustainability Tool for REmote Assessment and Management of farmland habitats**	**John Finn (TEAGASC)**
Sector	Livestock	
FIE general goal	We will use technology to reduce the logistical effort and cost to produce customized farmland habitat reports for environmental sustainability assessments.	
FIE short description	We will use technology to reduce the logistical effort and cost to include customized farmland habitat reports in sustainability assessments. We will use smart combinations of ICT (aerial imagery, existing GIS information on biodiversity, and digitized land parcel information (LPIS)) to provide a map of land uses that include farmland habitats. Preliminary investigations in a pilot project indicate the reliability of this approach and involved the two SMEs associated with this proposal. We will use expert assessment to compare modelled outputs with on-the-ground surveys of farmland habitat (ground-truthing). To better demonstrate farm-level environmental assets and actions, we will develop an online application to link local photos of wildlife features (provided by the farmer or adviser) with an information management system that can collate land use information and farm photos to produce land use reports for individual farms. We will also conduct a preliminary investigation of the capacity of machine learning to improve habitat identification, based on the use of habitat images (from drone footage and photos) from these 30 farms.	
FIE specific objectives	The overall objective is to reduce the logistical effort and cost to produce customized farmland habitat reports for environmental sustainability assessments. We will use smart combinations of ICT (aerial imagery, existing GIS information on biodiversity, and digitized land parcel information (LPIS)) to provide a map of land uses that focuses on farmland habitats. More specifically, we will: - Develop a workflow to integrate visual interpretation of orthophotography to develop individual farm reports - Implement the methodology on a sample of 300 farms - Ground-truth the methodology on 30 farms	

	Trial the use of machine learning to recognize habitats from photos.
FIE specific challenges	Environmental benchmarking of food systems is a major contributor to market reputation of food companies, and a requirement of food producers. The inclusion of farm maps of habitat features is becoming an urgent requirement for farm-scale sustainability assessments and for compliance or benchmarking with international certification schemes. Traditionally, farm habitat assessments require a farm visit by an ecologist, with considerable costs for travel, expenses and additional time for specialist ecological expertise. Because of this, examples of farm habitat assessments that have been implemented on a wide scale (across 100's of farms) are rare. Because sustainability assessments increasingly require inclusion of farmland habitats and biodiversity, this IE meets an urgent industry need.

SMART AGRI HUBS | Scandinavia

Regional Cluster Lead	Nicolai Fog Hansen (SEGES)
Regional Cluster Co-Lead	Liisa Pesonen (LUKE)
WP3 Responsible	Jurgen Vangeyte (ILVO)

FIE #	FIE name	FIE leads
3	**Digitizing farm machinery produced by SMEs**	**Nicolai Fog Hansen & Kathrine Hauge Madsen (SEGES)**

Sector	 Arable farming
FIE general goal	This FIE targets SMEs without capacity to have in-house expertise on how to develop new 'intelligent' versions of their commercial implements.
FIE short description	In this FIE the DIH will be equipped with a setup and roadmap for adding existing digital solutions to existing implements. The IE will focus on two SME-producers of implements, however more companies will be invited to this IE, should funding be adequate. These will independently be invited to a workshop with agricultural and digital experts to identify the added value from

	a potentially digitized version of the implement. Secondly, a roadmap towards developing a digital version of the implement is developed, and support is provided to produce a digital version of A. a row hoe, and B. a field sprayer that can deliver and receive data from FMIS. Parallel to this process, a business plan is developed for the identified solution. The prototypes are finally adequately tested according to current standards.
FIE specific objectives	The overall objective of this FIE is to ensure support for agricultural machinery producing SMEs to ensure that the digitized products meet the farmers requirements. This will be done by: 1) assessing the value of digital control of implements and data communication on a specific implement 2) identifying and applying relevant sensors and data communication to existing implements that today are not digitized 3) document that the intelligent technology works satisfactorily 4) Implement and demonstrate a near market ready version the 2 intelligent implements on at least two commercial farms.
FIE specific challenges	Small companies producing different implements for farming often lack technological insight to develop the implement with integration of new digital solutions. This IE therefore aims to digitize specific farm equipment with the aim to identify the added value (e.g. Minimized energy consumption, increased yield, optimized efficacy, higher transparency etc.), providing the right expertise for choosing the appropriate digital solution and data communication, testing the digitized equipment of precision and effects and developing a business plan for the new digitized implement.

FIE #	FIE name	FIE lead
4	**Adopting digital technologies by farmers**	**Kristina Anderback (Agrovast)**

Sector	 Livestock
FIE general goal	The FIE aims at developing DIH services that supports an enhanced technology adaption by farmers and advisors. The FIE is based on two specific technologies within livestock and arable farming.
FIE short description	Agroväst and SEGES (as DIHs) will support two AgTech companies and two Advisory service companies to develop services with a focus on making farmers more efficient with investments in digital technologies, and to strengthen the farmers abilities to get greater benefits by fully understanding and using the data delivered by the digital solution. The

	implementation of the FIE will be made with a user centred design approach in which we involve farmers and advisors. Two specific technologies are chosen: Meat production – PigScale is a digital camera solution for weighing pigs automatically for a consistent and more accurate finishing weight. Plant production - Solutions for digital upgrade of existing farm machinery and implements for precision agriculture. The participating AgTech companies will receive help in developing services that gives the end-user easy access to knowledge, best practises and training in how to use the digital production data to optimize their production. Implementing relevant production data in the daily farm management system will also be a priority. The participating Advisory services companies will receive help in developing their methods and new types of advisory activities, with a focus on making farmers better able to overcome technical problems and handle involvement and investments in digital technologies.
FIE specific objectives	Involved DIHs have improved its skills and methods to work with a user centered design approach in their innovation services, which strengthens the possibilities for a quicker adoption of new technologies by farmers and advisors. Involved DIHs have also developed methods to support AgTech companies and Advisory service companies to develop services that helps the end-user to get greater benefits by fully understanding and using the data delivered by the digital solution. For example, facilitation of workshops for a. requirement definition, b. detailed roadmap for the development process, c. business planning, and facilitation of an agile process for development of services.
FIE specific challenges	1. Enhancing technology adoption by farmers and advisors 2. Implementing a user centered design approach in product and service development to strengthen the possibilities for a quicker implementation of new technologies by farmers and advisors.

FIE #	FIE name	FIE leads
5	**Digital tool and knowhow for valued grain chain**	**Liisa Pesonen (LUKE)** **Mats Emilson (Agrovast)**

Sector	Arable farming
FIE general goal	The aim is to increase the profitability of cereal production. In this experiment, the technology providers, in close co-operation with farms, will build up a grain value chain (Valued Grain Chain) utilizing and integrating available digital solutions. The experiment includes 1) precision/smart farming technologies, 2)

	defining the quality of grain lots and 3) giving them IDs in farms, 4) selling the grain lots with attached quality, cultivation history and origin data in electronic grain marketplace to the quality appreciating buyers, taking into account efficient grain logistics.
FIE short description	Producing cereals as bulk is a low profit business in Nordic climate conditions due to low average yields. Producing high quality instead of bulk would be a way to increase profitability. However, there are a lot of variation in soils, cultivation methods, used inputs and farm sizes. Until now, it has been very laborious and often technically impossible to define the grain lots with valuable characters in farm level, prove them to markets, find customers and logistically handle them. Thus, investments to farm practices, e.g. precision farming techniques aiming to sustainable farming and improved quality of produce, haven't paid off. Digital technologies and services provide means to tackle the perceived hindrance efficiently. The experiment covers demonstration of integrated digital solutions in practice, and analysis of business models for grain value chain (with assisting CCs). The experiment includes farmers (hands on) training of the digital solutions in the value chain, peer discussions between farmers, and co-creation of products and production methods with consumers and other actors in the value chain.
FIE specific objectives	1) To increase the number of actors who are specifically aiming to enhance digitalization of agriculture through DIH services. 2) To establish a usable and to the farmers profitable digital grain chain (Valued Grain Chain), which evaluated by farmers and assisting CCs, and communicated among farmers. 3) To establish DIH services to assist farmers to connect with national and international technology/service providers, existing knowledge provided by CCs, and potential funders of investments.
FIE specific challenges	1) To develop DIH services to promote system integration and development of truly useful and profitable digital system of systems for farmers. 2) To show farmers how the employment of available digital tools improves the profitability of cereal farming in the Nordic farming conditions and to share awareness among farmers. 3) To get farmers familiar with the available digital technologies and help them to make informed investment decisions for further development of farming and business.

France

Regional Cluster Lead	Anne-Claire Branellec (Paydelaloire)
Regional Cluster Co-Lead	Adrien Guichaoua (ACTA)

<table>
<tr><td colspan="2"></td><td colspan="2">Samy Ait Amar (ACTA)</td></tr>
<tr><td colspan="2">WP3 Responsible</td><td colspan="2">Jurgen Vangeyte (ILVO)</td></tr>
<tr><td>FIE #</td><td colspan="2">FIE name</td><td>FIE leads</td></tr>
<tr><td>6</td><td colspan="2">AgriFarmLab</td><td>Delphine Bisson (Infagri85)
Alexandre Morin (CA PdL)</td></tr>
<tr><td colspan="2">Sector</td><td colspan="2">
</td></tr>
<tr><td colspan="2">FIE general goal</td><td colspan="2">AgriFarmLAB has the ambition to upscale the existing initiatives and accelerate the emerging and propagation of innovative solutions to farms by interfacing between farmers and their field-level problems, innovators (SMEs and start-ups), and the whole innovation ecosystem.</td></tr>
<tr><td colspan="2">FIE short description</td><td colspan="2">InfAgri85, a SME coming from the leading farmers association in Vendée, is building on existing networks to offer to the start-ups from AgTech, FoodTech and GreenTech the means to develop their projects, by opening farms and farming organizations to innovative projects. At a broader regional level, the Chamber of Agriculture is also providing innovation support through the network of advisors at farm level, bringing new ideas to farmers and leading projects for innovation and applied research. Images&Réseaux and CEATech, as Competence Centers in their respective fields, will bring access to technology providers and innovators that need application at farm level. VEGEPOLYS, also as a competence centre, will bring access to a national and international network of firms, research and training centres in the horticultural sector, all along the plant value chain, from agrofurniture to delivery of fresh products to final consumers.</td></tr>
<tr><td colspan="2">FIE specific objectives</td><td colspan="2">AgriFarmLAB's main idea is to get the partners from these existing networks together, and to bridge the gap between innovation and the farm level by allowing:
• Solution providers to co-create and test their ideas at farm level and to benefit from a European market visibility since day one
• Farmers to express their needs, to influence solution developers and get their hands-on concrete solutions, designed to suit them and economically viable.
Farmers to discuss with their counterparts in other European countries and take benefit from their know-how and experience</td></tr>
<tr><td colspan="2">FIE specific challenges</td><td colspan="2">The challenges for AgriFarmLAB are
• to identify the most promising SMEs and technologies,
• to make sure that they match the needs of the farmers,</td></tr>
</table>

<table>
<tr><td colspan="2"></td><td colspan="2">• and that the technological and organizational solutions that are tested are commercially viable after the initial support from the network.
To do so, the emphasis will be put on farmer’s needs first and foremost. While the network will be open to all projects supported by the partners of AgriFarmLAB, the farmers will take a leading part in identifying the relevance of the projects, selecting the SME they want to welcome in their fields, and give them access to their network.</td></tr>
<tr><td>FIE #</td><td colspan="2">FIE name</td><td>FIE leads</td></tr>
<tr><td>**7**</td><td colspan="2">**DIGI-PILOTE**</td><td>**Stéphane JEZEQUEL (ARVALIS)**
Samy AIT AMAR (ACTA)</td></tr>
<tr><td colspan="2">Sector</td><td colspan="2">
Arable farming</td></tr>
<tr><td colspan="2">FIE general goal</td><td colspan="2">The project aims to support farmers in their adaptation to the constraints of a chaotic climate. The specific problems of the Mediterranean climates become generalized. The challenge of the project is therefore to move to a larger territorial scale. To face unpredictable weather and to maintain a high level of production in terms of quantity and quality, farmers must control their production throughout the year. This action is part of a global plan for reliance of cereals sectors.</td></tr>
<tr><td colspan="2">FIE short description</td><td colspan="2">The FIE will develop a computer tool and application currently in R & D phase (EPILOT project) to an operational scale. Nowadays, EPILOT use is focus on the South East of France with the durum wheat production. DIGI-PILOTE will upgrade the tool to a larger territorial scale thanks to a network of digital farms and some farmer networks facilitate by cooperatives (Cluster France). The Digi-PILOTE App will link parcel data from sensors (including satellites) and crop models (CHN ARVALIS model) to generate technical and strategic advices. The Information System will be extended to a higher use level, developing outputs for farmers and insuring the connection with farmers' parcel management software and information systems or Decision Support Systems of other operators (cooperatives, software vendors) in API and Web Services format.</td></tr>
<tr><td colspan="2">FIE specific objectives</td><td colspan="2">- Development of an application on smartphone integrating photo taking, voice input, modelling, technical advice (cooperative technician), application (farmers). Evolution of a prototype to an industrialized tool (TRL 7 to 9).
- Extension of the functionalities and calibration to the piloting of soft wheat.
- Test with digiferms network, development of agronomic, but also economic and environmental evaluation protocol (KPI € and reduction of inputs)</td></tr>
</table>

<table>
<tr><td></td><td colspan="2">- Deployment within a much larger cooperative network and at the France scale via the Hub and Cluster.</td></tr>
<tr><td>FIE specific challenges</td><td colspan="2">- Development of a mobile app that can work in offline mode
- Chatbot technology to limit manual entry
- Data transmission in the cloud Arvalis for data processing with culture models of the technical institute
- Assimilation of data via other sensors for forcing models (sentinel 2, IOT systems ...)
- Management of data and data flows via API (API-AGRO technology)</td></tr>
<tr><td>FIE #</td><td>FIE name</td><td>FIE leads</td></tr>
<tr><td>8</td><td>STRATE-GEEK</td><td>Ines TEETAERT (ARVALIS)
Stéphanie WEBER (ARVALIS)
Samy AIT AMAR(ACTA)</td></tr>
<tr><td>Sector</td><td colspan="2">
Arable farming</td></tr>
<tr><td>FIE general goal</td><td colspan="2">One strategic decision made by a farmer will affect economic, social and environmental performances in a different way. A farm is a complex system within all the performance criteria have to be assessed before to set up a strategy.
In this context, farmers need tools which could help them making strategic decisions for their operations. In 2008, ACTA & ARVALIS have developed the SYSTERRE multi-criteria evaluation tool. This tool, is based on standardized scientifically robust calculation methods that are able to:
- describe in a precise and complete way the functioning of a cropping system in farmers or prescribers,
- follow in time its evolutions,
- evaluate the impact of technical choices on economic performance, level of dependence on inputs, and the energy footprint, or other indicators of practices implemented.
The FIE aims to provide to farmers and advisors, a decision support tool (DST), which helps them in their strategic decision-making. To achieve this, two steps must be taken:
- take inspiration from the SYSTERRE tool and develop it in Web format
integrate API type communication technologies to open access to its calculation methods faster and increase its scope of use in an open innovation ecosystem</td></tr>
</table>

FIE short description	Firstly, FIE partners will develop the access, consultation and indicator calculation interfaces of SYSTERRE tool. They will improve interoperability between software and calculation methods. ACTA Informatique will be in charge of the realization of new interfaces using web development technologies. In parallel, a large part of the 20 indicators (representing 50 secondary indicators) calculated by the SYSTERRE tool will be developed in an API type communication technology to make them available to all other tools already marketed. DIGIFERMES and TERRASOLIS will test and implement the interoperability of the indicators developed by ARVALIS – Institut du vegetal and ACTA in real conditions. Then, TERRASOLIS could also extend during the realization of this IE the deployment of the APIs in a large network of farms in the east of France. DIGI-PILOTE partners will conduct a compilation of needs from farmers, economic operators and advisory services in order to better understand the expectations regarding a strategic decision support tool.
FIE specific objectives	<u>Use</u> : Technical objectives are to give up with MS Access technology and to develop new web interface. Fifty interfaces should be developed. This task gathers around 200 working days. <u>Decision support</u> : The qualification of the needs for the development of a strategic tool. <u>Interoperability and performance</u> : Design a calculator engine available with API technology though a large volume of data is needed. Many questions should be solved around memory and data storage.
FIE specific challenges	<u>Diffusion of standardized and reliable calculation methods</u> : Digi-PILOTE will provide an open tool to growers and breeders to assess the multi-performance of their farm. The deployment of SYSTERRE with the TERRASOLIS partnership will extend the scope of use of the tool. Nevertheless, models and algorithms should justify a scientific reliability. <u>Decision support</u> : FIE will develop a strategic decision support tool simulating cropping systems and assessing performance impacts with various calculated indicators <u>Interoperability and performance</u> : Farm digitization require interoperability. Farmers can already manually input the data describing their cropping system using the web interfaces or use the standard exchange files import functionality. We hope that the availability of the calculation engine by APIs will lead Farm Management Information Systems developers to integrate the evaluation methods directly in their tools, with no manual data input. The evaluation engines need large quantity of data describing the whole cropping system. It is becoming a challenge to exchange

	this amount of data through APIs and perform calculation in a reasonable time.

Regional Cluster Lead	Hubert Gerhardy (MSG)
Regional Cluster Co-Lead	Jurgen Vangeyte (ILVO) Peter Rakers (ILVO)
WP3 Responsible	Jurgen Vangeyte (ILVO)

FIE #	FIE name	FIE lead
9	**Deep Learning and hyperspectral imaging - AI4AGRICULTURE**	**Jonathan Berte (Robovision)**

Sector	Arable farming
FIE general goal	Reducing and optimizing spraying applications on crops by combining Artificial Intelligence (AI) with hyperspectral imaging, thus creating a supportive decision model to channel the hyperspectral data into task maps.
FIE short description	Spraying the right amount (variable rate) at the right time requires extensive information on the status of the crop. This information will be collected by hyperspectral cameras, which capture the reflection of light on leaves and provide as such information about pigment concentration, cell structure etc. The SME Robovision, leading expert in deep learning technology and analytics will construct and validate cutting edge deep learning algorithms such as Generative Autoencoder Networks (GANs) to produce new data and thus better classify crop images. These GANs are essential for agricultural systems since the period of data acquisition is typically short and the need for quantity is prevalent with data-hungry deep architectures. The deep learning algorithms will be implemented on supercomputers (NVIDIA DGX1) to allow fast training of decision algorithms, while inference will be done on embedded GPU devices. These decision algorithms provide the necessary input to build task maps which can be used to do the precise spraying.

FIE specific objectives	Main objective: create pipeline for applying deep learning algorithms on hyperspectral data in agriculture - Implementation and validation of deep learning convolutional neural networks (CNN) with the aim to classify infected crops. - Implementation of Generative Autoencoder Network (GAN) to generate artificial data and assist the precise classification of crops. - Conduct field experiments with invasive weed species and pathogen infection. - Create hyperspectral dataset for training, testing and validation. - Expert labelling of dataset supported by visual images. - Evaluation in field conditions at end-user's farm. - Demonstration of obtained results.
FIE specific challenges	- Calibrated data acquisition (Acquisition under field conditions can be cumbersome) - Since deep architectures are data-hungry, where needed, generation of new data with Generative Autoencoder Networks, a relatively recent advance in deep learning. - Snapshot hyperspectral cameras have low spatial resolution. - Large variety in potato crop types causes broad natural variability - Early detection of infection before major visible symptom development. - Computational resources to process huge datasets.

FIE #	FIE name	FIE lead
10	**Farmcube**	**Tamme van der Wal (Bioscope)**

Sector	 Arable farming
FIE general goal	Farmcube's goal is to develop a farm based digital infrastructure, to store, retrieve and analyse data about the farm and its agricultural production. Farmcube will focus on integrating data from remote sensing (satellites and drones), machines, sensors and other sources.
FIE short description	The FarmCube FIE is a collaboration of several SMEs active in the digitisation of agriculture. This includes BIOSCOPE (spatial data), AureaImaging (Drones), AVR (agro-machinery) and FarmHack (social processes). FarmCube addresses the missing link in the (big) data discussion: the data management on the farm. Collectively we will develop a working prototype that will facilitate farmers to store, analyse, manipulate and share relevant on-farm data. The FIE is furthermore supported by several well-

	established stakeholders in the farming digitisation arena, such as ILVO, WUR, ZLTO and several fieldlabs. The Farmcube's aim is to improve digitization on farms and in particular on data decision making, as this will facilitate the demand for more fresh data, which will grow our market. Satellite and drone data are however useless if not embedded in a functional context that farmers can put to work. The Farmcube will be that context where fresh remote sensing data and machinery data can be absorbed and translated into advice and instruction maps. We will start with an evaluation of what participating farmers require, and then offer market initiatives and solutions, and we develop specific software, tools and interfaces to meet the requirements in order to make the data hub at farm level successful. We will define a use case in smart data use potato production in which 20 farmers collect and share data in order to improve sustainability of production. A software programming hackathon to connect FIE partners components is foreseen. Results of the use case will be available in year 2 of the project.
FIE specific objectives	The objectives of the Farmcube FIE are: - Demonstrate that data fusion and smart data functionality improves farming; - Set up an innovation ecosystem inside the farming community; - Develop a market/outlet for fresh data; - Improve the trust of farmers in data driven solutions and applications; - Improve the trust of farmers in start-ups and new entrants in the Ag data segments. Our KPIs are therefore: - Connecting to at least 20 farmers in the project; - Align at least 4 different data suppliers in a smart provision chain providing fresh relevant data and create a joined business model based on enlarging the market; - Create an open source IT framework deployable on versatile platforms; - Demonstrate the added value of digital data decision making on farms; Improve farming practices resulting in 5% higher yields and 10% lower costs.
FIE specific challenges	Drones are an attractive data source to help farmers monitor their crops. But for good use, these data need to make a soft landing on the farm's digital infrastructure, which is currently underdeveloped. We identified our biggest IE challenge is in the adoption of data driven decision making on farms. When solved, many data providers can put competitive offers in the growing market. Adoption barriers are technical (complexity, integration, ubiquitous), but more over from a behavioural nature. Ethical, social and legal considerations are more important than ever as well as business models for farmers and their chain partners. Overcoming the technical part by harmonized and quality assured data is one challenge. Putting it to work in a changing digitization agriculture is definitely the second challenge and maybe even the more persistent one. Farmcube will address both challenges.

	The innovation experiment will also amplify the role of competence centres and existing innovation hubs and the challenge is to provide leverage on those investments. Digitisation of agriculture is a major challenge that cannot be left to one stakeholder alone. It is an indispensable challenge to get stakeholders connected and to intervene with this innovation experiment in existing social and commercial structures and transform them in a collaborative innovation ecosystem.	
FIE #	FIE name	FIE lead
11	**SmartPigHealth: Pig health assessment based on applied sensors**	**Dr. Hubert Gerhardy (MSG)**
Sector	 Livestock	
FIE general goal	Pig health and reduction of use of antibiotics are of ongoing importance for the society and for farmers. Market, customers and food trade are more and more interested in transparency and keen on getting information how pigs are kept and pork is produced. The FIE is a holistic approach to increase pig health as well as to reduce the use of antibiotics and antimicrobial resistance (AMR). To reach the targets all relevant players in the pig production sector are integrated. Means of choice is to launch the digitalization as well as to implement sensors and prediction models to increase pig health. The data analytics approach will enable a continuous health assessment of the pigs based on applied sensors. Furthermore, it predicts upcoming diseases and mal-conditions. Research results indicate that the criteria like humidity, temperature, noise, water and feed consumption, NH_3, CO_2, H_2S are impacting on pig health. At the moment those criteria are only taken into account by accident or from time to time (no continuous recording). Consequently, the FIE fits into this strategic challenge of the farmers, vets as well as of the major societal challenge to reduce the use of antibiotics and to increase pig health.	
FIE short description	– Increasing pig health and animal welfare – Reduction of use of antibiotics and antimicrobial resistance (AMR) – Building up a sustainable ecosystem pig production – Developing predictive analytics (Machine Learning & AI) based on applied sensors – Increasing transparency how pigs are kept and pork is produced	
FIE specific objectives	– Using digitalization to increase information on production issues and pig health concerning diseases and production conditions – Based on sensor technology in the stables the quality of information on animals and on production during the production process will be increased (online)	

	– The data of sensors, information on biological and economic parameters and assessments of organs in slaughterhouses will be merged to develop a sustainable ecosystem 'pork production' – Fitting on market available sensor technology to use it in stables – Developing tools to launch a data driven health management system – Using self-developed algorithms based on machine learning & AI a prediction model shall be developed to enable a continuous health assessment of the pigs based on applied sensors – Disseminating the FIE experiences in the DIH to farmers, vets and consultants and further on to provide results to other DIH's
FIE specific challenges	Solving farmer's challenges for – fitting to demand of society to reduce the antibiotic use. – more support to increase pig health – increasing the competitiveness – information on data driven health management systems – support to conduct process routines and control – getting information on upcoming diseases and mal-conditions already during the production process (at the same time as it occurs) – provide data-driven and prescriptive guidance to the farmers to avoid upcoming diseases

FIE #	FIE name	FIE lead
12	**DIG-ITfarm**	**Geert Bruggeman (Nutrition sciences)**

Sector	Livestock
FIE general goal	Antimicrobial cross resistance (AMR) remains an emerging issue and all measures to reduce the decency of antibiotics in animal livestock production – as a major contributor to AMR development - are welcome. Therefore, the European Commission initiated EU strategic planning to deal with the development and spread of AMR. The EU has applied, across its member states (MS), a common policy and legislation covering antimicrobial use and monitoring and reporting programs of zoonotic diseases and AMR status. EFSA, together with ECDC are responsible for collecting and analysing the relative scientific data deriving from MS. Since monogastric production is the major contribution to antibiotic use in modern farming, this IE focusses on that animal species. At European level, some policy guidelines were drafted by the Agricultural European Innovation Partnership (EIP-AGRI). To lower the use of antibiotics in modern swine rearing systems, the EIP-AGRI Focus Group on reducing the use of antibiotics in monogastric farming recommends a number of existing solutions and future initiatives, in the following three areas: 1) Improving monogastric health and welfare, 2) Finding specific alternatives to antibiotics and 3)

<table>
<tr><td></td><td colspan="2">Changing attitudes and human habits. The IE aims to contribute to these recommendations, by applying data collection in PLF as predictor of early stage diseases in monogastric. Changing attitudes and human habits are also the starting point for this IE, because it will select farmers as case studies that are open for attitude, habit and behaviour changes. The results of the IE should convince them even more that adapting good farming practices are promising ones, and this will stimulate other farmers to follow them.</td></tr>
<tr><td>FIE short description</td><td colspan="2">DIG-ITfarm is about testing prototypes in high-fidelity monogastric farm practices and/or in a simulated operational environment. Finally, the IE goes to developmental test and evaluation of the system in its intended to define the design specifications. This IE contributes to responsible farming, beyond human skills. Taking care that intensive large-scale farming remains responsible farming, contributing to human and animal health and welfare. Special focus goes to reduction of AMR, which is claimed to become N°1 death reason in 2050 when no actions are taken. Finally, this IE can be an example how also large multinationals, SMEs and farmers can work together in a DIH to realize digital innovations in Farming.</td></tr>
<tr><td>FIE specific objectives</td><td colspan="2">The main objective of the IE aims to reduce antibiotic use – and subsequent antimicrobial resistance – in order to improve the quality of animal health and of human food derived from livestock. Specific objectives of the IE is to develop a proven PLF based predicting and monitoring service for farmers, veterinarians, farmer advisers, etc., that can be followed to reduce antibiotic use. This IE will result in holistic approaches based on combination of novel synergistic feeding concepts (= functional feed ingredients × feed technology) and innovative precision livestock farming (PLF) technology, and the creation of awareness on the role of safe feed for healthy food.</td></tr>
<tr><td>FIE specific challenges</td><td colspan="2">The main challenge is to detect respectively pig cough and abnormal chicken behaviour in an early stage (as a measure of starting disease) and to act in a curative way to affected animals. This way, we need sensitive sensors for that as well as adapted algorithms and interfaces, because the human observation is too slow. The partners have access to this knowledge, infrastructures, methodologies and needs, and can assist farmers in the successful implementation for value creation (better growth and health of livestock)</td></tr>
<tr><td>FIE #</td><td>FIE name</td><td>FIE leads</td></tr>
<tr><td>**13**</td><td>**AEMON – Ammonia Emission Monitoring Network**</td><td>**Jurn Dely (Vervaeke)**
PHVO (ILVO)</td></tr>
<tr><td>Sector</td><td colspan="2"> </td></tr>
<tr><td>FIE general goal</td><td colspan="2">The main objective of this IE is to develop an NH3-emission and climate monitoring and control technique for naturally and mechanically ventilated animal houses, aiming for an optimized</td></tr>
</table>

	indoor climate control and potential emission reduction. Theoretical, technological and tacit knowledge will be combined to develop a product fitting the needs of the animals and farmer whilst being scientifically substantiated to increase the products market value in the light of current and future environmental and animal welfare legislation.
FIE short description	There are three main components, i.e. gas measurement, climate control and wireless sensor network. Emission measurement will focus on ammonia with a possible extension to GHG's, where climate monitoring will look at a broader range of parameters such as CO2, NH3, temperature and relative humidity. Performance of NH3 sensors with different TRL and sensing principle will be tested including a low-cost sensor from the ISense project. Secondly, ventilation control and the effect on indoor emission/air quality will be investigated in two steps: 1) notifications or alarms will be given to the farmer in order to take action, and 2) an automated control scheme which employs dynamic control techniques will be developed and tested. Last but not least, a wireless sensor network that links the sensor measurement and ventilation control will be put in test. The participating stakeholders will contribute to the collaboration with their respective filed of expertise: Vervaeke and Stienen on ventilation systems, Dräger on gas sensors, and Van Mierlo on wireless network platform and equipment integration.
FIE specific objectives	The specific objectives: • Deliver tools to manually or automatically optimize the stable climate, enhancing energy efficiency of ventilation systems. • Increase the farmers' insight into the stable climate. The current lack of knowledge and/or the desire for reducing labour and energy consumption often leads to overventilation in naturally ventilated farms, potentially causing additional emissions, or underventilation in mechanically ventilated farms, potentially resulting in suboptimal air quality. A monitoring system allows the farmer to make more informed decisions. • Delivering a tool to the policy makers to gain more insights into NH3-emissions at farm or regional levels. Mapping of NH3 emissions and hotspot detection in real environments. • Generate quality indexes related to farm management, enabling a policy where efforts made by the farmer to ensure an optimal climate and minimal emissions could be monitored and rewarded. • Increase public awareness of the efforts taken by the sector to ensure the animals' wellbeing. • Enabling suppliers to examine their reduction techniques in farms equipped with an emission rate monitoring technique, facilitating the generation of quality indexes related to the reduction potential of their techniques and increasing their market value.
FIE specific challenges	The biggest challenge is to generate objective, representative and reliable information with a clear value for the different stakeholders. Some specific challenges are: • Quality of emission measurements (stability, accuracy): current low-cost NH3 sensors do not have the necessary

	accuracy, however the Dräger sensor has shown great potential in both the lab and farm environment. • Developing devices that are able to withstand the harsh conditions within the stable and that can operate without the need of regular cleaning or recalibration. • Developing algorithms for optimal climate control: a balance has to be found between different climate parameters and emission reduction (high flow rates deliver clean air but potentially increase emissions). Part of these test will be performed in occupied stables; therefore, the risk of a system failure should always be reduced to a minimum. • Developing a system that is affordable for the farmer. The amount of detail obtained with a sensor network is proportionate to the amount of sensors and therefore the costs. An optimal sensor to surface area ratio needs to be found for each typical housing system.

SMART AGRI HUBS | Central Europe

Regional Cluster Lead	Florian Herzog & Martin Hirt (LKO)
Regional Cluster Co-Lead	Karel Charvat (WirelessInfo)
WP3 Responsible	Dragana Matic (BIOS)

FIE #	FIE name	FIE lead
14	**Mower-robot for Vineyards**	**Riegler-Nurscher Peter (Josephium Research)**

Sector	Fruits
FIE general goal	Main objective is the development of an autonomous mower for vineyards. Secondary objectives are a cost-effective solution, which works very robust.
FIE short description	In viticulture, vine is planted in rows with small distance, often less than 1m within the row. The distance between the rows is sufficiently large to allow a conventional care of the greening (erosion protection) by a tractor with specialized in row mowers. However, the area between the vine must be kept clear, to reduce the competition for water and nutrients. Chopping and

	mulching within rows is a repetitive and monotonous task. The goal is to develop an autonomous mower which cultivates the grassy areas and replaces these tasks. In contrast to conventional mowers, autonomy allows to mow as close as possible to the wine plants without hurting them. The mower should be compact and operated electrically. The main challenges in robotic mowers are above all in the area of navigation and obstacle detection. This includes planting and soil conditions, plant distance, cutting height, etc.
FIE specific objectives	Main objective is the development of an autonomous mower for vineyards. Secondary objectives are a cost-effective solution, which works very robust. A central computation system fuses and processes all sensor data and does path planning. Global path planning is based on GPS RTK positioning. The global navigation rule is based on geo fencing and driving on a predefined global route. For precise navigation, a visual odometry system will be implemented. The row/plant detection is needed for precise mowing towards the vine plants. Crucial for safety is an obstacle detection system with haptic emergency bumpers. Additional to the implementation of the mower unit and the platform, a safety concept will be developed in parallel.
FIE specific challenges	Autonomous machines are not so far developed to cope with these environments. Rough terrain requires a certain size of the robot, which on the other hand increases its costs. Also driving in an energy efficient way along the plant rows is an important issue. This has to be considered during path planning. Full autonomy also requires the robot to find a base charging station to work efficient. Especially the detection of small wine plants within grass is still very difficult. One major challenge will be to mow as close as possible to the wine plants without hurting them. This also needs to be considered at the conception of the mowing mechanism. Concerning safety, obstacle detection and emergency bumpers are important tools to prevent any damage. Therefore, integration of state-of-the-art obstacle detection algorithms into the vision system is planned. Besides obstacle and plant detection, the vision system is used for visual odometry to increase the tracking accuracy of the GPS. All these tasks are very computationally elaborate. Longer computation time leads to a delay in reaction time and therefore leads to slower driving speed of the robot. One possible solution would be to use a very powerful computation unit, which on the other hand increases the energy consumption and cost of the overall robot.

FIE #	FIE name	FIE lead
15	**Precision Farming in agricultural practice on small-scale farms**	**Prankl Heinrich (Josephium Research)**

Sector	 Arable farming

FIE general goal	The main goal of the experiment is to propagate site-specific management methods in agricultural practice, with a focus on small-scale and heterogeneous farms. This includes to adapt precision farming models and present them in a simple and reasonable manner for non-expert users. Finally, this innovation experiment should enable precision farming for a wide range of farmers, hence contribute to sustainable and profitable agriculture.
FIE short description	In recent years the techniques of Precision Farming (PF), i.e. data and GPS-based precision agriculture, have gained increased importance in industrialized countries. However, according to a recent study, only 6% of farmers in Austria use such technologies[1], and thus the economic and ecological potential of PF remains largely unused. The main goal of this experiment is to propagate site-specific management methods in agricultural practice, with focus on small-scale and heterogeneous farms. The EIP project "GIS-ELA", which started at 1st of January 2018, focuses on the agronomic aspects of small-scale precision farming, this includes field tests of various sensors. The results and findings regarding agronomics from that EIP project should serve as basis and be utilized, integrated, and implemented in the software development during this IE. These findings shall include, amongst other things, an evaluation of different variants for application of fertilizers subject to factors such as climate or available infrastructure, as well as different models and methods for the application of maps in the field. The objective of this IE is to make the models and solutions accessible for a wide range of farmers, in particular focusing on usability and stability, as well as scalability on an international level.
FIE specific objectives	This experiment propagates site-specific management methods in agricultural practice, with the focus on small-scale and heterogeneous farms. To accomplish this goal one objective is to develop an (international) mobile application with a simple-to-use interface for precision farming applications. With this application, firstly, it should be possible to create application maps based on different data sources and sensors. Secondly, in a field mode, the application shows application rates or instructions on the smartphone or tablet screen based on the current GPS position. Optional it should be possible to export the application map in standardized and established formats, e.g., for tractor terminals, FMIS and other apps. Additionally, to the mobile app a server with a database will be set up to serve as a cloud based central data hub. This improves the usability for the farmer and solves the data safety problem for the user. In addition, cloud based systems enable collaborative applications (e.g. division of labour on a farm).

---

[1] *KeyQUEST-survey asking 400 Austrian arable farmers: http://www.agrartrend.at/news/article//aktuell-nutzen-6-der-oesterr-landwirte-precision-farming-systeme-1.html*

	In the last stage of the IE it is also crucial to spread the information and findings through the DIH members to the farmers. This can be accomplished over farmers' associations like the LKÖ.
FIE specific challenges	Precision farming has an economic and ecological potential for farmers, especially for fertilizing and spraying. However, the potential of these technologies remain largely unused. An important factor is the high costs for technical equipment, which is hardly or not at all profitable for many small-scale farms across Europe. Furthermore, software systems and user interfaces for precision farming are often complex and overstrain non-expert users. With this regard, especially map generation is still a very complicated task. In this sense, the topic of site-specific management and the generation and utilization of application maps must be presented to farmers in an appropriate and easily comprehensible manner. Not least the integration of different data sources is still a challenging issue in many smart farming applications (e.g. FMIS). The use of open standards and linked data technologies is therefore a necessity, however, with their standardization being lengthy and tiring. The knowledge about site-specific management and PF technologies is still not widespread among farmers. Therefore, the spreading of information about precision farming possibilities and the findings in this project is crucial.

SMART AGRI HUBS North East Europe	
Regional Cluster Lead	Inga Berzina (ZSA)
Regional Cluster Co-Lead	Raul Palma (PSNC)
WP3 Responsible	Dragana Matic (BIOS)

FIE #	FIE name	FIE lead
16	**E-services using drones for quantity buyer**	**Maciej Zacharczuk (WODR)**

Sector	Arable farming

FIE general goal	The experiment will run and implement e-services advisory system for agriculture with the use of drones. It will consist 4 services, especially on the market of small and medium-sized farms, which at the moment cannot afford expensive solutions. Important element for the experiment will be the financial analysis carried out by DIH.
FIE short description	The solutions and services exist but are limited to a narrow market or are in the experimental phase. The task of the pilot will be to use the capabilities of DIH to implement, test and prepare e-services for mass use. The reduction of costs should be related to the connection of services with public agricultural consultancy, which supports a large number of farms in a given area (grouping of recipients and services). The scope is to analyse, choose and implement minimum 4 of 10 identify possible e-services. The experiment will involve 10 farms. In order to compare the results, there will be 2 large farms, 4 medium and 4 small ones. Farms cooperating with WODR as demonstration network farms. The scope is to do minimum 80 tests - 4 e-services, 10 farms, 2 tests per farm. To the innovation experiment there will be involve team composed of system analysts, business analysts, economists, programmers and testers. An important factor of the experiment will be the involvement of final users of the targeted services.
FIE specific objectives	1. Start-up of 4 drones e-services. 2. Readiness to provide services to farmers at the production level. 3. Developed strategy of operational activities, including a business plan and a plan to launch mass service provision. 4. Test and start-up 5 DIH services.
FIE specific challenges	- enable high tech drone services for mass using, especially for small and medium farms - implementation and dissemination online tools for close cooperation between farmers, advisory and ICT providers - combine drones mapping with complex agriculture advisory - determination of financial challenges, cost-effectiveness of e-services and accessibility for a mass audience - adequate understanding of the needs of the users in the aspect of the availability of services at the level of medium and small farms

FIE #	FIE name	FIE lead
17	**On-line DSS for optimizing fertilizers - PULS for fertilizers**	**Tomasz Wojciechowski (UP Poznan)**

Sector	 Arable farming
FIE general goal	The owned by PULS VIS-NIR soil and yield sensing platforms provide, as in their current form, data that are not well adapted by the end user, farmer. It is, therefore, necessary to process them and transfer to the end user in a simpler, more functional form. Therefore, the aim is to develop an on-line Decision Support System (DSS) using data from sensing platforms and optimizing and better soil management (here sampling & mapping) by geo-localisation of nutrient inputs zones in order to increase the yields quality and quantity, hence increasing farmers' competitiveness. DSS will be based on the information about soil, crop cover and yield acquired from different sources. This also allows recording locally variable environmental conditions (topography) and geo-localisation of nutrient application sites, and the on-line integration of processed signals for applying variable rate (VR) / site specific fertilizing.
FIE short description	In actions 1 to 3 soil, crop and yield data will be collected data for database supply for the development of optimization algorithms. Soil and grain properties will be measured by classical methods and on-line with VIS-NIR proximal probes. Crop cover remote hyperspectral images (satellites and UAV) will be subjected to computer image analysis classification and pattern recognition for diagnosing the chosen crop status. Measurements results will comprise the basis for developing data integration algorithms in activity 4, finding correlations between data and modelling. Also, for the purpose of powering the database, an IT system will be created which integrates on-line signals from mobile sensors, taking into account data exchange standards in machines and agricultural systems. The ultimate task is development of a Decision Support System, combining and adapting project advisory services, applying correlation models and methods, which will be based on semantic analysis of data. The first two planned in DSS modules are: soil sampling and mineral nitrogen variable Rate fertilizer Application (VRA) modules. The data acquisition and DSS tests will be carried out in the fields of PULS experimental farm Brody and in the private fields cooperating with WODR.
FIE specific objectives	• A central deliverable will be a Decision Support System, including customized advisory services, the models and algorithms applied by these services, as well as the vocabularies used for the representation and semantic annotation of source datasets. • More over the objectives are: • Design and develop intelligent fertilization strategy extending current yield-optimized approaches to take into account soil quality degradation and environmental footprint.

	• Gather data in real time and with on-the-go sensors to minimize or avoid soil devastation and additional costs. • Develop models for determining optimum usage of nutrients (nitrogen N) in order to maximize farmers profit while reducing the environmental impact. It will thus improve knowledge of promising farm-scale technologies and research priorities. It will define optimized crop and site-specifics Nutrient Management Plans for a selected set of crop types and assess the achieved efficiency with respect to the resource required vs. crop production (i.e. produce more with less). Develop ontologies of soil- and crop-related datasets. Develop Linked Open Data for enriching global agricultural resources.
FIE specific challenges	The main challenges of this FIE are: • designing and developing agriculture-oriented algorithms for turning raw data into agricultural knowledge with emphasis on spectroscope-based sensors and image processing algorithms; • transferring the solutions (Decision Support System) based on the newest technologies into the farmers everyday life; • developing user-friendly solutions which give the farmers direct answers and hints in the simple, legible and comprehensible way; • mounting sensors on farm machinery to collect data across large farmlands and building sensing infrastructure for monitoring the actual influence of farming production on the environment; improving agricultural machinery within a precision farming logic.

FIE #	FIE name	FIE lead
18	**Autonomous Greenhouses – smart micro farming and smart large-scale production**	**Lukasz Lowinski (PIMR)**

Sector	
FIE general goal	Enabling fully autonomous greenhouse cultivation for individual users and groups of users based on the implementation of AI and IoT components.
FIE short description	The concept idea includes fully automated greenhouses for micro-gardening/micro farming for Smart Farming and Smart Cities implementation. Greenhouses will be computer-controlled: climatic conditions, robotic treatments will be carried out starting from soil preparation, sowing, weeding and crop harvesting.

	Smart greenhouses will be equipped with a set of sensors allowing to monitor climatic conditions with high read accuracy. The system analysing the data from the sensors will allow to adjust the conditions in greenhouses. An intelligent production support system prepared for the needs of greenhouses (individual and/or group), will predict yields at specific settings, help to indicate and eliminate production errors to maximize yield or reduce production costs at a given yield. The project will use the experience of EU producers of greenhouse systems (i.e. Arlen Team, Vitavia), sensor systems and measuring bases (Freedomgrow) and experience in the use of ERP systems in agriculture (DIH Agro Poland) and data processing and support of business models in agriculture (PIMR). PIMR as a coordinator will assist producers in the preparation of the offer for end-users. The pilot will be tested in selected locations in Poland and Portugal/Spain, among the producers of peppers, tomatoes, soft fruits and/or flowers, including Smart Cities small producers. Pilotage will be run and supported by DIH Agro Poland and HUB4Agri. The results of the experiment together with view the working system on pilot farms will be presented to producer groups and agricultural and gardening associations.
FIE specific objectives	Identification of key data needed for the proper use of the system; Integration and collection of Sensor Data; Data analysis and preparation of the Artificial Intelligence for Decision Assisting system; Preparation of a fully working demonstration system; System protection against the influence of external and environmental factors, system tests; Gather feedback from users.
FIE specific challenges	Technology innovation by integration of solutions in the field of automation/robotics, environmental control, modern sensors and artificial intelligence supported by the experience of people involved in greenhouses production. Integration of Apps, Services, Data management, Adapters, System and Sensors, Decision making Assistance, data providing; Standards. Communication standards and the possibility of expanding the system with any solutions from other manufacturers; High performance computing and Big Data Analyses and Applications, integration of Sensor Data; Real time feedback and Simulations; Integration of and linking with user and sensor generated data; Minimization of the number of processes; Optimization of resource use, including water and energy;

	Organic. Production without harm to soil, water, air, humans and all species – promoting ecological health and biodiversity. Certified organic goods must meet specific production requirements as outlined by national organic programs and independent certifiers; User involvement; Cost-balanced solution. An important factor when creating and implementing a system is its unit price for the end user. It cannot be a barrier preventing the application of the solution, and even the solution should be characterized by a reduction in production costs.

FIE #	FIE name	FIE lead
19	**Bee Monitoring and behaviour prediction**	**Uǵis Grīnbergs (BOSC)**

Sector	 Livestock
FIE general goal	Successful beekeeping depends on multiple environmental factors and processes inside and outside of hive. To make beekeeping more predictable it is necessary possible maximum long term collection of various environment and hive monitoring data, such as temperature and humidity measurements, sensor measurements together with expert survey and observation data. Later on, such data artificial intelligence could be deployed and trained. The main goal of the experiment is to provide technological platform for sensor data and expert observation collection. Provide data model, data and preconditions for: • statistical analysis for identifying of irregularities; • observation data for statistical result validation and connection to the real world actions; • building of triggering and notification system for beekeepers; To meet general goal following tasks were identified for the experiment: • define requirements for pilot sites; • gathering farmer's (Beekeepers) specific requirements may occur;

	- identify requirements for data collection platform(s) changes; - identify needed modifications and improvements for existing platforms; - deployment of the solution; - aggregate of existing data; - install environment in new sites to collect new data and observations and tests of replicability; - analysis of available data potential prediction and triggering modelling; - testing of triggering and notification system; - improvement of the solution based on testing results to reach higher TRL level; - training and workshops for developers, service organization and end users (bee keepers, data scientists, etc.);
FIE short description	The objective is to design solution focused on monitoring environmental phenomena inside and outside of hive, providing data for further analysis and regularity identification, together with observation and survey data. Based on analytical results and available real time monitoring data easy manageable triggering system able to identify bee behaviour changes would be provided. System will send alerts to beekeepers and allow provide interactive analysis in appropriate time frame. Monitoring will be based on Wireless Sensors Network or state of the art IoT solutions Following tasks (phases) would be designed in the experiment: - gathering of requirements for pilot farms; - gathering of data formats necessary for analytics; - redesign and modifications of existing solutions and components to build appropriate solution on site; - deployment of the first version of the solution on platform (both - local and DIHs) - testing of the solution against requirements; - testing of the solution against different use cases; - testing and validation in additional farms (end users) - more than one beekeeper farm; - implementation of requests for changes based on testing results; - implementation of requests for changes based on customer requests; - training and workshops for developers, service organization, and end users (farmers, beekeepers, etc.) - testing of the systems final TRL level Initially technologies will be deployed on at least one beekeeping farm in several spots. During second and third year validation of solution together with DIH Farmers Parliament of Latvia and WirelessInfo DIH will be done. Dissemination of activities and technologies in the third year. Extension of services and their future commercialization will be scheduled.

FIE specific objectives	Monitoring conditions inside hive. Data collection and measurement of following phenomena is supposed: ● Mandatory: ○ Continuous measuring the weight of the hive ○ Temperature in hive - (preferably at least 3 zones); ○ Humidity in the hive; ● Optionally, if feasible: ○ bee movement real time analysis based on optical bee and its movement recognition from streamed video of bee hive entrance; ○ Monitoring the amplitude and frequency of the sound sensing in the hive; Signal processing and analysis of the sound inside of hive, if feasible - in real time. Other services - all season apiary asset journaling WEB service, real time hive data monitoring and alerting, mobile application with journaling and beekeeper activity registration subsystem.
FIE specific challenges	As it is known everything what happens (pleasant or not) in the beehive is mirrored in its temperature portrait, sound species, may be relative humidity dynamics. As it is stated - today there is not a problem build comprehensive in means of volume and time sensor measurement system. The main challenge is to stick together comprehensive environmental physical phenomena measurement data with real event what happened at the particular moment of the Time in the hive. The main challenges for improvement to reach higher TRL of the technologies are: ● organise beekeepers servicing properly equipped hives for attendance, and particular precise problem or happening notice and description of them in the notebook subsystem for further researches; ● ability to properly systematize and define the data recorded and events taking place in the hive (sting, sickness, overheating, etc.) The structured measurement of data and observation data is the basis for precise and substantiated development, development and deployment of triggers for prior warning, event and process identification. The availability of a high-quality such data set can allow in future use of AI technologies.

FIE #	FIE name	FIE lead
20	**Groundwater and meteo sensors**	**Inga Berzina (Farmers Parliament)**

Sector	Arable farming
FIE general goal	Agriculture especially precision farming requires the collection, storage, sharing and analysis of large quantities of spatially referenced data. Such data to be effectively used, they must be transferred between different components of the complex environment (hardware, software, standards and organizations). These data flows currently present a hurdle to uptake of precision agriculture as the multitude of data models, formats, interfaces and reference systems in use result in incompatibilities. Management of huge amounts of data is a challenge. The main goal of the experiment is to provide integration, transformation and utilization of large quantities of data and models for agrometeorological and groundwater measurement and usage such information for optimizing time of interventions (e.g. fertilization, spraying) on farms. Following tasks (phases) were designed in the experiment: • define requirements for pilot farms • design modifications of existing components to build appropriate solution • deploy the solution on platform • testing solution on different input parameters • testing and validation in selected farms (end users) for two producer groups • improve the solution based on testing results • training and workshops for developers, service organization and end users (farmers, agronomists, etc.) • creating an advanced version of the system for ground water management and frost detection
FIE short description	The experiment will consist of implementation of cloud data server management with number of interfaces for different protocols and exchange formats, implementing additional tools like event processing, analytical functions, visualization tools. The experiment will be based on design and development of an expert system that will support farmers in decision making about planning field interventions on the farms. It will combine existing datasets from different sources, local agro-meteo measurements, global meteorological data and local weather forecast from various meteo models. System will integrate data together on one virtual space, add analytical functions and advanced demonstrative visualization.

	Connection of the system to the local weather forecast made by Meteoblue with local meteo data from sensors should provide weather forecast with higher precision. Taking into account agro-climatic zones in which farms are located in combination with data from groundwater measurements, agro-meteo measurements and local weather forecast can provide better information about crops and soil conditions and extrapolate conditions for next days. Based on this crops and soil condition forecast and weather forecast system can recommend farmers to do or not to do some interventions on fields.
FIE specific objectives	The specific objectives of FIE is to develop Web based system for integration, transformation and utilization of large quantities of data and models for agrometeorological and groundwater measurement and usage this information for optimizing time of interventions on farm. The integration includes sensor data, meteorological data and other spatial data management and processing within the common analytical model to improve management of farm operations. One from testing farms will be the Vilcini farm in Latvia. The system will support farm's operations in sending alerts based on the accurate data analytics for the particular types of work. It will consist of a data model and a server-side application which is capable of storing, analysing and publishing both sensor data and relevant spatial data in various ways friendly for the end-user. We will also demonstrate possibilities of usage new API and their integration with other APIs like meteoblue API to improve local weather forecast and improve management of farm interventions. We plan to support decisions like following: • Is nitrogen fertilization useful or permitted in that area (by land use map) – not in forest, water, near protected area etc. • Is crop at the right stage (Satellite maps: is the crop in a phenological phase that requires fertilizer? + photographs acquired from the smartphone (both optional))? • Is the soil not too wet to apply fertilizer and drive with a tractor (soil type and moisture)? What is the level of groundwater to start seeding of crops? (groundwater level, weather forecast)
FIE specific challenges	Current problem is that there exists number of protocols and data exchange formats for accessing data and especially sensors observations • There are three sources of standards for sensor data - industrial (OPC UA), OGC standards and IoT protocols • There are various communications protocols to transfer data between sensors in fields and sensor data management cloud - IoT oriented (LoRa, NB IoT, SigFox), classical networks (GSM, GPRS, LTE) Due this fact is difficult to integrate existing sensors with other decision tools and farming data. The challenge is to offer farmers and service providers easy environment for integration of their data with other service

	providers. There is clear need for brokerage system which will allow easy data integration with farmers existing infrastructure.

SMART AGRI HUBS Iberia

Regional Cluster Lead	Judit Anda Ugarte (CAPDER)
Regional Cluster Co-Lead	Luis Mira da Silva (Consulai)
WP3 Responsible	Marcos Alvarez & Ruth Muleiro Alonso (Gradiant)

FIE #	FIE name	FIE leads
21	**SAIA – Sensoring and Artificial Intelligence Algorithms for early detection of crop disease symptoms**	**Pedro Petiz (Tekever)** **Ricardo Arjona (EC2CE)**

Sector	Fruits
FIE general goal	SAIA FIE aims at exploring the usability and taking advantage of some key technologies for crops observation and algorithms to assist and help in the early detection of pests and, thus, to reduce the negative impact in production and environment.
FIE short description	SAIA FIE aims the exploitation of remote sensors and development of artificial intelligence algorithms to identify diseases symptoms, create risk maps and establish data patterns of symptoms. Therefore, it is proposed to develop a set of solutions to gather and analyse data for the development of early detection, identification and characterization of plant pests and environmental conditions favourable for their appearance in relevant crops in the Iberian region.
FIE specific objectives	The main objectives of the IE are the following: - Use sensors to collect crops data - Explore crops pests detection algorithms - Evaluate the sensors / algorithms performance according to pest conditions - Establish a service exploitation plan - Contribute to support IPM AI based to reduce the use of pesticides in agriculture

<table>
<tr><td></td><td colspan="2">- Evaluate the level of technological acceptance by End-User farmers</td></tr>
<tr><td>FIE specific challenges</td><td colspan="2">The main challenges of the IE can be of the following nature:
- Technological: To explore/use of remote sensing and artificial intelligence to early identification of crop diseases and pests' symptoms.
- Data volume: The number of samples required to successfully obtain the necessary data to establish an automatic algorithm is very high. The challenge is to have an algorithm that will require a low number of samples.
- Representativeness: the data acquired will be based on a few campaigns and the representativeness could be limited
- Variability: Different diseases present similar symptoms, as well as the symptoms of a disease, are different according to the bio stage of the plant and season of the year. The challenge is to have a reduced number of algorithms to handle the different conditions of the crops.
- Operational: Establish a solution that presents an operational performance that can be used in large crops, especially in cases where the quick and fast coverage of large areas is a key point to ensure early detection of contamination.
- Service: The technology and results obtained with drones and other new solutions should be cost effective and easy to use in order to be adopted.
- Service: The use of AI algorithms recommendations must be accepted by the legislation as a threshold to authorise the use of pesticides</td></tr>
<tr><td>FIE #</td><td>FIE name</td><td>FIE leads</td></tr>
<tr><td>22</td><td>Iberian Irrigation Portal</td><td>Rafael Angel Ferrer Martínez (HISPATEC)</td></tr>
<tr><td>Sector</td><td colspan="2">
Arable farming</td></tr>
<tr><td>FIE general goal</td><td colspan="2">Providing support to farmers in Portugal and Spain to:
- Optimal management of irrigation from a technical, economic and environmental point of view;
- Optimization of the water use for agriculture;
- Rationalization of the exploitation and conservation costs;
- Supporting to irrigation decision using usable IT tools.</td></tr>
<tr><td>FIE short description</td><td colspan="2">Deployment of an irrigation web portal (and its supporting services) in two demo sites, one in Portugal and the other one in Spain.</td></tr>
</table>

FIE specific objectives	- Create an experimental 'Iberian Irrigation Portal' providing enhanced irrigation support services to farmers; - Define and trial a low-cost information infrastructure (including IoT technologies) for the effective operation of the 'Iberian Irrigation Portal' services; - Create and pilot a Competence Catalogue (of experts and enabling technologies) for Irrigated Agriculture Digitization; - Demonstrate the FIE solutions in one Portuguese region (that's not in the Alqueva region) and one Spanish region.
FIE specific challenges	- Scale-up the 'Portal do Regante' digital services for effective and sustainable irrigation for agriculture enabling a better use of water and productivity of the crops, to the farmer for farmers out of the Alqueva region; - Define a low-cost information infrastructure for sufficient and effective data provision to operate the irrigation support services to farmers at large; - Extend the 'IoT Catalogue' for supporting the pick & choose of digital competences and its enabling technologies; - Create irrigation management models for additional crops/regions of experimentation that is not in the Alentejo/Alqueva region.

FIE #	FIE name	FIE leads
23	**Data-Intensive Dairy Production**	**Manuel López Luaces (XUNTA)** **José Antonio Portos Mouriño (XUNTA)**

Sector	Livestock Arable farming
FIE general goal	Our FIE plans to effect improvements in different steps of the early dairy production chain (forage production, feed mixture and management, stable operations and general resource planning) by exploiting the benefits that digital/data technologies bring. These improvements will become part of the product and service offerings of the 5 SMEs participating in the FIE, that provide such products and services to end-users (farmers and cooperatives). Such end-users are members of the Galician DIH for Agri-Food, and their participation will be guaranteed when required through the hub's activities.
FIE short description	The dairy sector is of high importance in the Galician region, the 7th largest milk producer in the EU. The dairy sector is undergoing a progressive modernization process, in which digital technologies are becoming more and more important. The lack of data (and often, quality data) hinders the productivity of dairy farms. Our FIE seeks a data-aided optimization of dairy production in an integral way, considering from forage growing,

	feed mixture, in-stable herd and operations management and overall farm management. Optimization drivers are: - resource efficiency - milk quality - animal welfare - environmental impact - quality of life of the farmer, and - overall farming business sustainability. An intelligent use and integration of multiple data sources, machinery, models and analytics, the know-how of experts, and market knowledge will allow the involved SMEs to generate, test and demonstrate a number of improved products and services that will improve their market position and improve that of their customers (end-users).
FIE specific objectives	- Improve the efficiency in the utilization of resources for forage production, optimization of the use of own resources of agricultural holdings combining data from multiple sources (aerial, climatic, soil analysis, etc.) - Achieve a better performance in the animal production through the optimization of the grow conditions (feed mixture optimization, precision feeding, animal production…) and the quality of the data available. - Increase the sustainability of the process: Increase feed precision intake in dairy stables (reduce feed loss), improve the use of natural resources (intelligent use of slurry to minimize GHG emissions to atmosphere, soil, crops…) - Improvement in the monitoring and management of in-stable operations and conditions - Improved decision making by integrating multiple data sources (including machinery from multiple vendors) in the resource planning system - Test and demonstrate the readiness of the improved products and services in real conditions and specific sites (including actual commercial dairy holdings)
FIE specific challenges	Improve the efficiency in the use of resources through proper exploitation of the data available along the indoor/outdoor dairy production cycle (including pasture, fodder, animal health, milk composition), thus contributing to a better and more sustainable performance. Specific challenges: - Extracting value from data at the different stages identified above, but also in combined manner, though parametrization, joint analysis, pattern identification and translate into actionable information for decision support. - Successful integration of such digital knowledge into the products and service offerings of the SMEs involved in the FIE. - Making this technology affordable to small-medium sized farms, such as those that are more common in the Galician region.

Regional Cluster Lead	Sofia Michelli (ASTER)
Regional Cluster Co-Lead	Ambra Raggi (Coldiretti)
WP3 Responsible	Milica Trajkovic (BIOS)

FIE #	FIE name	FIE lead
24	**Implementation of ICT in aquaculture - AquacultuER4.0**	**Alberto Cavazzini (UNIFE)**

Sector	 Aquaculture
FIE general goal	AquacultuER4.0 is aimed at developing an innovative automated system able to control water quality at farming sites by continuously collecting the information coming from different sensors (here referred to as "environmental", "measure" and "weather" sensors), to store and organize this information in a dedicated server-cloud and to inform in real-time aquaculture operators if and when critical situations are occurring
FIE short description	Activities can be divided into four main blocks, each of which is characterized by a series of sub-actions described in the following: 1) Small-scale (lab) pilot plant demonstration. 2) Pilot-plant demonstration. 3) Technology transfer to SMEs 4) Divulgation and dissemination to potential stakeholders
FIE specific objectives	To develop an integrated automated system to manage aquaculture farms based on real-time data that fulfil Precision Fish Farming (PFF) concept whose aim is to apply control-engineering principles to fish production, thereby improving the farmer's ability to monitor, control and document biological processes in fish farms. To reduce GHG emissions by production cycles through automated systems including control routines to regulate operational devices To develop ICT in aquaculture to guarantee high quality of fish and shellfish life.

	To certify environmental conditions of fish farming to meet the needs of a market sensitive to the product provenance and the use of appropriate fish and shellfish farming practices. To increase competitiveness of aquaculture SMEs through digitalization and IoT technology by reducing cost of management actions, increasing economic performance and quality of fish and mollusc production To support the development of aquaculture because the fish is one of primary protein source with more high qualities respect the protein sources obtained with land animals. To improve education of fish farming operators in order to increase the employment of ICT solutions and tools in aquaculture. To reduce the impact of intensive aquaculture production on the environment by continuously monitoring and correction of critical events.
FIE specific challenges	Promotion and development of sustainable aquaculture through ICT. Mitigating environmental impact of aquaculture activities in coastal ecosystems, while simultaneously reducing both energetic costs and GHG emissions. Improving aquaculture productivity to meet the increasing future food demand through the employment of intelligent and technological solutions. Reducing the impact of adverse events, such as environmental ones (e.g., eutrophication, pollution, etc.), electrical/mechanical ones (e.g. failure of electric devices) and meteorological ones (storm, whirlwind, etc.). Increasing animal wellness through ICT. Guarantee the respect of good living conditions for fishes and molluscs in aquaculture plants by continuously monitoring environmental conditions. Increasing climate resilience of aquaculture activities through ICT. Develop adaptation solutions to monitor and prevent effects due to climate change. Promoting the territoriality and traceability in aquaculture by monitoring and preserving the environment where fishes/molluscs/etc. are farmed through the aid of ICT. Mobilizing stakeholders to support the introduction of ICT solutions in aquaculture Enhancing aquaculture SME conscience and competence towards the adoption of Digital Technology solutions and tools. Training and education for the diffusion of Digital technology in aquaculture. Developing good practice protocols for aquaculture.

FIE #	FIE name	FIE lead
25	**The VINeyard ecosystem: an ideal case for data driven and PREcision based management (VINPREC)**	**Stefano Poni (UNICATT)**

Sector	Fruits
FIE general goal	General goal of VINPREC FIE experiment is to bring at least to TRL 7 a modified multisensory tool for high resolution proximal scanning of grapevine canopies. Two main reasons for such a goal: i) vineyards, with few exceptions, feature typically discontinuous canopies where soil spots mixed with canopy areas originate the so called "mixels". Best way to overcome the issue, becoming independent also from remote imagery acquisition, is to target directly the canopy from its side, therefore eliminating the disturbance of soil pixels; ii) viticulture in Italy is still bound to tradition and innovation needs to be also mentally accepted by growers. Having a simple sensor that is mounted in front of the tractor and that, during routine mechanical operations (i.e. tillage, spraying, grass cuts, shoot trimming) is able to provide such additional information seems to be a winning strategy. VINPREC is a new and fully original implementation of the already available MECS-VINE allowing segmented scanning (up to 15 sectors) of any hedgerow grapevine training systems with simultaneous acquisition of canopy index (a parameter related to vine vigour) and thermal status of the canopy aimed at assessing which zones of the vineyard are more likely to undergo a water stress.
FIE short description	VINPREC will be characterized by three concurrent, desirable and integrated features: i) image acquisition in the vineyard parcels is exclusively based on proximal sensing performed by a multi-sensor apparatus (MECS-VINE, already available and tested) mounted in front of a tractor. Moreover, it is very well suited to small farms and, on a more technical basis, is independent from weather conditions or restrictions rules that might affect feasibility of remote sensing acquisitions (i.e. from satellite or drone); ii) the type of sensor used (multisensory) allows concurrent acquisition and processing of both vigour and thermal data that can refer either to the whole canopy or, if needed, to specific sectors of it. The latter, unique feature is quite often a must in the vineyard environment where special analyses of defined canopy portions (i.e. the basal part where clusters are usually located and where renewal wood for next season cropping is often selected at winter pruning) is indeed a plus; iii) the amount of potentially usable information derived from a single passage per row is huge; production of high resolution (HR) vigour maps will generate, in turn, possible prescription maps for selective mechanical harvesting, or variable rate spraying, fertilization and irrigation. At the same time the vineyard manager will be provided of a tool able to assess, in almost real time, the water status of the canopy and the extent of any water stress, fixing the physiological threshold beyond which additional water supply can be wisely started.

FIE specific objectives	Specific objectives of the VINPREC experiments area also clearly outlined in the GANTT diagram and can summarized as it follows: – Industrial components (sensors) identification: market scouting and sensors testing (M2); – System design and implementation (M15) – Calibration bench design and implementation (M15) – System calibration (M16) – Post-processing software design and implementation (M18) – System testing under semi-controlled conditions (e.g. outside pot lot) (M21) – In field system testing and demonstration including a variability in terrain slope, trellis size, vigour, yield potential, floor management techniques and cultivars (M22). – Collected data analysis and exploitation (e.g. warnings and prescription). Notably, being the grapevine plant a perennial crop whose annual performances are very sensitive to environmental conditions, most of the above activities will have to be duplicated in both seasons to better isolate year-to-year variability.
FIE specific challenges	Main challenge of this FIE is to provide a user-friendly tool that might greatly contribute to approach the great potential of precision viticulture application to growers. Insofar, in Italy, consistent viticulture precision strategies are used in less than 1% of farms and wineries. This main challenge can be tackled successfully based on three main features of VINPREC: – Grape growers are usually not willing to accept a technology requiring extra labour and additional machine traffic beyond the standard. VINPREC combines the use of the sensor with any other conventional tractor - executed vineyard operation and therefore alleviate grower’s commitment. – It is very much necessary that the amount of information gathered during one single passage is multiple and, in theory, usable to provide warning and decision making procedures for a number of operations including spraying, summer pruning, irrigation, fertilization and, if available, selective mechanical harvesting. – Most importantly, time needed for the post processing of the recorded data and ultimately, the release of different types of maps, represent an additional and very noisy cost. Besides, further delay related to such need might endanger effectiveness of the intervention. VINPREC aims at a real time post-processing of the scanned data that can be visualized on a mobile apparatus or a tablet.

Regional Cluster Lead	Spiros Fountas & Nikos Mylonas (AUA)
Regional Cluster Co-Lead	Viorel Marin & Adina Cristea (PRO-AGRO)
WP3 Responsible	Milica Trajkovic (BIOS)

FIE #	FIE name	FIE lead
26	**Digitizing Open-Field Vegetables**	**Spiros Fountas (AUA)**

Sector	 Vegetables
FIE general goal	The aim of this IE is to monitor and optimize the production of organic open field vegetables. The IE will take place in the ancient place of Marathon, which is the main vegetable production for Athens in Greece. The contributing parties consist of AUA, NEUROPUBLIC (NP) and Marathon Bio Products (MARATHON).
FIE short description	AUA will be the coordinator of this IE and will be responsible for monitoring the field trials, running algorithms for irrigation, weeding and maturity level, as well as for the scientific part of the IE. In addition, AUA will conduct field trials using proximal sensors (multispectral canopy sensors and chlorophyll meters) as well as drones to identify weed patches and also determine the maturity level of the vegetables for optimum harvesting and for yield estimation. NP will be the technology provider and thus will be responsible for exploiting the IoT devices that will be provided by the Gaiasense DIH. The IoT devices will be installed in the end user's field and will include atmospheric and soil monitoring sensors. NP will also provide access to satellite data for the targeted fields from Sentinel 1 and 2. In addition, NP will provide the cloud infrastructure where the collected data will be maintained and processed along with decision support services for issuing risk alerts about irrigation, fertilization and pest management. Finally, MARATHON cultivates more than 20 types of vegetables all year around will be the end user and will be responsible for daily cultivation processes.
FIE specific objectives	• Increase crop inputs and agricultural operations efficiency due to better crop monitoring

	• Decrease environmental input of vegetables production due to less crop inputs (water, fertilizers, bio-pesticides) • Increase of crop yield and crop quality of vegetables and thus increase profit of vegetables production due to better crop monitoring and crop inputs application • Decrease vegetables production losses due to less pests, diseases and infestations due to optimized agricultural operations scheduling. • Increase consumer awareness on the quality of the vegetables production by providing more information that can be used for traceability
FIE specific challenges	Main challenge of this IE is the digitization of open field organic vegetables production in order to utilize the use of smart farming technologies to less studied type of crops. For addressing this challenge, this IE will address the below mentioned specific challenges. These are: • Monitoring of vegetables production using continuous measurements from IoT devices and aerial and satellite data from remote sensing • Optimization of agricultural operations scheduling (weeding, irrigation, spraying and harvesting) and crop inputs efficiency (water, fertilizers, fuel, bio-pesticides) of vegetables using different types of data (proximal, aerial and satellite) • Integration of digital monitoring and decision support models into the certification and traceability process for organic vegetables producers in order to add value to the final produce.

FIE #	FIE name	FIE leads
27	**Quick & Mass Animal Identification with IOT devices**	**Ovidiu Vladu (IQM)** **Constantin Teodorescu**

Sector	Livestock
FIE general goal	The overall objective is to offer an easy and reliable online access for farmers self-registering, animals' movements for efficient traceability, under advanced reliability and security requirements. The technology used will offer a larger range of scanning/reading, as well as the bulk reading of data for a high number of animals, increasing significantly the speed of the movements tracking process, a higher working safety for the operators, a higher accuracy of data sent to the database and as a consequence, an improved animal traceability overall.
FIE short description	The FIE will be designed and implemented as an open-access data centre to collect, organize, operate and report standard animal ID, movements & behaviour data using IoT, RFID technologies (as hardware), a dedicated platform for animal

	tracking (as software) and data collection (made by a minimum of 100 farmers). An alternative would be the use of Bluetooth beacons (BLE) together with RFID/IoT so the scanning process can be done in a higher automation manner.
FIE specific objectives	Quick & Mass Animal Identification with IOT devices FIE aims to design, build and operate an integrated information system to collect, process and store information about holdings (farms, slaughterhouses, fairs and markets, rendering units, etc.), animals (cattle, sheep, goats, pigs, and horses) with their movements, events and owners, decreasing dramatically the number of paper forms, in benefit of operators and in higher accuracy of the data.
FIE specific challenges	The identified specific challenges would be: - the creation of the FIE database structure , web apps and farmers /Authorities related services; - creating the connections / network among a group of minimum 100 farmers; - creating the network and communication between the devices (device to device) - connecting with existing national authorities (Ministry of Agriculture, National Authority); - testing the new remote access identification smart-beacon devices, -demonstrate and validate the system model services.

FIE #	FIE name	FIE leads
28	**Decentralized trust in agri-food supply chains**	**Žiga Drev (OriginTrail)** **Ana Bevc (OriginTrail)**

Sector	 Livestock
FIE general goal	The main goal of FIE is to demonstrate the value of data exchange between stakeholders in the supply chain by decentralizing trust with use of blockchain technology. By implementing OriginTrail protocol into use cases in complex supply chains we are going to benchmark proposed KPIs. FIE should deliver substantial results to the included stakeholders that will provide the foundation for scaling up the solution - through extrapolation on the new use cases with existing stakeholders, or by acquiring new stakeholders (and use cases) in another supply chain. We are going to achieve these goals by implementing solution, based on OriginTrail protocol into two different industries - dairy and poultry. With the diversified approach, we are going to prove the flexibility of the solution and gather deeper insight into the specifics of both industries.
FIE short description	Blockchain technology has huge potential to decentralize trust in supply chains and bring measurable benefits to organizations and

	individuals. During the course of this FIE, we will provide an environment that will enable quick detection of discrepancies in a supply chain, establish accountability, provide traceability data and help to better position different products. There are two industries that we will focus on (Dairy and Poultry). For the deployment of the proposed solution, there are three companies that will be involved in the process: 1. Prospeh d.o.o. (SLO) - Providing OriginTrail technology and Business and technical insight 2. Prospeh BGD d.o.o. - Technical integration 3. BioSense Institute - Provide support In the course of the project BioSense DIH will support Prospeh d.o.o. in: • Creating a panel of users (farmers, food producers, consumers) that will test and validate the existing solution, based on the lean multi-actor approach. Users will be from sectors of poultry and dairy in Western Balkan countries (ex-YU), • Provide consultations and support on the business models required to engage all relevant actors in an efficient way, • Support the company with international contacts for complimentary sales • Support the company in attracting additional funding Activities in FIE are organized in several stages of the project. After the initial introduction and requirements gathering with the designated stakeholders (that include collaborative effort from DIH), OriginTrail protocol is going to be utilized through integration procedures in order to gather the data from various participants of the supply chain. The following stages of the project are the development of frontend solutions that are going to be used by consumers. In the final stage the evaluation of the solution with proposed KPIs will take place. Based on the use case, stakeholders should receive additional value regarding the traceability of the products, provenance and authenticity. Prospeh d.o.o. and BioSense will get insight and valuable experience throughout the activities of the project that will help in future development of the solution and fine tuning the implementation procedures. The FIE is projected to finish on December 2020, with both of the cases fully integrated as outlined in the activities.
FIE specific objectives	• Establish a foundation for data analysis (ex. for Track and Trace feature) by enabling supply chain entities to share their data along the supply chain. • Implement blockchain technology on top of the legacy systems and verify improvements and added value that it brings in agri food sector • Establish trust between stakeholders and provide authenticity of their product • Provide additional value to involved stakeholders by set KPIs
FIE specific challenges	• Lack of interoperability across the food supply chain • Data silos • Lack of familiarization of farmers with relevant technologies • Consumers’ demand for provenance of food products

	• Inflated expectations from blockchain technology across the ecosystem.

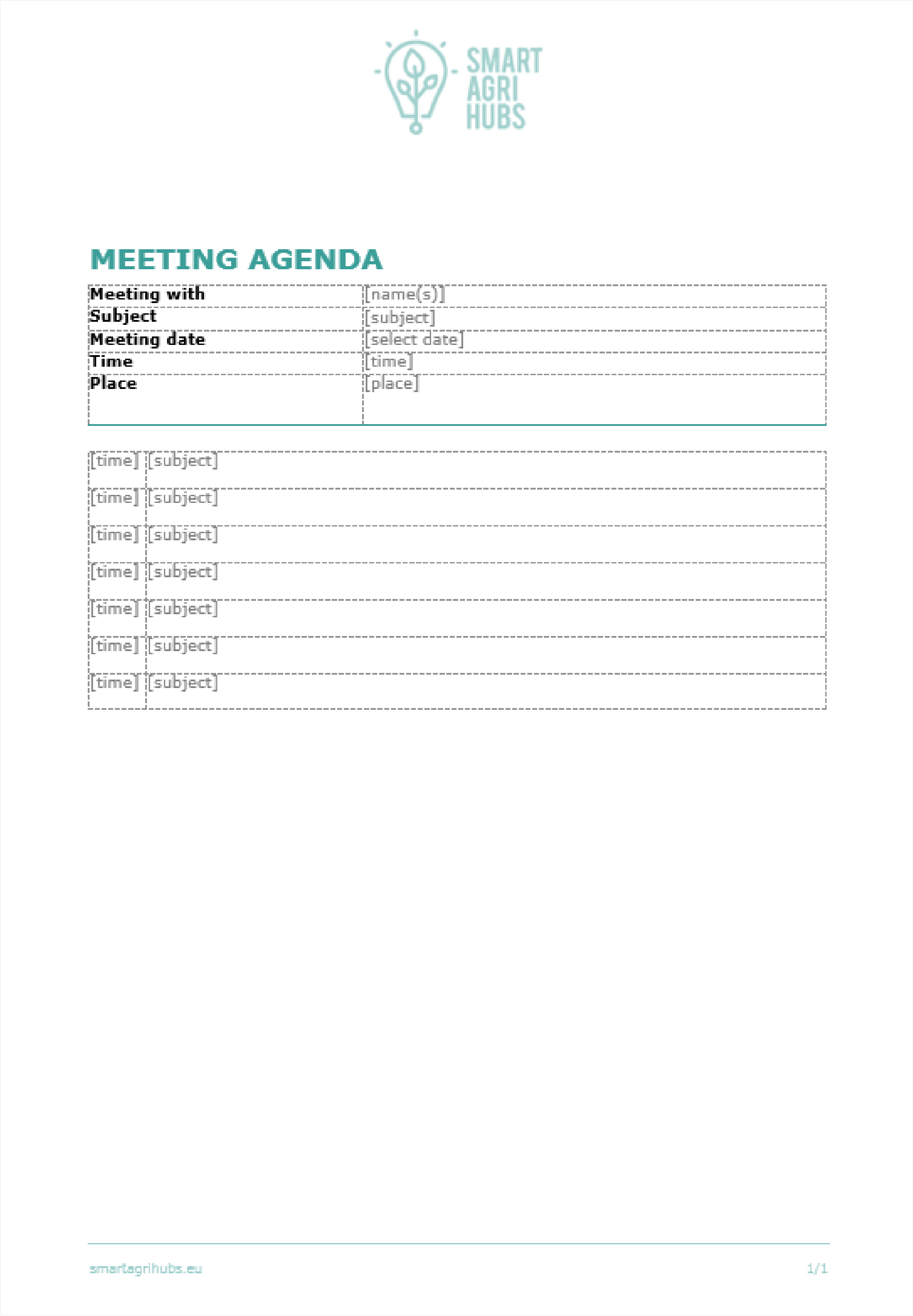
4 CONCLUSIONS

The overall guidelines and information provided throughout the deliverable represent the concrete starting point of the SmartAgriHubs Project. The designed guidelines will be the reference point for the Innovation Experiments teams for the whole length of the project, as it gives information about their role duties, the deadlines to provide the required information for specific reporting, specifics on meeting management, its frequency and participants, as well the documentation criteria, and the communication channels.

At the same time, the deliverable IE guidelines aims to enhance the close cooperation between WP3, FIE leads, Regional Cluster leads and co-leads. Such cooperation is at the base of SmartAgriHubs project, assuring the smooth progress of the project through a multi-actor approach, where all the partners, from the end-users to the leaders of work packages, DIHs and CCs are involved in the development of a successful project. In addition, it ensures a bottom-up approach to problem solving, which will ensure very fast responses to possible problems.

ANNEX 1

Documentation and templates



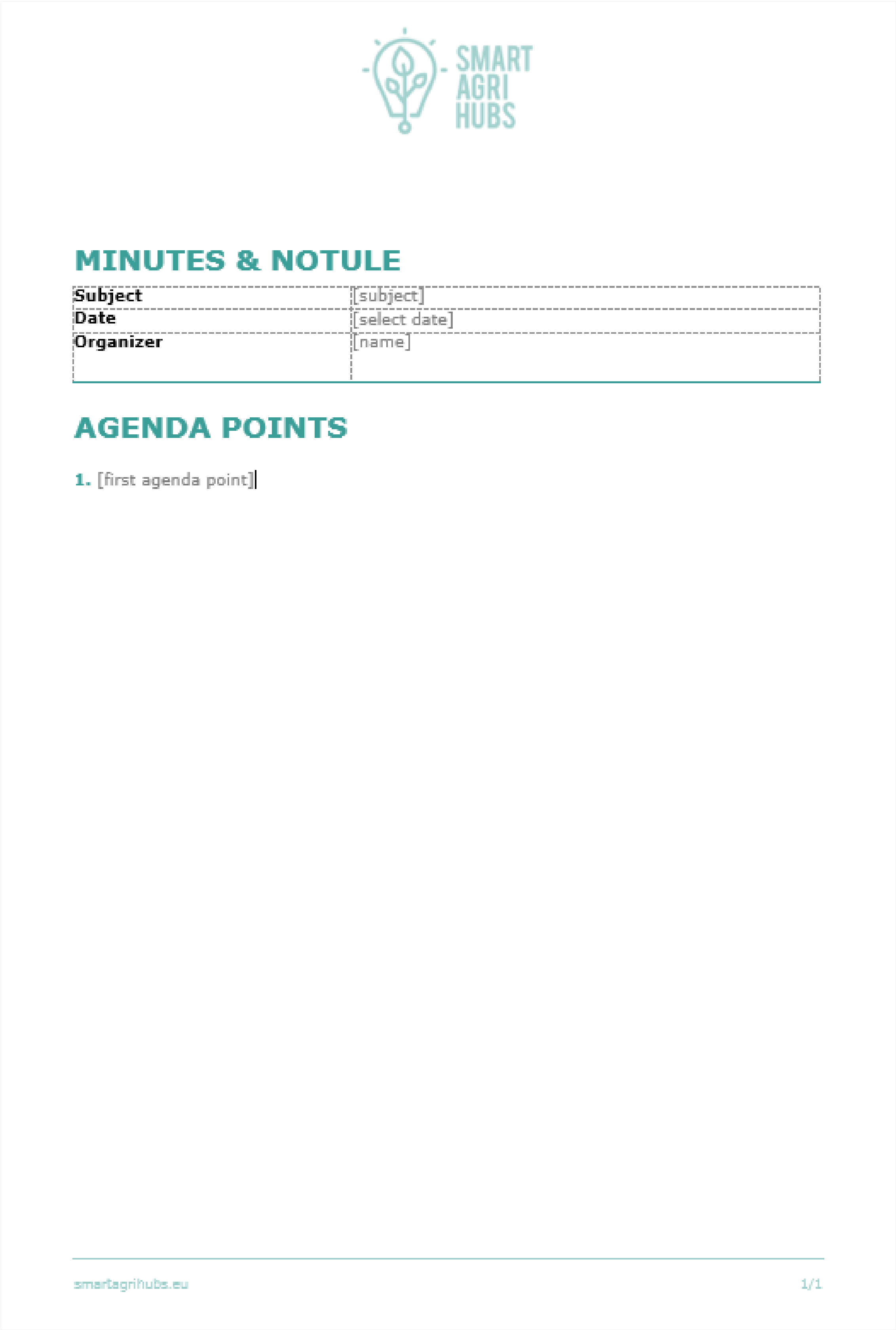
MEETING AGENDA

Meeting with	[name(s)]
Subject	[subject]
Meeting date	[select date]
Time	[time]
Place	[place]

[time]	[subject]
[time]	[subject]
[time]	[subject]
[time]	[subject]
[time]	[subject]
[time]	[subject]
[time]	[subject]

smartagrihubs.eu 1/1

Table 8 SmartAgriHubs Meeting Agenda template



SMART AGRI HUBS

MINUTES & NOTULE

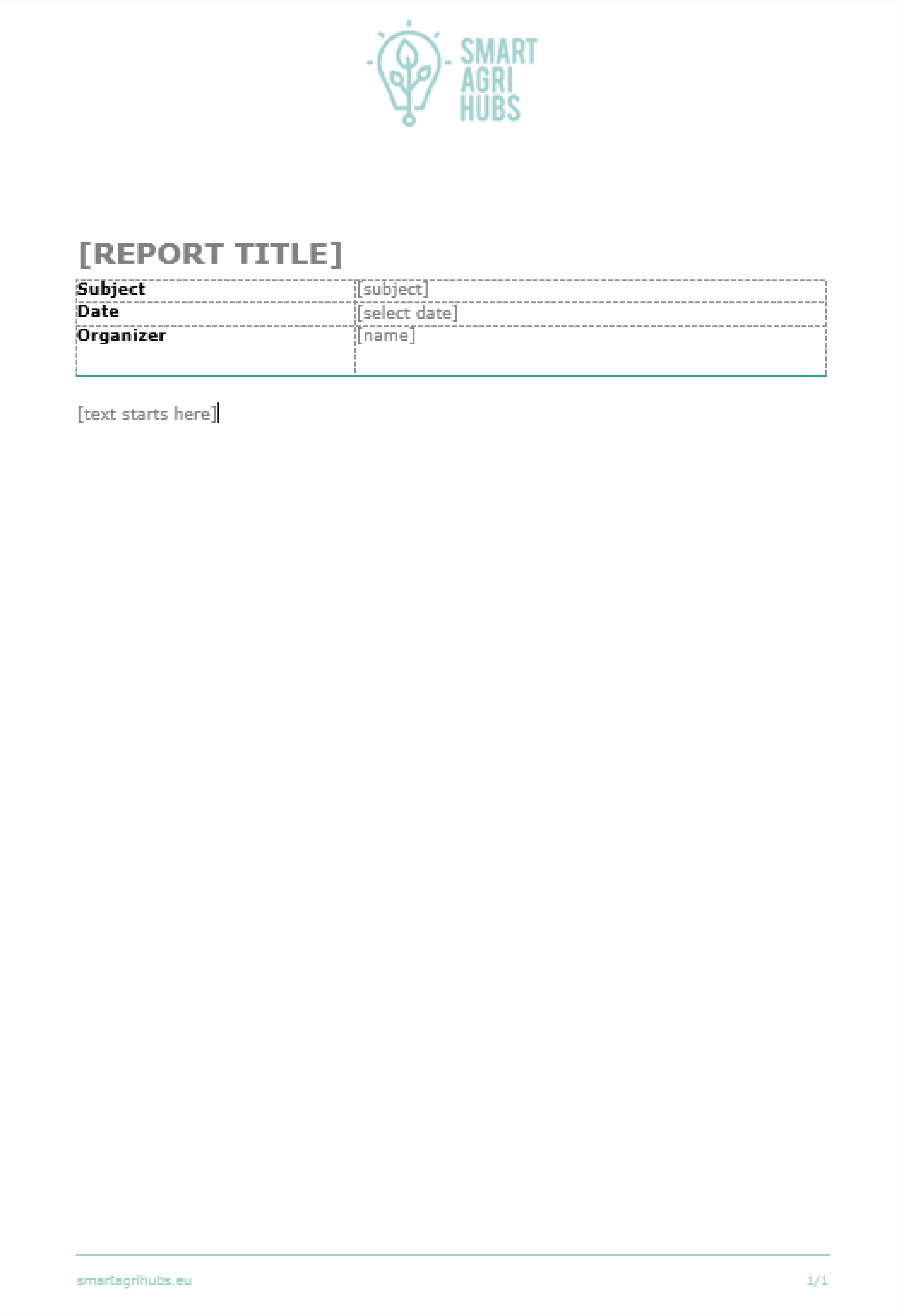
Subject	[subject]
Date	[select date]
Organizer	[name]

AGENDA POINTS

1. [first agenda point]

smartagrihubs.eu 1/1

Table 9 SmartAgriHubs Meeting Minutes template



[REPORT TITLE]

Subject	[subject]
Date	[select date]
Organizer	[name]

[text starts here]

smartagrihubs.eu

1/1

Table 10 SmartAgriHubs Report template