



Research workshop on Digitising the Agri-food Sector: a research agenda for Horizon 2020

28-29 September 2016, Brussels

Report

European Commission – Directorate General for Agriculture and Rural Development
November 2016

*Agriculture
and Rural
Development*

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More information

Workshop web page:

<https://ec.europa.eu/programmes/horizon2020/en/news/digitising-agri-food-sector-workshop>

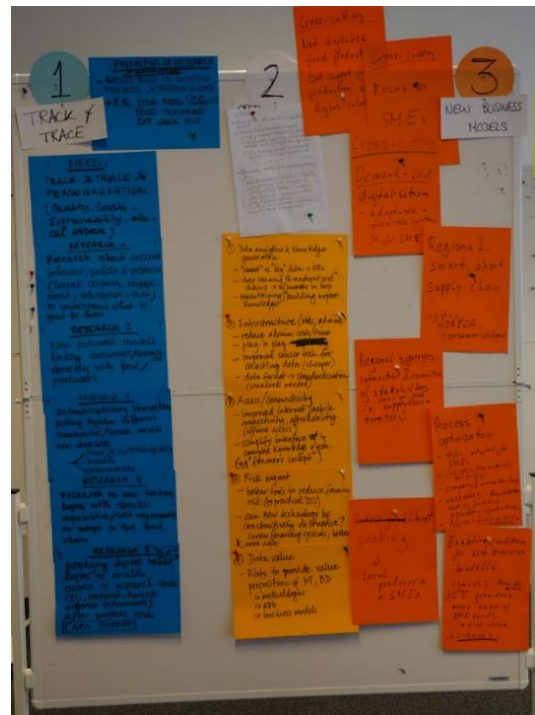
Disclaimer

This report compiles and presents the contributions made by experts in the context of a workshop held on 28-29 September 2016. These contributions do not represent the views of the European Commission.

Summary of the workshop

In the course of preparing for the next work programme 2018-2020 under Horizon 2020, the Directorate General for Agriculture and Rural Development (DG AGRI) organised a workshop in Brussels on 28 - 29 September 2016 on the theme of "Digitizing the agri-food sector".

Digital technologies (or the interchangeable acronym, ICT) are one of the most important recent innovations for all actors in the agri-food value chain and advances in precision agriculture especially are already helping to address the global challenge of raising agricultural productivity in a more sustainable manner. Beyond assisting in primary production, digital technologies have immense potential to support many elements of the rural economy from food supply chain management to innovative new business models. Provided that sufficient infrastructures are in place, digital technologies can therefore bring many new opportunities to rural areas which are likely to raise their attractiveness and viability, in particular to younger generations.



In this context, the main objective of the workshop was to define appropriate research and innovation priorities for supporting the on-going demand-led digitization of the agri-food sector. A total of 87 people participated in the workshop, including a diverse mix of practitioners from the ICT and agri-food sectors. All discussions were interactive and participatory, and focussed on identifying the real needs of farmers, consumers and food businesses in order to help ensure that future research and innovation activities under Horizon 2020 are driven primarily from the demand side.

The first day of the workshop kicked-off with a comprehensive discussion about the role of digital technologies in providing solutions to existing practical problems / needs in the agri-food sector, as well as bringing new opportunities for actors in the agri-food chain to develop new businesses and new services. This discussion soon progressed to the specific needs of the main end-users of these technologies. Five main clusters of specific end-user need were identified:

1. The need to "Track and Trace" quality products from farm-to-fork
2. The need to optimise farm operations
3. The need for new business models
4. The need to combine and exchange data
5. The need for environmentally-sustainable production

Each need was elaborated from the perspective of farmers, consumers and food businesses. Inevitably there was some overlap between end-user needs. There were also some important words of caution from participants regarding the potential problems / pitfalls of the rapid digitisation of the agri-food sector.

The interactive discussions continued on the second day of the workshop with the identification, prioritisation and more detailed definition of relevant research and innovation activities that could help meet the specific end-user needs identified on Day 1.

Five priority needs were identified for each of the five main clusters of needs. These are elaborated fully in [Section 5](#) of the report.

1. Objectives of the workshop

The overall aim of the workshop was to contribute to preparing the forthcoming 2018-2020 Work Programme for H2020 by **defining appropriate research and innovation priorities for supporting the demand-led digitization of the agri-food sector**. To achieve this overall aim, the specific objectives of the workshop were as follows:

1. **Orientate** workshop participants towards the scope of potential H2020 support for digitizing the EU agri-food sector;
2. **Identify** where digital technologies can play a role in providing solutions to existing practical problems / needs in the agri-food sector, as well as bringing new opportunities for actors in the agri-food chain to develop new businesses and new services;
3. **Discuss** the specific needs of the various “end-users” (e.g. farmers, consumers, food businesses) of digital technologies in the agri-food sector;
4. **Identify** relevant research and innovation activities that will help meet the needs of these “end users” (including tapping into the innovation potential of any brand new emergent technologies);
5. **Prioritise and define** in more detail the research and innovation activities identified above for potential inclusion in the 2018-2020 Work Programme of Horizon 2020.

2. Who participated in the workshop?

A total of **87 people** participated in the workshop, of which **68 were ICT and agri-food sector professionals from 18 countries (16 EU Member States, plus Switzerland and Serbia)**. The other 19 participants were officials from the European Commission (AGRI and CNECT) and the European Global Navigation Satellite System Agency (GSA).

The ratio of professionals participating from the ICT and agri-food sectors was approximately 50:50 and they brought a huge diversity of experience to the workshop. Their profiles included:

- farmers (some of them with practical expertise on data issues) and representatives from farming organisations;
- representatives from agricultural machinery manufacturers with expertise on software solutions, data solutions and standardization for precision farming;
- researchers, consultants and entrepreneurs working on various aspects, and at various stages, of the agri-food value chain;
- researchers working on the digitisation of specific agricultural production processes;
- representatives of consumer organisations;
- representatives from a variety of companies, research institutes and universities working on the Internet of Things, Robotics and data issues;
- specialists on macro-nanotechnology and bioengineering.



3. Description of the process

In order to define research and innovation priorities that were **based upon the needs of the various “end-users” of digital technologies in the agri-food sector** it was necessary to initiate and facilitate a workshop process which was:

- **Multi-sectorial and multidisciplinary** – this began with the identification and invitation of the participants and the careful mixing of professionals from the ICT sector with those from the agri-food sector (see [2. Who participated in the workshop?](#));
- In line with the **multi-actor approach** – this is a key principle underpinning the activities of the [EIP-AGRI](#) and many [Horizon 2020 projects](#). It requires i) listening to the needs of the end-users (farmers, food companies, consumers etc.) and ii) then promoting collaboration between various actors to make the **best use of complementary types of knowledge** (scientific, practical, organisational etc.) for both the **co-creation** and diffusion of solutions/opportunities **ready to implement in practice**;
- **Interactive and participatory** – the programme of the workshop (see [Annex 1](#)) was specifically designed to balance the informative inputs from presenters with the opportunity for interactive discussion between the participants. Two specific techniques were used in the workshop – the World Café format on Day 1 and five facilitated parallel Break-out Sessions on Day 2. In both cases the outcomes of the discussions were “harvested” on cards and further synthesised / discussed in plenary. An important characteristic of the overall workshop process was the use of the results of the World Café discussions on Day 1 to define the themes of the five parallel Break-out Sessions on Day 2.

The remaining sections of this report present an **overview of the outcomes** of the interactive discussions, however the presentations that helped to guide and inform the discussions must also be gratefully acknowledged. These were:

- **Introductory presentations** from

[Mr Joel Bacquet](#) - European Commission Directorate-General Communications Networks, Content and Technology (CNECT)

[Ms Ana Cuadrado Galván](#) - European Commission Directorate-General Agriculture and Rural Development (AGRI)

- The **presentation of end-user needs** from

[Ms Laura Fernández](#) - EUFIC, Belgium (consumer perspective)

[Ms Kathrine Hauge Madsen](#) - SEGES, Denmark (farmer perspective)

[Mr Ferdinand Lakemeyer](#) - AGRAVIS, Germany (farmer perspective)

[Ms Helena McMahon](#) - Shannon Applied Biotechnology Centre, Ireland (food business perspective)



4. Overview of the Interactive Discussions on Day 1

The participants were invited to discuss two questions:

Question 1 – what is the role of digital technologies in the future development of the EU agri-food sector?

Question 2 – what are the specific needs of the various “end users” of digital technologies in the EU agri-food sector?

The role of digital technologies in the agri-food sector

The responses to this question were very comprehensive and too numerous to report fully here. However, the following **clusters of key roles** for digital technologies emerged:

- **Providing fast rural broadband** that is easily accessible to all actors in the agri-food value chain from ‘farm-to-fork’
- **Challenging and changing existing business models** throughout the agri-food sector
- **Improving regulatory compliance and reducing the administrative burden** upon all businesses in the agri-food sector
- **Increasing the capacity to monitor** food production, processing, distribution and consumption at all stages of the agri-food value chain
- **Creating the opportunity for greater transparency and traceability** throughout all stages of the agri-food value chain
- **Enabling and empowering smaller-scale businesses** to fully and effectively engage with – and benefit from – the agri-food value chain
- **Enabling greater resource efficiency and sustainability** at all stages of the agri-food value chain
- **Facilitating greater connectivity, collaboration and information / data exchange** between all actors in the agri-food value chain

Many of these themes were of course repeatedly reflected in later discussions in the workshop. But it is important to note that there were also some **words of caution** from participants.

Concerns were expressed about information overload, especially of consumers being overwhelmed with information that they cannot meaningfully assimilate or interpret. About whether all businesses in the agri-food sector, especially farmers, really do need digital technologies. And very importantly, the concern that the rapid digitisation of the agri-food sector is already accentuating negative trends in the agri-food sector, such as the increasing scale of industrial agriculture and the concentration of power and influence over the agri-food value chain in the hands of a small number of very large-scale businesses.



Specific needs of the main end-users of digital technologies in the agri-food sector

The responses to this question were collected for the three main groups of end-user: farmers, consumers and food businesses. The responses were then further grouped into 5 **main clusters of specific end-user need** as follows:

Cluster 1: The need to "Track and Trace" quality products from farm-to-fork

| | |
|----------------------------|---|
| Farmer Needs | <ul style="list-style-type: none"> To better communicate the provenance of food to consumers (origin, production processes, carbon footprint etc.) To improve the delivery / reception of goods from their farms to factories for processing |
| Consumer Needs | <ul style="list-style-type: none"> To have more trust in the agri-food sector. Trust must be founded upon greater transparency and traceability along the whole value chain To have more reliable and authoritative information about their food. Consumers want to "know their food"! Easily accessible and understandable information is needed at the point of sale on all characteristics of food products (origin, ingredients, health benefits / risks etc.) To have the necessary information to buy natural and healthy products with confidence To know more about what happens on the farm (inputs, animal welfare, environmental practices) To enjoy the benefits of quality assurance, but at the right price Not to be overloaded with more information than they can use! |
| Food Business Needs | <ul style="list-style-type: none"> To have affordable digital technologies to help produce, process and distribute safe products of specified quality and good value for money to consumers To have better communication along the whole value chain from farm-to-fork, including the development of closer links with farmers and other suppliers To have more cost effective IT solutions for improving traceability, quality control / assurance and risk management in the value chain (both fresh and processed products) To increase consumer confidence in processed products through greater traceability and transparency during all stages of food production, processing and distribution To promote better informed consumer purchasing decisions regarding price and quality To have ICT tools that provide consumers (in a manageable way) with more comprehensive, transparency and trustworthy information on food product composition, origin and health-related concerns (e.g. allergies) To get adequate returns on the investment made in providing the greater supply chain transparency and higher levels of trust in products that is required by consumers To improve regulatory compliance through traceability To facilitate demand-driven quality control To harness current innovation and new technological advances in intelligent packaging and flexible automation To have data collection and processing tools for better understanding consumer behaviour (including better feedback from / engagement with consumers) To use digitisation for increased profitability and bargaining power – both with suppliers and customers |

Cluster 2: The need to optimise farm operations

| | |
|----------------------------|--|
| Farmer Needs | <ul style="list-style-type: none"> • To use available ICT tools to simplify / reduce administrative workload, improve regulatory compliance (e.g. eco-conditionality), enable automated “hands-free” reporting and generally facilitate a better work / life balance for farmers and their employees • To have better information tools and networks to support day-to-day farm management decisions, help maximise farm profits and reduce waste and inefficiency in the overall value chain (including the full use of all by-products). This includes benchmarking tools, more easily accessible information on input / output market prices, as well feedback on consumer preferences to help better match supply and demand for some products • To have affordable ICT tools that enable the production and delivery of consistently high quality products (nutritious, tasty and safe) from the farm • To work with technologies that are easy to use by a range of different operators. Training should be available if needed • To have new digital applications that can control and maximise efficiencies in production and thereby enhance profits. In some cases, digitisation may continue to increase economies of scale and help keep food prices low, but beware of reinforcing trends in farm structure that have negative environmental or socio-economic impacts • To focus more on the development of “farmer-friendly” technologies that are designed with the end-user in mind. All new technologies must be safe and easy to use, reliable, inter-operable and have a good support / service network. More practical, tailored, easy-to-understand instructions on how to use the available technologies are needed • To have more affordable access to digital technologies. Current technologies (e.g. for precision farming) are not affordable by many farmers. Specific investment support / credit facilities for digital technologies on the farm would help • To have access to more objective (less commercial) advice and information on the digital technologies available for use in different production systems |
| Consumer Needs | <ul style="list-style-type: none"> • All new digital technologies in the agri-food sector should contribute to the secure and sustainable supply of affordable, safe and nutritious food |
| Food Business Needs | <p>Note that some responses were specific to SMEs and other food businesses and have been placed here rather than form another cluster:</p> <ul style="list-style-type: none"> • To use digital technologies for the automation of specific processes / tasks where it is difficult to recruit / train sufficient labour. This might also help to avoid dull, dangerous and dirty tasks • To use digital technologies for the simplification of manufacturing processes, including cost management and waste control. This includes technologies that help to stabilise unpredictable production processes and thereby assist business management and planning |

Cluster 3: The need for new business models

| | |
|----------------------------|---|
| Farmer Needs | <ul style="list-style-type: none"> To embrace digitisation as a major driving force for redefining and strengthening the place of farmers in the agri-food value chain To use ICT to i) generate greater knowledge about consumer eating habits, including a “feedback loop” for individual on how the specific products from their farms are perceived by consumers and are performing in the market-place, and; ii) thereby improve the responsiveness of farmers to changing market conditions and new business opportunities To apply ICT to the development and operation of radically new farm business models, such as “production on demand” To use ICT to help simplify the operational management of increasingly diverse and complex farm businesses To develop new digitally-driven business models around farmer-owned data |
| Consumer Needs | <ul style="list-style-type: none"> To offer “flexible supply chains” to consumers with the potential to personalise their diets according to preference or need (e.g. health-related issues) To facilitate the development of “smart kitchens” with automated ordering and assisted food preparation |
| Food Business Needs | <ul style="list-style-type: none"> To use available digital technologies more effectively in existing production processes and distribution logistics, including i) the reduction of supply / production costs and ii) obtaining more rapid and comprehensive feedback on changing consumer preferences To use social media more effectively for marketing and brand communication, especially for on-line sales To replicate in agri-food SMEs the current trend towards increased automation and data exchange that is observed in the manufacturing sector (Industry 4.0) To build enhanced regional / local supply chains based on ICT-based business models e.g. online purchasing and appropriate logistics To have affordable ICT tools available in order for SMEs to easily adopt new digitally-driven business models |

Cluster 4: The need to combine and exchange data

| | |
|----------------------------|---|
| Farmer Needs | <ul style="list-style-type: none"> To have 100% connectivity at all times and in all places To keep control of their own data To work with digital technologies that are compatible / harmonised with the whole value chain, whilst avoiding technologies that “lock into” specific vendors To work with data interfaces that are secure, interoperable and easy / “comfortable” to use |
| Consumer Needs | Not considered applicable |
| Food Business Needs | <ul style="list-style-type: none"> To have integrated data / ICT systems for the personalisation of information and services, including the combination of diverse market information (e.g. prices, quality, sources, predictions) To have data management tools that empower SMEs in the agri-food value chain To have digital technologies that work with standard data formats and offer guaranteed interoperability and transferability To work with secure ICT systems that guarantee data privacy and protection at all times |

Cluster 5: The need for environmentally-sustainable production

| | |
|-----------------------------------|---|
| <p>Farmer Needs</p> | <ul style="list-style-type: none"> • To use all available new technologies (digital and other) to improve the sustainability and profitability of food production • To apply available ICT tools to the conservation of landscapes, protection of animal welfare, sustainable management of natural resources and adaptation of farming systems to climate change • To select those digital technologies which are most appropriate to the sustainable management of individual farms |
| <p>Consumer Needs</p> | <p>Not considered applicable</p> |
| <p>Food Business Needs</p> | <ul style="list-style-type: none"> • To target the digitisation of production processes and distribution logistics at reducing the environmental footprint of the agri-food value chain • To specifically apply ICT to improving the environmental sustainability of meeting consumer demand for the 'out-of-season' supply of fruits and vegetables • To specifically address the reduction food waste via the use of ICT • To add value to the environmental / sustainability benefits of digitisation through new product development / branding |



5. Research and innovation priorities for meeting the needs of end-users (Day 2)

The themes of the 5 parallel Break-out Sessions on Day 2 were defined by the main clusters of specific end-user need identified on Day 1. Participants were free to participate in whatever Breakout Session interested them most. Each Break-out Session examined one **specific end-user need** as follows:

1. By double-checking that all participants in the Break-out Session had a common understanding of the specific end-user need that had been identified for discussion, and further defining if necessary;
2. By discussing how research and innovation can help to address the specific end-user need that had been identified, and;
3. To identify **up to 5 research and innovation priorities** for the specific end-user need under discussion.

The results of the Break-out Session discussions are summarised in the sections below.

The need to “Track and Trace” quality products from farm-to-fork

Fuller definition of need

To find ways to track and trace food through the value chain thereby i) allowing the attribution of quality to the food and ii) giving choice to consumers (including the personalisation of diets according to quality, health, ethical issues etc.)

Research and innovation priorities

As a general principle it was stressed that research and innovation activities for “Track and Trace” should aim to build as much as possible upon existing research projects and existing technologies since a lot of good work and useful platforms already exist.

Regarding further research and innovation priorities:

1. **Better understanding of consumer profile, behaviour and preference** is needed to understand exactly what they expect / need from the ‘tracking and tracing’ of products through the agri-food value chain
2. **Development of new business models** is needed for directly linking consumers (and communities of consumers) to food producers
3. **Greater inter-disciplinary exchange and innovation** in the combination of community-based experience, scientific research results and relevant datasets from supply chains on the links between consumption, food quality, nutrition, health and sustainability
4. **Research on new technologies** for ‘tracking and tracing’ (e.g. smart packaging) regarding their specific capabilities and costs for adaptation to different food supply chains
5. **More ‘Open Science’** and the use of digital technologies to enable access to research data after projects are ending

The need to optimise farm operations

Fuller definition of need

Not defined further in the Break-out Session, but it was acknowledged that more discussion of the concept of "optimisation" is needed. What does it mean exactly in the context of the huge variability in farm type, size etc. across the EU? And "optimisation" for whom and for what?

Research and innovation activities

1. **Data analytics and knowledge generation** – "smart" versus "big" data, what are the KPIs? Deep learning is needed throughout the agri-food production and value chain, humans need to be "in the loop" of data analysis in order to continue maintaining / building expert knowledge
2. **Infrastructure** – there is much potential to reduce the administrative burden (costs/time) upon businesses. 'Plug-n-play' applications are available, with improved / cheaper sensor technologies also being used for data collection. But standardisation of data formats is needed to allow communication / exchange of data across different systems / platforms
3. **Access / connectivity** – improved internet / mobile phone connectivity is still needed, and it must be affordable. It's also necessary to simplify the interfaces offered to farmers for accessing / managing complex data, knowledge and technologies. Farmers need affordable, useable technologies that are applicable to their farms
4. **Risk management** – better tools (e.g. practical decision-support systems) are needed to reduce / manage farming risk. Can new technologies be "constructively disruptive" and foster new farming systems that are more responsive and resilient to change?
5. **Data value** – using ICT on the farm has a "big entry price" and the value of digitisation needs to be clearly demonstrated through pilots and case studies. But what's the best methodology – KPIs and business models?

The need for new business models

Fuller definition of need

To take advantage of ICT to create new business models in the agri-food value chain.

This need was interpreted as having a specific focus on adaptable and flexible digital solutions to address the business needs of SMEs. It is not concerned with the digitisation of production processes etc.

Research and innovation activities

1. **Development of SMART regional short supply chains** – with innovative ICT-based logistics and consumer intelligence
2. **Regional synergies** – interaction and connection of stakeholders in food and non-food supply chains at regional level
3. **Process optimisation** – available digital solutions for process optimisation (logistics, raw materials, packaging etc.) need to be adapted for SMEs. Demonstration and testing is needed. Advice and decision tools on the scaling of process optimisation for SMEs should be developed
4. **Enabling conditions for new business models** – ICT providers need to be more aware of SME needs and vice versa. Better linkages need to be established between SMEs and the ICT service providers
5. **SMART Cooking** – connecting local producers and SMEs

The need to combine and exchange data

Fuller definition of need

To find ways to combine and exchange data for creating value

Research and innovation activities

1. **Standards** – data standards need to be developed which are FAIR (Findable, Accessible, Interoperable and Reusable). “Data lockers” may be a solution. Islands of good practice exist in data management, but how to connect them? Do we start local and work up? Or wait for something top-down? It would be good to work with individual cases and tease out the standards from these
2. **Infrastructure** – this is related to Standards above. Where is data best stored? How to store it? What are the most appropriate application programming interfaces (APIs)? Consider certification for providers
3. **Benefits** – the benefits of combining and exchanging data need to be better understood, especially for decision-support systems. More tangible evidence is needed from the islands of good practice that exist at local/regional level. Incentives and other benefits need to be offered to all parties to get them involved
4. **Trust** – there can be no mobilisation, manipulation or exchange of data without trust. Nothing happens without it. There is a need to better understand the technological and sociological aspects of this trust, including the role of public authorities
5. **Education** – there are various actors involved (not just farmers) and they all need training. But who provides this? And how?

The need for environmentally-sustainable production

Fuller definition of need

To make use of ICT to improve the environmental performance of food production and agri-food value chains

Research and innovation activities

1. **Environmental monitoring** - measure environmental performance and increase the knowledge / evidence base regarding the impact of agriculture upon climate, energy, water, waste and pollution. Develop models and algorithms using large quantities of data collected from the small, low cost and robust field sensors now available
2. **Environmental benchmarking** – based upon the monitoring activities above, develop new benchmarking practices for environmental performance. Consider issues of data ownership and the integration of disparate data sources to enhance the knowledge base used for benchmarking
3. **Foster innovation in new forms of sustainable food system** – lots of issues to address in both farm- and non-farm based production systems. Look at innovation in the application of ICT to alternative production (e.g. aquaponics, non-meat protein) and distribution models (e.g. SMART short-supply chains)
4. **Food 4.0** – huge potential for the increased use of sensors, software and automation to enable the development of more sustainable food supply chains from farm-to-factory-to-fork e.g. the use of sensors and modelling to better understand where and why food waste occurs in the food supply chain
5. **Enhance the adoption of digital technologies** – better understanding is needed of the motivation for / barriers to the adoption of ICT by individuals and businesses in the agri-food sector

ANNEX 1 – Workshop programme

| Day 1: Wednesday, 28 September | |
|---|--|
| 11:30 – 13:00 | Registration followed by buffet lunch (12:00 – 13:00) |
| Introduction | |
| 13:00 – 13:30 | <ul style="list-style-type: none"> Welcome and opening by <i>Mr Aldo Longo, Directorate-General Agriculture and Rural Development, European Commission</i> Objectives of the workshop |
| Digital technologies in the EU agri-food sector [Objective 1] | |
| 13:30 – 14:15 | <ul style="list-style-type: none"> Introductory presentations from <i>Mr Joel Bacquet, Directorate-General Communications Networks, Content and Technology</i> and <i>Ms Ana Cuadrado Galván, Directorate-General Agriculture and Rural Development, European Commission</i> |
| Demand-led digitization of the agri-food sector – an interactive discussion [Objectives 2 + 3] | |
| 14:15 – 15:00 | Question 1 – what is the role of digital technologies in the future development of the EU agri-food sector? |
| 15:00 – 15:30 | Coffee break and networking |
| 15:30 – 16:45 | Question 2 – what are the specific needs of the various “end users” of digital technologies in the EU agri-food sector? |
| 16:45 – 18:00 | <ul style="list-style-type: none"> Presentation of end-users and response to the needs identified <i>Ms Laura Fernández - EUFIC, Belgium (consumers)</i> <i>Ms Kathrine Hauge Madsen - SEGES, Denmark (farmers)</i> <i>Mr Ferdinand Lakemeyer - AGRAVIS, Germany (farmers)</i> <i>Ms Helena McMahon - Shannon Applied Biotechnology Centre, Ireland (food SMEs)</i> |
| Day 2: Thursday, 29 September | |
| Defining priority research and innovation activities [Objectives 4 + 5] | |
| 09:00 – 09:30 | <ul style="list-style-type: none"> Recap on Day 1 |
| 09:30 – 11:00 | <ul style="list-style-type: none"> Parallel break-out sessions to a) discuss the priority needs of end-users in more detail and b) identify priority research and innovation actions that will help address these needs and thereby encourage the increased digitisation of the agri-food sector |
| 11:00 – 11:30 | Coffee break and networking |
| 11:30 – 12:30 | <ul style="list-style-type: none"> Presentation of demand-led priority research and innovation actions Discussion - have we missed anything? |
| 12:30 – 13:00 | <ul style="list-style-type: none"> Closing comments |
| 13:00 | End of the workshop |

ANNEX 2 – List of participants

| Name | First name | E-mail address | Organisation | Country |
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