



European
Commission



PREPARING FOR FUTURE AKIS IN EUROPE

**Standing Committee on Agricultural Research (SCAR)
4th Report of the Strategic Working Group on
Agricultural Knowledge and Innovation Systems (AKIS)**

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(SCAR)

4th Report of the Strategic Working Group on
Agricultural Knowledge and Innovation Systems
(AKIS)

Directorate-General for Agriculture and Rural Development

PREPARING FOR FUTURE AKIS IN EUROPE, SCAR-Strategic Working Group on AKIS

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Preface



Feeding 9 billion people in the future with continuous pressure on the Earth's natural resources, climate, health and welfare for both humans and animals, are big challenges for sustainable agri-culture and forestry. There is an increasing demand for innovative solutions through continuous renewal of products, processes and services. For quicker impact, such solutions are best co-created by people with complementary knowledge, and by the real end-users of the project results. They bring in the necessary practical (tacit) knowledge to make the result applicable in practice. The interactive innovation model developed in 2012 by the Strategic Working Group on Agricultural Knowledge and Innovation Systems (AKIS) of the

Standing Committee on Agricultural Research (SCAR) is now widely appreciated. It has come into practice since 2014 in H2020 Multi-Actor projects and in the Operational Groups of the Agricultural European Innovation Partnership (EIP-AGRI) funded under the CAP. It is all about collaboration between actors such as researchers, advisors, farmers or foresters, enterprises, NGOs, educators, etc. which contribute with complementary knowledge to reach the project objectives. As a result of the co-ownership and the focus on farmers' and foresters' needs generated by such interactive innovation model, as end-users they make quicker and better use of project results in daily practice. Not only end-users will benefit. Through an improved impact on end-users, also citizens, NGOs, policy makers etc. profit from the change of practices. The term end-user should not imply that these actors are involved only at the end of the process. End-users have to be fully committed from the beginning of the process, to ensure co-ownership of the solution and help putting that solution into practice.

Knowledge and innovation have a key role to play in helping farmers and rural communities meet the challenges of today and tomorrow. Our current challenge is that the existing national and regional AKISs are not sufficiently interconnected within the country to meet the challenges ahead, although there are so many well-meaning people and organisations that generate, share, and use knowledge and innovation for agriculture and interrelated fields. Although there is already a substantial amount of knowledge available, and agricultural research delivers new advancements, the available knowledge is fragmented all over Europe and insufficiently applied in practice. Open impartial knowledge reservoirs become ever more important for individual farmers in an environment increasingly dominated by private multinationals. Moreover, the agricultural sector has considerable and under-used innovation capacity. New combinations of knowledge and actors drives innovation.

The performance of AKISs varies greatly from one Member State to another, and often from one region to another within the same Member State. These AKISs need to be strengthened to structure knowledge exchange and foster innovation processes. Well-functioning AKISs will help speed up innovation throughout the

EU, avoid duplication of efforts and save costs, and strengthen the impact of EU and national/regional R&I funding. Overall, the improved AKISs will become real innovation ecosystems, increase even more the EU-added value and incentivise cross-border spill-overs of knowledge and innovation. This is reflected in the future CAP proposals post 2020 and in Horizon Europe.

In particular, the Commission's CAP proposal introduces a cross-cutting objective on fostering knowledge, innovation and digitalisation to step up efforts to share new knowledge and develop innovative solutions. MS will describe in their CAP Strategic Plans the organisational structure of their current AKIS. They will indicate how impartial advisors, researchers and CAP networks will improve cooperation to provide high quality advice, knowledge flows and innovation support services. Advisors, researchers and EIP or CAP Networks should not work in silos, but interact even more to find effective ways to exchange knowledge. Having advisors deeply involved in AKISs helps to reveal farmers' knowledge needs and intensifies sharing of applicable solutions in a clear language with farmers and drives innovation.

To this end, MS will be able to make use of dedicated CAP interventions to support e.g. advice, innovation support, training and field demo events where the AKIS actors can meet and exchange. These and many other dedicated bilateral or thematic events can strengthen links between research and practice, including cross-border activities. A key objective is a better integration of all advisors in the development of EIP-AGRI innovation projects, in particular to feed in farmers' needs and share innovative outcomes broadly with their clients and beyond. Therefore, the CAP enables support to MS to set up innovation hubs, where farmers with innovative ideas can get connected with other actors having complementary knowledge.

We are proud to present this report, in which the results of the ambitious 4th Mandate of the SWG SCAR-AKIS are reflected. It covers more than 3 years of work on various AKIS related topics, based on broad discussions and exchanges between many knowledge experts from EU Member States, which I highly appreciate.

We are convinced this report will be useful to help sharing experiences between Member States' and for authorities to discover interesting actions to improve their AKIS.



Jerzy Plewa
Director General
DG Agriculture and Rural Development.

List of Abbreviations

AKIS	Agricultural Knowledge and Innovations System
CAP	Common Agricultural Policy
CSA	Coordination and Support Action
DG AGRI	Directorate General Agriculture and Rural Development
DG RTD	Directorate General Research and Innovation
EC	European Commission
EIP-AGRI	European Innovation Partnership on "Agricultural Productivity and Sustainability"
EU	European Union
H2020	Horizon 2020
M&E	Monitoring and evaluation
MA	Multi-Actor (as defined in H2020 WP – call 2020)
MAA	Horizon 2020 Multi-Actor Approach
MAs	Managing Authorities
MSs	Member States
NCP	National Contact Point
NRN	National Rural Network
OG	EIP-AGRI Operational Group
R&I	Research and Innovation
RDP	Rural Development Programme
RIA	Research and Innovation Action
RII	Research and Innovation Infrastructures
SCAR	Standing Committee on Agricultural Research
SME	Small and Medium Enterprise
SWG	Strategic Working Group
TN	Horizon 2020 Thematic Network (= specific type of MA project)

1 AKIS in Europe



1.1 Setting the scene

Text by Inge Van Oost and Floor Geerling-Eiff, based on the work in the SWG SCAR AKIS over its mandates 1 to 4

1.1.1 The genesis of the AKIS concept (2008)

The concept of Agricultural Knowledge and Innovations Systems (AKISs) has grown within the last decade in the European Union (EU), with increased visibility and recognition, as it became more and more clear that the linear research model was failing (see section 2.2). AKIS is a useful concept to 'describe a system of innovation, with emphasis on the organisations involved, the links and interactions between them, the institutional infrastructure with its incentives and budget mechanisms' (EU SCAR, 2012, 2016¹). Over the years, AKIS evolved from a primarily academic concept to a broader approach for agricultural knowledge, policy and sectors. Awareness on the importance of strengthening AKISs increased, to **better connect science and practice and to boost knowledge exchange and innovation** for the benefit of European farmers and foresters. This has been reflected in the European Innovation Partnership on Agricultural productivity and sustainability (EIP-AGRI²) which was launched in 2012, setting the framework conditions for EIP-AGRI Operational Groups and at the same time supporting the evolution and progression of EU AKISs.

1.1.2 Implementation of the interactive innovation model (2014-2020)

In the 2014-2020 period, the European Commission (EC) implemented new tools to stimulate innovation and development of knowledge useful for practice. The EIP-AGRI is a major policy and networking initiative designed to speed up innovation on the ground. The EIP-AGRI is entirely based on the interactive innovation model. This model promotes **targeted collaboration between a set of actors** (e.g. farmers, foresters, advisors, entrepreneurs, end-users of project results, consumers, researchers, etc.) to make best use of their **complementary types of knowledge** (scientific, practical, organisational, etc.) in view of co-decision and co-creation all along the project of solutions/opportunities which are ready to implement in practice. The interactive innovation model aims at increasing projects' impact through starting by identifying the end-users' needs, and **creating co-ownership during the project for all involved**. The model also pays great attention to fully developing all ways to **communicate** on the project and disseminate the

¹ EU SCAR (2012), Agricultural knowledge and innovation systems in transition – a reflection paper, Brussels; EU SCAR (2016), Agricultural Knowledge and Innovation Systems Towards the Future – a Foresight Paper, Brussels.

² <https://ec.europa.eu/eip/agriculture/>

developed solutions and opportunities with all means and at all levels (geographical, sectorial, working with multipliers joining the project, etc). The EIP-AGRI benefits from a unique set of measures and instruments funded under **two European policies working in close synergies: Horizon 2020 and the rural development pillar under the Common Agricultural Policy (CAP)**. Operational Groups (OGs, local interactive innovation projects funded under measure 16.1 of the Rural Development Programmes - RDPs) are the cornerstone of the EIP-AGRI under the CAP and support the development of innovations by groups of relevant actors in a bottom-up manner. These groups hold great potential for creating innovative solutions that will make farming smarter, more efficient and more sustainable. Today, more than 1000 OGs have started under the rural development programmes. It is expected that the amount of OGs will have tripled by the end of the RD period 2014-2020 (n+3). **While OGs are working at regional and national level, over 180 European and international research and innovation projects funded under Horizon 2020** are dealing with similar issues related to agriculture and rural areas. A cornerstone for both types of projects is the interactive innovation model, called 'the Multi-Actor Approach' (MAA) under Horizon 2020, in which actors with complementary knowledge work together from project conception to implementation and harvesting of results to design innovative solutions that have high chances to be disseminated and applied in practice. Linking Multi-Actor (MA) projects to OGs is highly stimulated in the calls for EIP-AGRI MA and OG proposals, and a unique EU repository and the EIP-AGRI networks are supporting strongly.

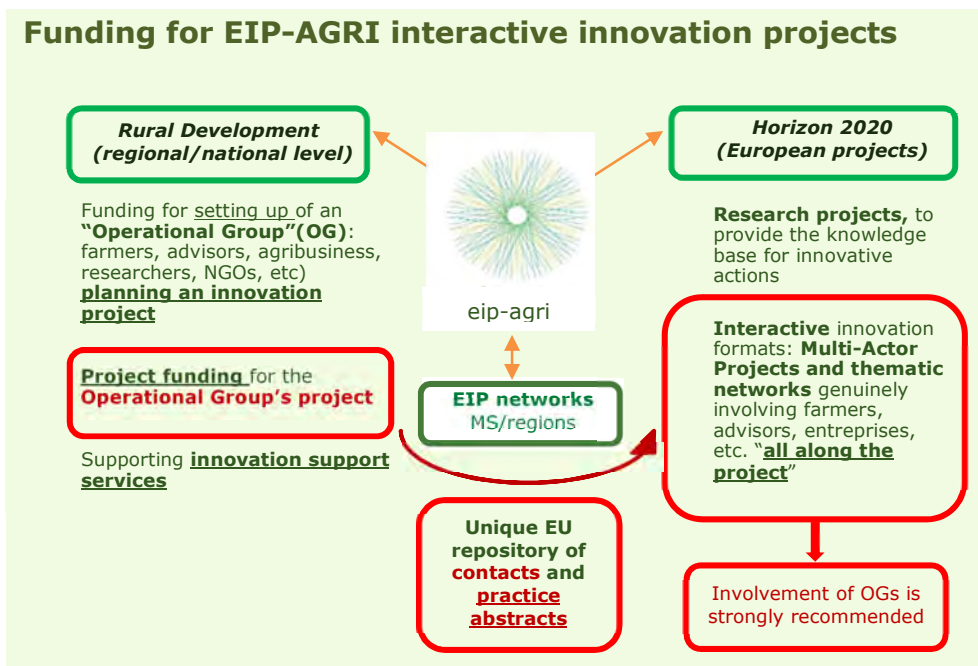


Fig. 1 Synergies between Horizon 2020 and the CAP in the period 2014-2020.

1.1.3 Post-2020 EU programming period (2021-2027)

We are now moving forward towards the post-2020 EU programming period in which AKIS functions receive special attention. In the Commission proposal for the **Horizon Europe Specific Programme, increased attention goes to co-creation and the Multi-Actor Approach**, covering a broader number of societal challenges in the Cluster 'Food and Natural Resources'³.

The Commission proposal for the future CAP regulation 2021-2027⁴, presented by the EC in June 2018, comprises even a **cross-cutting objective** (Article 5), which seeks the modernization of the sector through the **promotion of knowledge, innovation and digitalisation** in agriculture and rural areas, in particular **by means of CAP Strategic Plans made up by Member States (MSs)**. With regard to AKIS, this includes:

(i) a description of 'the organisational set-up of the AKIS designed as the combined organisation and knowledge flows between persons, organisations and institutions who use and produce knowledge for agriculture and interrelated fields', as well as

(ii) a description of 'how the advisory services, research and CAP networks will work together in the framework of the AKIS, and how advice and innovation support services are provided.'

The support for EIP-AGRI Operational Groups is continued, and further improvements added, such as advance payments and the collaboration between existing Operational Groups becoming more easy. Also the support for innovation through CAP funded networks will continue and be enhanced (see above). In short, whereas in the 2014-2020 period the focus was on funding impactful innovation projects, **in the 2021-2027 period there is attention for the complete innovation ecosystem**, including project funding but also stimulating supporting services.

The outcomes presented in this report allow to feed this process and provide ideas and proposals for the different actors engaged in the future development of EU AKISs.

³ Proposal for a Specific Programme implementing Horizon Europe: Doc 2 on the webpage <https://eur-lex.europa.eu/legal-content/EN/TXT/DOC/?uri=CELEX:52018PC0436&from=EN>

⁴ Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL establishing rules on support for strategic plans to be drawn up by Member States under the Common agricultural policy (CAP Strategic Plans). SEC (2018)305 final: <http://ec.europa.eu/transparency/regdoc/rep/2/2018/EN/SEC-2018-305-F1-EN-MAIN-PART-1.PDF>

1.2 Empowering AKISs in Europe

Text by Inge Van Oost, based on the CAP post 2020 impact assessment and the work by the SWG SCAR AKIS

1.2.1 Key Messages

- **Knowledge and innovation** have a key role to play in helping the farmers and rural communities **meet challenges** of today and tomorrow.
- **Policy makers, farmers, researchers, advisors, associations and media** need to **step up their efforts to develop new knowledge and innovative solutions**. Moreover, **a conducive environment** across the EU for quicker innovation and better valorisation of existing knowledge to achieve the CAP objectives and deliver on international commitments needs to be set up.
- The **European Innovation Partnership for agricultural productivity and sustainability (EIP-AGRI)** is a unique policy framework to support interactive innovation projects at local and transnational level.
- Therefore, it is essential to build stronger **Agricultural Knowledge and Innovation Systems (AKIS)** to boost initiation and development of innovation projects, to disseminate their results and to use them as widely as possible.
- Successful **AKIS strategies** include four main groups of actions:
 - Enhancing knowledge flows and **strengthening links between research and practice**;
 - Strengthening **all farm advisory services and fostering their interconnection within the AKIS**;
 - Enhancing cross-thematic and cross-border **interactive innovation**;
 - Supporting the **digital transition** in agriculture.

1.2.2 Stepping-up efforts to promote innovation and better valorise existing agricultural knowledge

Knowledge and innovation have a key role to play in helping farmers and rural communities meet substantial challenges. These include ensuring long-term

food and nutrition security, bolstering environmental care and climate action and strengthening the socio-economic fabric of rural areas. Although agricultural research delivers new knowledge and there is already a substantial amount of knowledge available to answer these challenges, it tends to stay fragmented and insufficiently applied in practice. Moreover, the agricultural sector itself has considerable and under-used innovation capacity. On average, twenty years separate the start of research from the mainstream application of its outcomes in agriculture. The insufficient or too slow uptake of new knowledge and innovative solutions in farming, in particular by **small and medium-sized farms**, hampers a smooth transition towards a more sustainable agriculture as well as the farm sector's competitiveness and sustainable development. The 2030 Agenda for Sustainable Development leaves just ten more years to provide effective solutions. Therefore, all actors involved must simultaneously step up their efforts to develop new knowledge and innovative solutions. **A conducive environment for quicker innovation and better valorisation of existing knowledge** to achieve the CAP objectives and deliver on international commitments has to be set up across the EU, in an inclusive way.

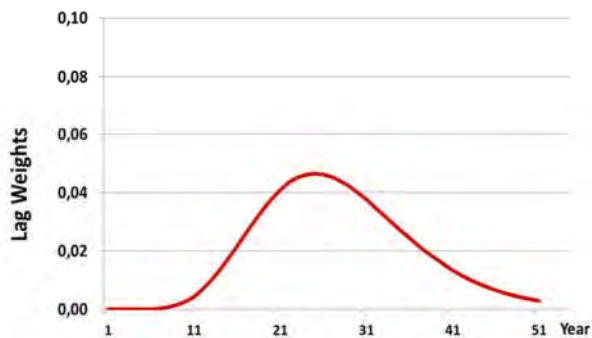


Fig. 2 Time lag between research and impact on farm productivity growth (Alston et al., 2011).

1.2.3 Co-creating knowledge and innovation through EIP-AGRI interactive innovation projects

In the 2014-2020 period, the European Commission has implemented new tools to stimulate innovation and development of knowledge that is useful for practice. The **European Innovation Partnership for Agricultural Productivity and Sustainability (EIP-AGRI)** is a major policy and networking initiative designed to speed up innovation on the ground through the **interactive innovation model**. This model is based on collaboration between various actors (e.g. farmers, foresters, advisors, entrepreneurs, consumers, researchers, etc.) and the identification of end-users' needs. It makes the best use of complementary types of knowledge in view of co-creation and dissemination of solutions ready to implement in practice.

The EIP-AGRI benefits from a unique set of instruments funded under two European policies working in close synergy: **Horizon 2020** and the **rural development pillar of the CAP. Operational Groups** (local interactive innovation projects) are the cornerstone of the EIP-AGRI under the CAP. They develop innovations by groups of relevant actors in a bottom-up manner. These groups hold great potential for creating the innovative solutions that will make farming smarter, more efficient and more sustainable. Today, around 1000 Operational Groups have started under the rural development programmes. We expect more than 3 000 such Operational Groups by the end of 2020. While Operational Groups are working at regional and national level, around 180 **European and international "Multi-Actor" research and innovation projects** funded under Horizon 2020 are dealing with similar issues related to agriculture and rural areas. The cornerstone of both types of projects is the interactive innovation approach in which actors with complementary knowledge work together from the project conception to implementation and dissemination of results. Building blocks for innovation are expected to come from science as well as from practice and intermediaries. End-users and practitioners are to be involved, not as a "study-object", but in view of using their entrepreneurial skills for developing solutions and creating "co-ownership" of results. This speeds up the acceptance and dissemination of new approaches.

1.2.4 Structuring knowledge exchange and fostering innovation processes in each Member State through their AKIS

Beyond funding of interactive innovation projects, there is a need for structuring knowledge exchange and fostering innovation processes in each Member State. New combinations of knowledge, actors, technology and related investments drive innovation. **If actors have to meet and exchange ideas or problems to create common solutions, there is also a need to incentivise the creation of flexible innovation ecosystems** in each Member State. Therefore, it is essential to build better **Agricultural Knowledge and Innovation Systems (AKIS 2.0)**, inclusively covering all people and organisations that generate, share, and use knowledge and innovation for agriculture and interrelated fields (value chains, environment, society, consumers, etc.) in the various regions and Member States. The AKISs currently in place are not sufficiently up to the challenges of today and tomorrow. Their performance varies greatly from one Member State to another (Fig. 3), and often from one region to another within the same Member State. All Member States can improve some aspects of their current AKISs by learning from one another. The EU has an interest in **ensuring that well-functioning AKISs exist throughout its territory, to avoid**

duplication of efforts, save costs, increase the impact of EU and national/regional funding and speed up innovation.

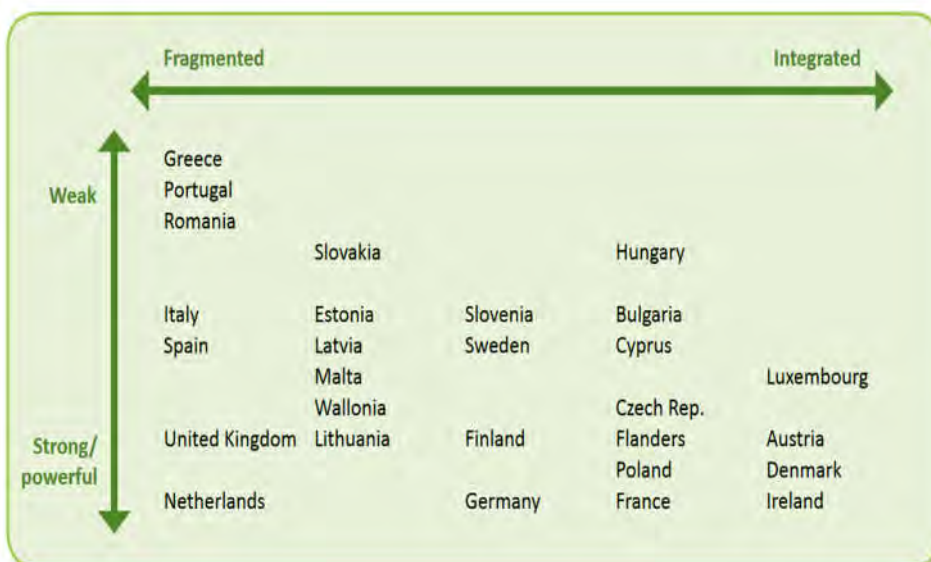


Fig. 3 Diversity of European AKISs in 2014 (Knierim and Prager, 2015⁵).

1.2.5 AKIS 2.0 - Member States' Strategic Plans for knowledge-based and innovative agriculture and rural areas of the future

Boosting the development of innovation projects and making these projects' results known and implemented is the key objective of an effective AKIS 2.0, following the **cross-cutting CAP objective** on 'modernisation of the sector by fostering knowledge, innovation and digitalisation of agriculture and rural areas' (Art. 5 of the CAP Strategic Plan regulation).



⁵ https://cordis.europa.eu/project/rcn/105025_en.html

Overview of relevant AKIS provisions

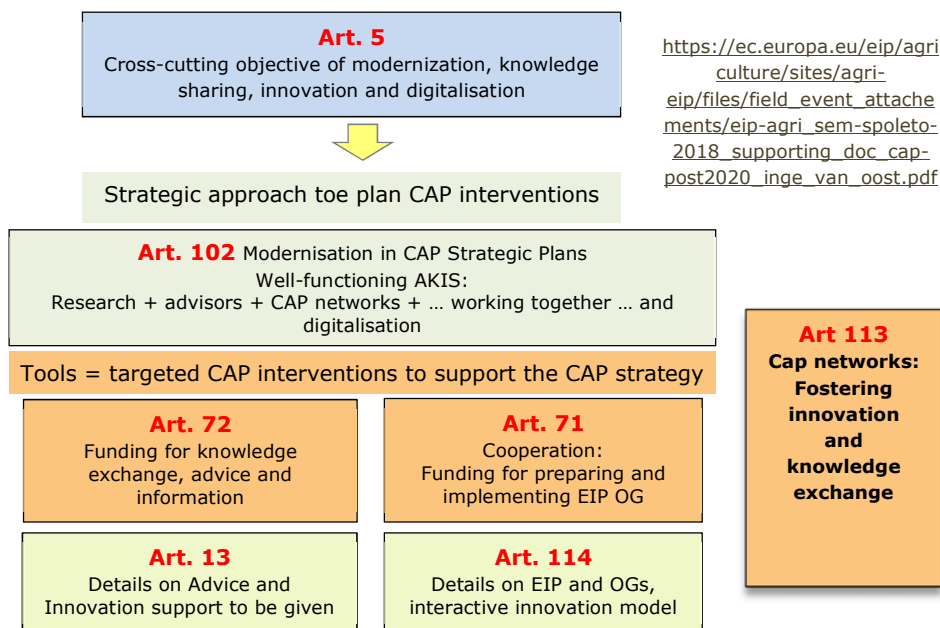


Fig. 4 Integrated approach for modernisation, innovation and knowledge flows.

Under the future CAP, the farm advisory services (article 13), the CAP Networks (art. 113) and the EIP-AGRI (art.114) can jointly contribute to this objective, notably through the support provided under the intervention types on knowledge exchange and information (art. 72) and cooperation (art. 71). **Including national AKIS strategies in CAP Strategic Plans will incentivise the structuring and organisation of the national innovation ecosystem (Article 102).**

More specifically, **successful AKIS 2.0 strategies include four main groups of actions.**

1.2.6 Enhancing knowledge flows and strengthening links between research and practice

The Foresight Study conducted by the Strategic Working Group on AKIS of the Standing Committee for Agricultural Research (SCAR) issued a warning regarding the **increasing privatization of knowledge** and the ever stronger dependency of farmers on commercial solutions. Sharing and building knowledge in an open way that creates space for actors to meet and develop ideas, is essential to generate innovation accessible to all. The EIP-AGRI

experience has shown that success depends on the combined performance of advisors, agricultural training and education systems, researchers and farmer organisations (the AKIS). A range of interventions from the CAP regulation can support these incentives.

There are various ways to **strengthen links between research and practice**, such as:

- incentivise and reward researchers for their impact on agricultural practice, to be promoted as an additional asset for their careers;
- request researchers to produce specific outputs that are easy understandable for practitioners (farmers, foresters, businesses etc.);
- help them to get inspired through supporting them to join regular meetings with practitioners, e.g. various agricultural (thematic) events;
- make use of on-farm demonstrations where researchers could present their results and exchange informally to learn about farmers' needs;
- organise specific training sessions for researchers on the interactive innovation approach.

Furthermore, providing **sufficient CAP networking capacity for innovation** in the Member States will be key to support the AKIS related activities. This includes also to assist researchers, advisors and CAP networks to work closer together in an efficient and effective way. While the amount of useful practical knowledge generated under the EIP-AGRI is growing in the EU, the **CAP networks will play a role in translating and filtering what is most useful for their Member State or region.**

**Interactive innovation:
Cross-fertilisation is key for tackling complex challenges
and developing opportunities for innovation**

Du choc des idées
jaillit la lumière

(From the clash of opposing minds, new ideas arise)

Nicolas Boileau, french philosopher, 17th century

> **Enlightenment comes, when views collide**

1.2.7 Strengthening farm advisory services within the AKIS

The role of farm advisors within the AKIS is particularly important, since they represent one of the **main information sources for farmers' decision-making**. The efficiency and effectiveness of advisory services can best be upgraded by **improving their connections within the AKIS and by sharing knowledge and innovative applications more widely**⁶.

Advisors need to access the newest knowledge. They regularly need to upgrade their technological, farm management, interactive and digital skills. Therefore, **close involvement in innovative developments is essential**, as well as **training and thematic or cross-sector events to update advisors' knowledge**. **Exchange visits to learn peer-to-peer from other advisors** abroad are also very effective. Funding advisors' time spent with researchers is a useful means to enable closer interactions with research. A system of sharing knowledge and tools and training for advisers across the EU is needed. The first two EU farm advisors' networks doing so will start their activities in 2019 and 2020 under Horizon 2020 funding.

Furthermore, advisors play a key **role to collect farmers' needs and opportunities**, thanks to their one-to-one interactions with farmers while giving advice. They should feed these needs and opportunities into the AKIS for further development – **possibly as an "innovation support service"** -, helping knowledge systems to improve their impact. Farm advisors within the AKIS should also be trained to act as **innovation brokers/facilitators**, helping to prepare, participating in and sharing knowledge from EIP-AGRI OG and H2020 Multi-Actor Projects. They also have an important role: **spreading the resulting knowledge and project results to their clients and beyond**.

1.2.8 Enhancing interactive innovation

To enhance interactive innovation projects, it is **key to help connecting actors**, to facilitate cross-border and transnational EIP Operational Group calls and knowledge exchange. Furthermore, it will be essential to establish **innovation support services (ISS), one-stop shops to capture farmers'/foresters' needs and innovative ideas**. Supported by these ISS, EIP OGs or Horizon Multi-Actor Project ideas can develop more easily, and projects are more likely to bring together actors with complementary knowledge who can help solve the challenges.

⁶ See SWG SCAR-AKIS Policy Brief on the Future of Advisory services on advisor's future interactive competences, interconnections and roles: https://ec.europa.eu/eip/agriculture/sites/agri-eip/files/policy_brief_on_the_future_of_advisory_services_scar_akis_06102017.pdf

EIP **Operational Groups** may engage in a very broad scope of activities, related to all nine CAP specific objectives, e.g. develop new products or practices, engage in pilot projects, novel supply chain cooperation, joint environmental projects or climate change actions, collaborate in biomass provision or renewable energy, work together on forest management, develop rural issues, intergenerational renewal and farm diversification, and **test future CAP interventions**⁷. OGs benefit from the higher funding for the EIP scheme and from the innovation networking, as well as from the link with European Horizon projects. Under the future CAP, they may also form **cross-border OGs** exchanging on similar topics or cooperate among each other stimulated by the CAP networks.

**Having potential innovative knowledge is one thing,
turning it into reality is another.**

**"The value of an idea lies
in the using of it."**

Thomas Alva Edison – inventor of the light bulb

1.2.9 Supporting digital transition in agriculture

Agriculture and rural areas are and will be changing significantly with the availability and multiplication of modern technologies, accompanied by smart devices, their increased "intelligence", autonomous behaviour and connectivity. **Also in the AKIS, ICT plays a role.** On the one hand, farmers need to be accompanied along the digital transformation process. Many farmers may be unable to keep up with new technologies. Therefore, having **impartial advisory services in place with sufficient digital knowledge and access to the data** is very important to help **minimise a digital divide** and make better use of the digital novelties. The future role of farm advisory services should include facilitating innovation projects on digital technologies as well as supporting farmers to orient themselves in the digital landscape. On the other hand, the AKIS itself will become more and more "digitalised". New

⁷ E.g. project preparing an agri-environmental intervention:
<http://www.henharrierproject.ie/resources.html>

decision support tools become available every day and open knowledge reservoirs will be built.

To maximise the positive contributions digitisation can bring for agriculture and rural areas in the EU AKISs, a comprehensive approach is needed, combining **investments in knowledge and in the enabling environment**. Support for digitisation at farm level and for the establishment of high-speed internet connectivity across Europe is essential. **Good ideas for digital innovations need attention and funding**. This can be done via Operational Groups on digital tools and agricultural Digital Innovation Hubs.

The current CAP legislative proposal requires from Member States a strategic and comprehensive approach, reinforcing the links between the broader AKIS, digitisation and existing advisory services. With these and other measures, the EU aims for a **fast deployment of digital solutions for a sustainable agriculture, fair and accessible for all**.

1.2.10 Conclusions

The approach implemented with the various EIP-AGRI instruments involving both Horizon 2020 (at transnational level) and the CAP (at national and regional levels) is gradually building a comprehensive knowledge base capable to deliver on the practical challenges faced by the agriculture and food/non-food sectors⁸. Therefore, **the focus is now on improving information flows within the AKIS**. It is essential for generating innovation to build and to share knowledge in an open way and to **create space for actors to meet and develop ideas. Innovation depends on this combined performance of AKIS actors**. There are many players – in particular at national/regional level – that have to be structurally involved in the creation and sharing of knowledge in order to create a **genuine innovation ecosystem**.

The **CAP modernisation will provide this enabling framework** for the transition pathways towards resilient, sustainable and climate friendly farming systems and value chains. It will help to secure the long-term supply of nutritious food and biomass, and the achievement of the 2030 Sustainable Development Goals. With well-functioning AKISs in Member States, knowledge and innovation will play a central role in this evolution. This includes also tackling the digital divide in agriculture and related sectors. **AKIS 2.0 is key to make farming more profitable and sustainable**.

⁸ EIP Seminar on AKIS: <https://ec.europa.eu/eip/agriculture/event/eip-agri-seminar-promoting-creativity-and-learning>
EIP AKIS Brochure: <https://ec.europa.eu/eip/agriculture/en/publications/eip-agri-brochure-agricultural-knowledge-and-innovation>

1.2.11 Context and further info

Impact assessment on Modernisation made in preparation of the CAP Commission Proposal:

<https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=SWD%3A2018%3A301%3AFIN>

Document 3 = Annex 6 of the CAP Impact Assessment – Promoting Modernisation

Overview of legal texts: COM(2018) 392 final

https://ec.europa.eu/eip/agriculture/sites/agri-eip/files/field_event_attachments/eip-agri_sem-spoletto-2018_supporting_doc_cap-post2020_ingevan_oost.pdf



1.3 Definition of the Multi-Actor Approach

Text by Inge Van Oost, based on the Horizon 2020 workprogramme and the discussions in the SWG SCAR AKIS mandate 2 till 4

The Multi-Actor Approach (MAA) has been developed under Horizon 2020⁹ during the SWG SCAR AKIS 2nd mandate, and further refined under the following mandates according to the discussions within the group and with the project coordinators invited to the meetings. It aims to make innovation more demand-driven in order to have increased impact from research.

Typically, for EIP Operational Groups, which are also multi-actor, this MAA approach, and in particular its requirements have often served as selection criteria when assessing proposals. Thanks to the long and elaborated process of their development ensuring quality and applicability, these requirements can be very useful as selection criteria for any other multi-actor project from whatever funding source, be it national, regional or at EU level. The rationale and precise requirements are listed here below.

The Multi-Actor Approach is more than just widely disseminating the results of a project, or listening to the views of a stakeholders' board, as is done in many research projects anyway. As opposed to these approaches, a Multi-Actor Project should ensure genuine and sufficient involvement of various actors, including as partners in the consortium. To ensure take up of project results, actors to be included are in particular the end-users of results such as farmers/farmers' groups, forest-related groups, fishers/fisher's groups, advisors, businesses, etc. It is possible to add other actors who could benefit indirectly, if this is not making the consortium too heavy. For instance, for a project which tests novel practices for Integrated Pest Management, farmers are here the "end-users" and to be included in the consortium to help the testing and get convinced to implement them later if the tests are positive, whereas of course also consumers and retailers will benefit from the project.

The MAA makes innovation more demand-driven and **increases the impact from research**. Thanks to the broad process of the development of the MAA requirements ensuring quality and applicability, these **specific requirements can be very useful as selection criteria for any other multi-actor project** from whatever funding source.

⁹ Details on the Multi-Actor Approach are in the European Commission Horizon 2020 Work Programme – call 2020
https://ec.europa.eu/research/participants/data/ref/h2020/wp/2018-2020/main/h2020-wp1820-food_en.pdf on page 11-13

What is very important to develop an effective project and come to applicable results, is that this involvement should be done **all along the project**: from the participation in the planning of the project and experiments (when the lines of what to do are being discussed), to implementation, the dissemination of results and a possible demonstration phase. Building blocks for innovation are expected to come from science as well as from practice and intermediaries, such as farmers, forest-related actors, advisors, businesses, NGOs and others ("co-creation"). End-users and practitioners are to be involved, not as a study-object, but in view of using their entrepreneurial skills for developing solutions and creating "co-ownership" of results, which speeds up the acceptance and dissemination of new ideas.

1.3.1 Specific requirements for Multi-Actor Projects

For the reasons listed above, a Multi-Actor Project proposal should always demonstrate that they fulfil the following specific requirements for Multi-Actor Projects, as foreseen in the H2020 Work Programmes 2014-2020, and to be continued in Horizon Europe post 2020:

1. how the project proposal's objectives and planning are targeting needs/problems and opportunities of end-users of project results;
2. how the composition of the consortium and the description of the project concept reflects an balanced choice of key actors with complementary types of knowledge (scientific and practical), with a view to result in a broad implementation of the project results;
3. how the project includes existing (sometimes tacit) knowledge into scientific work. This should be illustrated in the project proposal with sufficient quantity of high-quality knowledge exchange activities and indicating the precise and active role for the different non-scientific actors in the work. This should generate innovative solutions that are more likely to be applied thanks to the cross-fertilisation of competences and ideas between actors;
4. the project's added value: how does the project complement existing research and best practices;
5. how the project results in practical knowledge, made easily understandable and accessible, and how this feeds into the existing dissemination channels most consulted by end-users of the project results in the countries;
6. for EU wide communication, this knowledge should also be assembled into a substantial number of 'practice abstracts' in the common EIP format of the European Innovation Partnership (EIP) 'Agricultural Productivity and Sustainability'. For all other areas which would not

be covered by the EIP-AGRI¹⁰ - for instance projects on fisheries, aquaculture, marine and inland water issues - other similarly effective solutions for dissemination through main existing dissemination channels should be used.

Involvement of interactive innovation groups operating in the EIP context, such as EIP Operational Groups funded under Rural Development Programmes, as much as possible. It is strongly recommended to facilitate discussions and mediate between the different types of actors.

1.3.2 Aims of the Multi-Actor Approach

Project proposals requesting to follow the Multi-Actor Approach should meet all of the above requirements. In broad lines these MAA conditions aim to ensure:

- demand-driven innovation, which is a sort of guarantee for impact of research, if the project succeeds in developing practical solutions (requirement 1 mainly);
- result-based inclusion of tacit and practical knowledge in a balanced and focused way, beyond purely scientific inputs from various scientific disciplines (requirement 1 and 2);
- resulting applications which are fit for the local levels, thanks to inclusion of the local practitioner and contexts (requirement 2 and 3);
- real added value for practice by avoiding overlap during project proposal drafting with existing best practices and research done already (requirement 4 mainly);
- an efficient and effective dissemination to practice, both at EU level as at local/regional/national level, with a view to spread knowledge ready for application (requirement 4 and 5);
- a quicker uptake of research and innovation results, thanks to the co-creation and co-ownership of end-users of project results (all requirements).



¹⁰ For the areas of innovative action of the EIP-AGRI: see EIP Commission Communication COM(2012) 79 final

1.4 Horizon 2020 Thematic Networks compiling knowledge ready for practice

Text by Inge Van Oost, based on the Horizon 2020 workprogramme and the discussions in the SWG SCAR AKIS mandates 2 till 4

This specific type of call for MA projects runs from 2014 under Horizon 2020, for which inspiration was found in some Member States using national funding for the same purposes. These Thematic Networks (TN) are aiming at **accelerating the exchange of existing knowledge across the EU.**

Yearly 5 projects have been programmed under this Horizon 2020 topic¹¹ from call 2014, and further refined under the following mandates according to the discussions within the group and with the project coordinators invited to the meetings. The ultimate goal is to collect and share as much outcomes from research and best practices as possible, again to increase impact from research. This type of project, often connected with existing local EIP Operational Groups is very appreciated because the outcomes are easy to understand and therefore quick to use in communication for practitioners, as well as for making educational courses more up to date. Typically, subjects such as antimicrobial resistance, recycling nutrients, integrated pest management, biobased production etc, are on the top of mind of farmers and get selected under this H2020 topic.

For similar projects in Member States, which are also aiming at collecting, sharing and translating existing knowledge, the Horizon 2020 Thematic Networks requirements may serve as call description and/or selection criteria when assessing proposals. The rationale and precise requirements are listed here below¹¹.

Based on Multi-Actor interaction, projects must compile knowledge ready for practice on subjects where practice indicates an urgent need. To date, 34 such Thematic Networks have been funded under Horizon 2020 already, and the concept will be continued under the next Horizon Europe period.

The challenge is that despite the continued funding of scientific projects, innovative ideas and methods from practice are not captured and spread, while also often research findings are not integrated into agricultural and forestry practice. It is essential to act at EU level to remedy this because national and sectoral agricultural knowledge and innovation systems (AKISs)

¹¹ Details on the TN call for projects in the European Commission Horizon 2020 Work Programme – call 2020:
https://ec.europa.eu/research/participants/data/ref/h2020/wp/2018-2020/main/h2020-wp1820-food_en.pdf on page 157

are insufficiently connected and organised to fully facilitate the necessary intensifying of thematic cooperation between researchers, advisors and farmers/foresters. This exchange of knowledge will foster economically viable and sustainable agriculture and forestry.

Therefore themes of these projects must focus on the most urgent needs which farmers and foresters experience. The activities of thematic networks are summarising, sharing and presenting, - in a language that is easy to understand and is targeted to farmers and foresters - existing best practices and research findings that are close to being put into practice, but not sufficiently known or used by practitioners. The specific themes of the networks can be chosen in a 'bottom-up' way. First and foremost, they must tackle the most urgent needs experienced by farmers and foresters, or by any other primary producer (food or non-food), including where aquaculture and other farming systems are combined. If it is appropriate to solve these needs, the themes can cover sectoral or cross-sectoral issues, organisational or management solutions. The activities should pay attention to the cost/benefit aspects of the specific practices collected and summarised. A comprehensive description of the state of current farming practices relative to the chosen theme should explain the added value of the proposal and the relevance of the theme for the farmer. The proposal should also explain how it avoids duplication with on-going or completed projects and networks. In order to better reach and capture knowledge from the targeted farmers/foresters, the networks may organise 'cross-fertilisation' through sub-networks covering, for example, a region, a language or a production system.

The result of the project should be an extensive range of useful, applicable and appealing end-user material for farmers and foresters. This information should be easy to access and understand, and feed into the existing dissemination channels most consulted by farmers and foresters at national or regional level. It should also be provided to the European Innovation Partnership (EIP) 'Agricultural Productivity and Sustainability' in the common "practice abstract" format. Proposals should fall under the concept of the 'Multi-Actor Approach'¹², with preferably a project duration of three years and a consortium based on a balanced mix of actors with complementary knowledge clearly activating farmers/foresters, farmers' groups and advisors. Wherever possible, details on the synergies with relevant EIP Operational Groups and interactive innovation groups operating in the context of the EIP-AGRI are expected, and, if useful, with other European Structural and Investment Fund projects. In the exceptional event that minor testing of specific solutions would be needed, a maximum of 20% of the project budget may be used for this purpose.

¹² See definition of the 'Multi-Actor Approach' in section 1.3.

The expected impact is that activities:

- contribute to the collection and distribution of easily accessible practice-oriented knowledge on the thematic area chosen, including delivering as many “practice abstracts” in the common EIP-AGRI format as possible and as much audio-visual material as possible;
- conserve the practical knowledge for the long term - beyond the project period – in particular by using the main trusted dissemination channels which farmers/foresters consult most often, and also serve education and training purposes;
- increase the flow of practical information between farmers/foresters in Europe in a geographically balanced way, creating spill-overs and taking account of the differences between territories;
- achieve greater user acceptance of collected solutions and a more intensive dissemination of existing knowledge.

Thematic Network projects **must compile knowledge ready for practice on those subjects where practice proves there is an urgent need.** Themes are to be chosen bottom up by Multi-Actor consortia. The outcomes of thematic networks should be communicated in a **language that is easy to understand and is targeted to practitioners as well as education.** TNs should not do new research but must collect **existing best practices and research findings that are close to being put into practice, but not sufficiently known or used by practitioners.**

1.5 Improving the structuring of Member States' AKISs – designing CAP AKIS plans

Text by Inge Van Oost, based on the Horizon 2020 workprogramme and the discussions in the 4th SWG SCAR AKIS mandate

This chapter is summarizing **Elements for the design of Member States' CAP AKIS Strategic plans** collected at the December 2017 Tallinn meeting dedicated to the Member States' intentions for improving their AKIS plans. In the February 2018 Athens meeting, the group went one step forward with the reflections related to the design of Member States' AKIS plans. The objective there was to cross-fertilize on context-specific AKIS approaches that could make the regional, national and EU AKIS stronger and to draw generalized guidance from those exchanges. This collection, as listed below, will help prepare and fine-tune Member States' CAP Strategic AKIS Plans for the CAP 2021-2027 period. Section 1.5 summarizes the exchange and includes all inputs received from the members also after the meetings. The structure

follows the main 4 strands for well-functioning AKIS, as listed in the CAP impact assessment as well as in section 1.2 (1.2.6 till 1.2.9)

1.5.1 Enhancing knowledge flows within the AKIS and strengthen links between research and practice

The general aim for empowering AKISs and using CAP support to do so is to improve economic, environmental and social performance in agriculture, rural areas and related fields. As a consequence **CAP AKIS plans should be a strategy for sustainable agriculture**, not for AKIS on itself. AKIS should have a key role in the implementation of the RD (CAP) programme. The AKIS plan should be linked to measures on knowledge and information actions, to the use of advice and the running and setting up of advisory services, to the training of advisors, to the EIP OGs or other innovative cooperation measures, to support agri-environment-climate measures etc. It is important to seek to

A set of existing good examples of EIP networking activities at Member States' level was presented at the 2018 EIP seminar in Spoleto. These type of events can form part of the CAP Strategic Plans on AKIS and be funded under interventions Articles 71, 72 and 112:

https://ec.europa.eu/eip/agriculture/sites/agri-eip/files/field_event_attachments/eip-agri_sem-spoleto-2018_margarida_ambar_types_of_networking.pdf

combine measures such as e.g. the Irish OGs which develop farming practices in preparation for a future agri-environmental measure on habitats for hen harrier¹³, the NL farmers' groups implementing AEM, and the EL OGs developing novel supply chains which may end in becoming a producer organisation.

The aim is to **safeguard and exploit to a maximum of public knowledge on agriculture and enhancing knowledge flows within the AKIS with all related to agriculture**. We need a clear vision on AKIS and its function for rural development.

Therefore knowledge flows need to be strengthened within the AKIS.

- Make a CAP AKIS Strategic Plan: producing a coherent inclusive document with clear actions for farmers, researchers, advisors, education institutes (all ultimately impacting farmers' actions)
- Request specific obligations in the CAP AKIS plan to ensure results. Make strategic plans specific enough, defining the activities and target groups in the plan (e.g. universities, private researchers, international institutes, etc.).

¹³ See the box on the Hen Harrier OG in section 3.4

- Minimum EU requirements: if the EU does not request involvement of researchers, the Ministry of Agriculture cannot force researchers involvement
- Further development of the EIP networks and sufficient funding to do so (technical assistance)
- EU level EIP networks/CAP networks for innovation ("CAP networks") should know about and share all info on all OG and Multi-Actor Projects within the EU (at least on all OGs and H2020 Multi-Actor Projects for a start, other type of projects to follow when entering the unique EU repository of Practice Abstracts)
- Member States' CAP networks should filter, summarize and **translate (!!!)** all info relevant for their country about OGs, H2020 MA projects, other relevant EU or national (research) projects (source: material on EIP website: practice abstracts, videos, photos, links to useful websites and projects etc.). To this effect they need sufficient funding to cope with this task.
- Establish **knowledge centres** and digital knowledge reservoirs and systems of exchange of information, including physical meetings as well as e-learning
- Organise **farmer-to-farmer exchange** (branch organisations can help)
- Support establishment and networking of **demonstration farms**

The EIP/CAP networks should **summarize and translate** all info **relevant for their country** about OGs, H2020 MA projects, other relevant EU or national (research) projects (source: material on EIP website: practice abstracts, videos, photos, links to useful websites and projects etc.) - **sufficient funding is essential.**



Fig. 5 Support demonstration farms and use them to connect farmers with researchers and advisors.

- Use these demonstration farms to draw in and connect researchers and advisors on the topic demonstrated. The CAP networks could organize this and there should be an **incentive for researchers to take part in such on-farm demo activities**, together with farmers and other stakeholders.
- Ensure trust and continuity besides the project approach. **Knowledge transfer requires continuity, needs a long-term perspective**: only with reliable planning, security and appropriate framework conditions organisations will adapt their services to the EU objectives. Advisory back-offices could deliver this if sufficiently public funding is secured over a longer period.

How can CAP networks help strengthening innovation and knowledge exchange on all 9 CAP objectives?

1. Collecting and sharing outcomes of 3200+ EIP OGs from current CAP
2. Collecting and sharing outcomes of 180 H2020 multi-actor projects + Horizon Europe
3. EIP website + knowledge reservoirs being prepared under H2020
4. **Connecting OGs with Horizon** projects = great added value
5. All this **material provides great input for local AKIS actors** (farmers, advisors, businesses, researchers,...): training for advisors and farmers, peer-to-peer events, website, e-learning, ISS etc
6. Organising **events to link and network AKIS actors** for future cooperation
7. **Start now**, already testing future interventions and **brainstorm in AKIS coordination platforms**


 European Commission

Fig. 6 Tasks of national CAP networks post 2020.

- Seek ways to **connect national and regional with EU level**, e.g. H2020 MA projects should foresee a part of the budget to cooperate with related OGs (e.g. Sheepnet including Romania) [make a specific EU level rule or programme dedicated information actions]
- **Facilitate participation of partners of the EU-13 in consortium building for H2020 calls**. Under the current practice, EU-13 MS often have low budgetary participation in the project and thus do not have sufficient funding for dissemination of H2020 project results, which diminishes the impact of these projects due to the structural and financial situation of the EU-13
- **Support the preparation of H2020 Multi-Actor Projects with seed funding** for a number of meetings to gather information on the topic, prepare precise objectives, activities, consortium

agreement etc. (as for the setting up operation of OGs). **Make this process transparent on the EIP website, so that all interested Multi-Actor partners and OGs** have the possibility to know what is being developed and **can help to build the project** (objectives, activities) and maybe join the consortium

- Organise knowledge actions and **training** in particular on innovative results from OGs and research, including as specific target group the **advisors (not only training for farmers)**
- **Researchers need to share** their work with practice: networks should organize on a regular basis **meetings between research and advisors** at national and international level, e.g. national thematic networks gathering research, advisors and networks + other stakeholders (farmers, education, administration, ...), **discovering needs from practice and sharing best practices and research results**. These could at the same time produce practical output from what they gather (e.g. French RMT) + produce project proposals for interactive innovation projects
- AKIS plans **need specific incentives for researchers: budget-wise; number of publications in dissemination channels for end-users; showing how they reply to practice needs**

1) *An example from the UK Research Excellence Framework (REF), which is :*

rewarding academics and researchers as follows: for each submission of a member of staff/team of a research center (such as Rothamsted) or a University:

- *the quality of outputs (e.g. publications, performances, and exhibitions);*
- *their impact beyond academia;*
- *the environment that supports research.*

*This has **put impact right at the heart of the review system and is changing behaviour in the academic** and research community. More details are at: <http://www.ref.ac.uk/about/whatref/>*

2) *UK Research and Innovation (UKRI, £7billion per year) forces organisations which are not showing impact or engaging industry are at risk of being closed down before Easter 2018 unless they create a new business plan. This change to UKRI will align funding for research and innovation projects with the REF assessment framework and put even more emphasis on impact.*

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/527803/bis-16-291-ukri-case-for-creation.pdf

- Pay for **cross-visits/exchange visits for advisors and young farmers**: an EU wide "Erasmus-Agri" in AKIS: with a simple framework of implementing, funding and reporting
- Use **problem based learning** in agricultural education
- **Mandatory education for young farmers** as a condition to participate in the young farmer scheme
- Introduce hackathons and start-up methodology into the agricultural sector to **engage also people from outside the sector** (citizens, young people) to help solve problems and create new ideas.
- Soft and informal ways can improve knowledge flows e.g. **co-location of research, advice and networks** (+education, farmers' organization, food cluster, etc.)
- **Keep the AKIS open** and evolving to be future proof (e.g. include the role of food chains, marketing, banks, farmers ... are not well represented in the AKIS system now). We need a **dynamic, intertwined system bridging the gap between research and practice**: (applied) researchers, education and other actors also play a part in brokerage, knowledge valorisation and bridging the gap
- Improve **communication to consumers and society**

Potential indicators for this block supporting quantitative monitoring:

1. participation in activities/networks facilitating knowledge exchange and interactive innovation;
2. number of supporting networks producing output for agricultural practice;
3. number of selected interactive innovation projects produced by thematic Multi-Actor networks;
4. number of outputs/publications in agricultural dissemination channels for end-users.

1.5.2 Strengthening farm advisory services within MS' AKISs

- Problem with the terminology "advisory services": 95% of the audience only think about 'linear' knowledge transfer => **make clear that advisory services should be interactive**, this speeds up the reflection and decision in farming families
- Describe **the term "advisors"**: in the broad sense of the word (can also be staff from NGO, farmers' organization, innovation support service, etc.)

- **No public procurement of trainers of advisory services:** very limited institutions/training providers have proper know-how and experience meeting the specific requirements of agricultural advisors
- Advisors could **also be innovation support services** (= brokering, facilitation, promotion of innovation, networking, etc.). Availability of such services is key
- Create innovation brokers and **strengthen their role to incentivize interactive innovation projects and capture needs and ideas**
- Further develop **innovation support tools**



Fig. 7 Advisors should listen and work as interactive as possible, to speed up reflection about holistic on-farm decisions.

- Enable joint implementation of the measure "use of advice" (art 14) and "knowledge transfer and information actions" (art 14), this would allow for implementing complex advisory programmes for a larger group of beneficiaries, **linking different forms and methods of advisory work** (individual advice, group advice, discussion groups, training, workshop, demonstration, etc.)
- Such advisory programmes could be implemented by **joint consortia** of advisory services and research centres, and foresee adequate (higher) support for this ("back-office" creation)
- **The term FAS should be replaced by AKIS.**
- Use industrial **PhDs** in agriculture

- Better link the usual technologic farm advice with sustainable agriculture topics (**train and convince the trusted advisor**)
- **Strengthen support from the AKIS for advisors** (don't pay for front-office advisors but for areas where the society wants to see progress e.g. environmental issues, public goods, climate change, digitization, food chain, circular economy, animal welfare, water management, nature, ...) => after the privatization wave, **give advisory services again a public role**
- Common education and training: **train advisors regularly + in particular on new topics:** e.g. how to broker and facilitate interactive innovation projects, digitization, use of digital technologies for fast diagnosis, prognosis and decision-making, on-farm processing, production system advising and business management, start-ups,....
- A **more 'systemic' advice** should be provided, e.g. management of land resources, type of production, expected outputs, recycling of natural resources, quality and uniqueness of products, rural development support, branding and marketing, use of digital equipment and decision-support systems, use of social networks, new machines, local traditional foods, energy production, rural tourism, payments for stewardship of the Natura 2000 sites, etc.
- Enable creative freedom for **new themes** and instruments (e.g. whole value chain approach, bio-based chains, dialogue with society,...).
- **Link research facilities services to advice** (e.g. food pilot BE-FL testing new food processing techniques is linked with advice to the farmer under Art 14)
- **Pay for the time advisors spend with researchers:** sharing ideas and needs from practice and learning about new research results. The most useful (paid) time for an advisor is while giving advice, but the advisor should also spend time on learning and networking
- Advisors should be given more time for i) collecting new research results, knowledge or other know-how, ii) connecting with national & international networks iii) compiling the data collected, and iv) connecting to their (regional) clients and **tailoring all agricultural knowledge and innovation to the farm system and local context** for provision and adaptation of the collected agricultural knowledge and innovation to the specific situations
- The EU-13 should be especially required to support financially BSc and MSc programmes for **educating and training AKIS 'system-oriented' advisers**. Their training programme should address not only the modern extension methodologies, research methodologies

and individually-tailored client advice, but also the skills to use large (open-sources) data, systemize knowledge and use digital technologies for prediction, modelling and decision-making, participatory skills, communication skills, etc.

- Support **advisors' internships** and placements in experimental research centres and training facilities, in cooperation with **international** partners
- It is important to support advisors' **technological training**, as well as methodological and social competences of advisors
- Allow secondary school students and university **students to join advisors' training, as well as teachers** of vocational schools
- Foresee **dedicated actions to involve private advisors**: not only training but other information flows e.g. use of common advisory tools (nutrient management planning tool, disease levels weekly info, ...), pay for their contacts with research and for regular info (newsletters) => back-office support for **all** advisors public and private.
- **Support digitization of advisory work**: fund establishment and maintenance cost of an IT knowledge platform, containing knowledge reservoirs, good agricultural practices, e-learning modules and various instruments used in advisory work. The IT platform could allow for multi-level communication and be shared by several advisory bodies (e.g. regional, national or even international)
- **Simplify administration** for advisors: for instance a **voucher** system for advice and capacity building of farmers, a voucher system for training and skills development of advisors, vouchers for advice accompanying (innovative) investment support, etc.
- **Avoid a dense control system for advising, replace by quality management system** (regular training on issues/challenges for agriculture). Make use of best practice examples.

Potential indicators for this block supporting quantitative monitoring:

1. number of trained advisors;
2. share of farmers using support for advice, training and knowledge exchange;
3. number of advisors involved in EIP OGs;
4. number of shared digital tools supporting advisory work.

1.5.3 Incentivize interactive innovation projects

- **Continue** current **EIP OG** approach
- In particular: **foresee sufficient funding and enable advance payments**

- Clarify that costs related to work of advisors and farmers are eligible and that **resources for dissemination** shall be reserved
- Make clear that **costs of international cooperation are eligible** (e.g. study tour for advisors in other MS, business placement, ...)
- Further **strengthen the Multi-Actor Approach of OGs**: make them more interactive (ES) => ensure minimum criteria for the selection: combine relevant complementary knowledge targeted to the project objectives tackling needs/problems from practice
- **CAP networks should facilitate cross-border OGs** (within one country and between countries):
 - Take care of planning common timelines for cross-border OG calls by timely coordination between MS/regions Managing Authorities to prepare cross-border OGs (if at EU level, loss of flexibility) or H2020 MA projects.
 - CAP networks should list all finished, running and potential (in preparation) OG projects per theme and organize workshops to develop common themes of interest and capitalize on former projects
 - ⇒ MS/regions organize cross-border calls
 - ⇒ EU must enable measure for transnational OGs (as a kind of "Interreg")
 - Peer-to-peer learning: organize cross-border visits for OGs or for specific actors who can incentivize (ISS, advisors, farmers' groups, ...): contacts can be found through EIP website
 - Help the search for "foreign" experts to join in national/regional OGs as experts
- **Involve education in OGs**
- **Involve young people** (students, advisors, farmers, researchers, etc.) **in OGs**: they push for change
- OGs should be able to **find an "after"-life**, e.g. can become start-ups (help from innovation support service connecting with new projects, etc.)
- **Combine OGs with the new complex advisory programme** (mentioned above), supporting **also demonstration** of the new production methods on-farm
- **Ensure sufficient coordination within MS** and ensure that learning from each other is possible (e.g. NL provinces have different approaches, Spanish diversity between regions requires a national platform with the different actors linked to training, field visits; filtering lessons learnt in the regions to the national platform).



Fig. 8 Involve young people (students, researchers, advisors, farmers, etc.) in Operational Groups: they push for change.

Potential indicators for this block supporting quantitative monitoring:

1. participants in collaborative innovation projects (EIP OGs + innovative cooperation projects);
2. number of innovation support services;
3. number of interactive innovation projects developing generational renewal;
4. number of innovation cooperation agreements;
5. number of young people participating in OGs;
6. number of education actors (students, teachers, trainers) participating in OGs;
7. number of farmers and advisors trained in the innovative results of OGs;
8. number of cross-border OGs and OGs incorporating cross-border expertise.



Fig. 9 Organise knowledge exchange across borders between OGs, Multi-Actor Projects and all sorts of interactive innovation projects.

1.5.4 Support digital transition in agriculture

- **Interlink all public data** by a consortium of all involved stakeholders.
 - For instance and example of Estonia: Land Parcel Information System and location of farm building and landscape elements + soil fertility map + environmental monitoring + spread of harmful organisms + areas with environmental restrictions + agricultural statistics, animal movements => incentivize farmers to use it by agro-environmental measure + enable farmers to transmit their machinery data).
 - Example Belgium: VLM gives advice linked to biodiversity measures, erosion etc., cooperation agreement.
 - Example Netherlands: between farmers' organization, dairy, book-keepers, etc.
- **Organise training, OGs and national Multi-Actor Projects on digitization**

Potential indicators for this block:

1. share of farms having access to broadband;
2. % of EIP operational groups working on digital innovation;
3. share of farmers using digital technologies (e.g. precision farming).

1.5.5 General remarks related to the Strategic CAP AKIS plans

A clear financial envelope is needed: a certain proportion of the CAP budget should be spent on the various ways of improving the AKIS (blocks 1-4 above) to ensure that the issue is taken serious and that the plan is implemented with real actions. For instance "target" a dedicated part of CAP funding to knowledge and innovation, e.g. 10% (not: "ring-fence", because flexibility is needed).

Conditionality is OK for the approval of the AKIS plan, as a sign that actions need to be taken and will be followed up. Important is to sign this to our national policy makers. **Different ministries need to coordinate: sign a collaboration agreement between the institutions involved (gives responsibility and also visibility).**

A CAP strategic AKIS plan is good for the future, it will trigger improvement step by step and help to understand what kind of AKIS each country has. We need public knowledge and the flexibility to make it happen.

Develop the strategic AKIS plan in a trans-formative process together with different stakeholders: by means

of a participatory process with skilled facilitators. Ideally the plan would have a **longer term perspective** (longer than the programming period, e.g. 10 years). The content of the plan should use project planning and management tools like SWOT, Gant Chart, scenarios, key performance indicators + reflect on how to blend in the finance (national, regional, various EU resources, e.g. also Cohesion Funds, regional funds). Beyond researchers, advisors and networks, have also farmers and rural actors participating in the formulation of the plans, as well as the younger generation of researchers (up to 10 years after PhD), they are more transition enthusiastic.

The Commission should request that all the relevant Ministries are involved in the plan together, to make them cooperate and share responsibilities for the implementation (e.g. Ministry of Agriculture, Ministry of Education, Ministry of Research, Ministry of Rural Affairs, Ministry of Innovation, Ministry of Food/Economy, Prime minister, etc.).

Adopt a **National Partnership Programme** of all AKIS' related organisations, promoted and financed by the MS' respective ministries.

A specific **framework for reporting, evaluation and control practices is needed**, see the potential qualitative indicators for the 4 strands of AKIS actions

A financial envelope is needed: a certain proportion of the CAP budget should be spent on the various ways of improving the AKIS (blocks 1-4 above) to ensure that the issue is taken serious and that the plan is implemented with real actions.

Adopt a National Partnership Programme of all AKIS' related organisations, promoted and financed by the MS' respective ministries. **A coordination unit could be made responsible** for AKIS stakeholder relations and for supporting large scale national implementation of innovations.

For the approval of a functioning AKIS plan, **different ministries need to coordinate in an AKIS coordination body: sign a collaboration agreement between the institutions involved** (gives responsibility and also visibility).

There is a **need for a specific framework for reporting, evaluation and control practices**, adapted to R&I (not reporting as if it was an investment measure or as area-based payments). Be aware that **training, education etc, all**

human capacity efforts are difficult to measure.

Setting specific result indicators is needed, therefore see some ideas of the SWG for potential indicators per block enabling quantitative monitoring.

CAP AKIS Plans: potential to strengthen AKIS by:
(SWG SCAR-AKIS Athens, Tallinn) <https://scar-europe.org/index.php/akis-documents>

- 1. Enhancing knowledge flows and strengthening links between research and practice:** incentivise researchers for their impact beyond academia, e.g. in their careers, by making practice ready outputs, meet practitioners frequently/thematic events, organise on-farm demonstrations where farmers and researchers meet and talk, education for researchers on interactive innovation approaches etc
- 2. Strengthening farm advisory services within MS' AKISs:** capturing and sharing farmers' needs, acting as innovation brokers/facilitators, participating in and sharing knowledge from OG innovative projects, advisors' training and thematic events to update knowledge, cross-visits (learning peer-to-peer), spend time with researchers,...
- 3. Incentivising interactive innovation projects (OGs, H2020 MA):** help connecting actors, facilitating cross-border and transnational calls/knowledge exchange, establish innovation support services to develop projects and capture farmers' foresters needs and innovative ideas, support intergenerational renewal by experts' collaboration...
- 4. Support digital transition in agriculture:** EIP OGs on digital innovation, build and use repositories with agricultural data for multi-purposes, digital skills development,...



Fig. 10 Some examples of potential strategic AKIS plans interventions.

2 SCAR building insights on AKIS



Text by Inge Van Oost and Floor Geerling-Eiff, based on the work in the SWG SCAR AKIS over its mandates 1 to 4

2.1 The Standing Committee on Agricultural Research

This chapter explains the institutional background of the SCAR, SWG SCAR AKIS and its fourth mandate.

The EU's Standing Committee on Agricultural Research was founded by a regulation in 1974 and is mandated by the Council of the EU to play a major role in the coordination of agricultural research efforts across the ERA. The SCAR currently represents 37 countries, the members being ministries (or other organisations such as research councils) from all EU Member States, with Candidate and Associated Countries as observers. SCAR has grown to become a respected source of independent advice on European agricultural and wider bioeconomy research, along with being a major catalyst for the coordination of national research programmes, and has helped in the shaping of an integrated ERA. The Committee plays an important role in coupling research and innovation and in removing barriers to innovation and aims to make it easier for public-public and public-private sectors to work together in delivering innovation that tackles the challenges faced in the bioeconomy area. This has particular relevance with respect to the new growth-oriented approach in the Horizon 2020 programme. The SCAR builds upon four main activities:

- strategic policy advice in supporting the development of research initiatives, diverse policies and policy instruments etc.;
- developing a strong foresight process to cope with the wide range of complex and interlinked challenges facing agriculture and the wider bioeconomy;
- developing common research agendas as a base for further multilateral cooperation (including alignment of programmes at national and EU levels);
- mapping SCAR member research capacities to bring about increased collaboration.

These activities are established through the various groups within the SCAR governance structure: the plenary meeting, secretariat, working group, foresight group, strategic and collaborative working groups and dedicated task forces. The strategic working groups (SWGs) – such as SWG SCAR AKIS – were established to discuss strategic matters. These strategic matters cover broad issues with a specific remit, described in the terms of reference of the SWG, and approved at the SCAR plenary meeting, for who the SWGs work.

Membership in these groups is voluntary and is financed through national resources, with European Commission (EC) staff also being actively involved.

Why a dedicated Strategic Working Group of SCAR on AKIS ?

The SWG SCAR AKIS started its first mandate in 2010, after a 2009 SCAR Foresight exercise concluded that the AKISs at that time were "**currently unable to absorb and internalise the fundamental structural and systemic shifts that have occurred. The remaining publicly funded AKIS appear to be locked into old paradigms based on linear approaches and conventional assumptions**".

Background on the setting up of the SCAR SWG on AKIS

1974: Standing Committee on Agricultural Research (SCAR): Representatives of Member States and associated Countries that advise the European Commission and Member States on coordination of agricultural research.

- 2005: SCAR started "Foresight" exercises
- 2006, Krems (Austria): " [SCAR to] include questions of advisory services, education, training and innovation in their discussions"
- 2007 - 1st SCAR Foresight: "The mounting challenges facing the agri-food and rural sectors in Europe calls for a review of the links between knowledge production and its use to foster innovation"
- 2009 – The 2nd SCAR Foresight shed a rather crude light on the current state of Agricultural Knowledge Systems in Europe: "currently unable to absorb and internalise the fundamental structural and systemic shifts that have occurred. The remaining publicly funded AKIS appear to be locked into old paradigms based on linear approaches and conventional assumptions."

Why a SCAR SWG on AKIS?

A dedicated Strategic Working Group (SWG AKIS) of the Standing Committee of Agricultural Research (SCAR) has been reflecting and exploring AKIS systems since 2008. Why?

- the linear "knowledge transfer" system is not sufficiently adapted to and ready to solve new and complex challenges;
- the AKIS concept aims at describing knowledge infrastructures: institutions, organisations and their interactions;

- reflection on the AKIS concept aims at better understanding the knowledge flows within the system, focusing on the issue of knowledge access for a diversity of actors (Hall et al., 2006);
- parts of the AKIS are: farmers, advisors, research, education/training, input suppliers, retailers, media, services, ministries,...: they all produce and need knowledge;
- AKISs mostly work at a national and/or regional scale;
- the various parts of the AKIS **influence** more or less daily on-farm decisions;
- depending on how **knowledge exchanges** are organized, **necessary changes and transitions** will be either hampered or rather accelerated.

2.2 The Strategic Working Group of SCAR on AKIS

Since 2009, the Strategic Working Group SWG SCAR AKIS operates as a think tank providing insights for a better understanding and development of AKISs in the EU. The different mandates of the SWG SCAR AKIS have allowed to develop a narrative for implementing a strategic approach to AKISs within the political and socio-economic context of the EU Member States and regions, and globally.

The macroeconomic view tends to see innovation as a linear process from (basic) research via R&D to a commercial application. The main rationale is market failure and the main policy instrument is science or research policy. As there is also a risk of government failure, the choices on the direction of innovation have been left to the market as much as possible: the market organises the allocation of resources. The **interactive innovation model** has a more complicated approach to innovation and innovation policy. The focus is on interaction between different stakeholders in the innovation process.

The linear versus the interactive innovation model

The innovation model under the agricultural EIP goes far beyond speeding up transfer from laboratory to practice through diffusion of new scientific knowledge (referred to as a 'linear innovation model'). The EIP adheres to the 'interactive innovation model' which focuses on forming partnerships – using bottom-up approaches and linking farmers, advisers, researchers, businesses and other actors in operational groups and Multi-Actor Projects. This knowledge 'exchange' will generate new insights and ideas and mould existing tacit knowledge into focused solutions. Such an approach will stimulate innovation from all sides and will help to target the research agenda.

The main rationale is that there are many systemic (network) problems in the system or the creation of innovations. Therefore a specific new type of

innovation policy is needed. However that innovation causes policy-making choices and is much more context-specific.

Different areas of AKIS, such as education, extension and research, face different challenges. They are also governed with different incentives, which can be problematic for synergy and cooperation within an AKIS. Education is often weakly connected to the other components. Applied research is often reviewed on scientific output, much less on relevance. Networking and cooperation between research, and the extension or farmers' groups, is to be promoted.

Agenda setting by farmers and the food business is more important than more research dissemination. The SWG SCAR AKIS therefore advocated in its second mandate¹⁴ a distinction between science-driven research and innovation-driven research. Programming, farmer/business involvement and the role of the EU are quite different in both types. AKIS is a useful concept to describe a system of innovation, with emphasis on the organisations involved, the links and interactions between them, the institutional infrastructure with its incentives and the budget mechanisms.

AKISs vary between countries, regions and sectors. Although they are changing and diversity is useful in innovation and transitions, there is no guarantee that they are fit to answer the challenges posed by the need to increase productivity and sustainability in agriculture, food/non-food production and value chains up until the consumers and society. Innovation starts with mobilising existing knowledge. Innovation is a social process, more bottom-up or interactive than top-down from science to implementation. Even pure technical innovations are socially embedded in a process with clients, advisors etc. Very often partners are needed to implement an innovation.

The EU 28 is broad and diverse; this is a distinction that gives added value to the EU as a whole. In any event problems and needs should not be considered in a linear and unique way where one-size-fits-all. There are some priorities and needs that should be tackled at regional and sub-regional levels. For instance the possibility to develop cross-border collaboration at the regional level in the EU for the enhancement of the innovation process for topics such as plant breeding for different regions; water management in Mediterranean vineyards; enhancing the learning process and involvement of regions and countries less active in the EIP, innovation-related activities e.g. Eastern European Countries etc.

As innovation is a risky business and benefits from the exchange of ideas, learning and innovation networks have proven to be an adequate vehicle for empowering groups of farmers to investigate new options to make their

¹⁴ Report of the 2nd mandate of the SWG AKIS "AKIS towards 2020"

business more viable or sustainable. It also seems to be an efficient form for information brokers such as farm advisors. This implies policy instruments that finance collectives in networks, including food chain partners, non-governmental organisations (as advocates of sustainability), extension and research.

Farms in the EU are not a homogenous group; they produce very different products (from olives and goat's cheese to barley and flowers) with different technologies in different environmental conditions regarding soil and climate. Farm structures differ too. This all implies that a 'one-size-fits-all' solution is unlikely to be successful. Out of the 14 million holdings that are statistically counted as farms (and that includes airports as well as construction workers who live in the countryside or have a fiscal or social security incentive to stay on a farm) about 3 million are responsible for 75 % of the food production. Among these are the innovators who drive with the input, and the food industry which drives the technological innovation for higher production. At the other end of the spectrum there are millions of farms who essentially face problems of farm size, but also of a declining social fabric in the rural area, with public and commercial services closing down, few job opportunities etc. In between are farmers that are under pressure too, of which some groups are very innovative in developing new business models with, for example, 'slow food' products, care services, tourism etc. Environmental problems (including animal welfare, landscape issues etc.) are in many cases less related to farm size. This rough picture illustrates the diversity and suggests that quite different types of innovation and knowledge transfer can be needed.

The successful activities of this very participatory group, supported by external expertise, dedicated studies and specific AKIS related H2020 projects, provide the EC, the EU Member States and all interested actors a set of ideas, tools, best practices and recommendations for reflections on their AKIS and an efficient and coherent use of the different instruments which contribute to the EIP-AGRI (European Innovation Partnership for agricultural productivity and sustainability). The SWG SCAR AKIS has significantly incentivized agricultural and forestry innovation through linking existing policies and instruments, which is a main aim of European Innovation Partnerships as set out in the 2010 Commission Communication Innovation Union¹⁵. The SWG SCAR AKIS co-created dedicated Horizon 2020 formats for incentivizing interactive innovation (Multi-Actor Projects and Thematic Networks). These formats are now in place (see section 1.3 and 1.4) and it has proven to be very useful and fruitful to continue exchanging and discussing outcomes for enhancing and improving interactive innovation.

¹⁵ <https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM%3A2010%3A0546%3AFIN%3AEN%3APDF>

2.3 The 4th Mandate of SWG SCAR AKIS

After the chairmanship by France and the Netherlands under the first two mandates, the 3rd mandate SWG SCAR AKIS was coordinated by the Netherlands and Belgium. SCAR members endorsed the continuation of SWG SCAR AKIS with a 4th mandate and stated their commitment to participate. Mandate 4 (2016-2019) was co-chaired by Spain (2016), by France (2017-2018) and by Hungary (2017-2019). Co-chairs were Andres Montero Aparicio, Adrien Guichaoua and Anikó Juhász. The SWG SCAR AKIS co-chairs were supported by Inge Van Oost (European Commission) and facilitator¹⁶ Floor Geerling-Eiff (WUR, NL). The SWG is a network of civil servants and counterparts from research, advisory and farmers' organisations, from NGOs, from the Member States and the EC.

Specific priorities in the work of SWG SCAR AKIS include:

- contributing to the development of the R&I framework programme Horizon 2020 and beyond;
- enhancing the interaction with innovation, cooperation & networking initiatives under the CAP 2014-2020 and the CAP post 2020;
- further development of the interactive innovation model, launched under the EIP-AGRI and interlinkages along the supply/value chain;
- full coverage of Foresight study recommendations related to Knowledge and Innovation systems and partially taking up on recommendations related to research themes and scope;
- creating integrated approaches through incentivizing complementarities and synergies between policies, instruments and actors (mainly EU R&I policy, CAP, regional and education policies);
- contributing to the integrated approach with a focus to the different territorial levels of the several EU R&I strategies, in the field of agri-food and bioeconomy;
- better interconnections and partnerships among all EU agri-actors and stakeholders, enhancing knowledge flows.

More specifically, SWG SCAR AKIS's 4th mandate tackled the following six challenges:

- to improve the integrated approach within the European AKIS and the implementation of the EIP:
 - a. complementarity and synergies among EU funds;

¹⁶ The facilitation by Floor Geerlinck-Eiff was funded by the EU CASA H2020 project (Grant Agreement: 727486)

- b. thematic interconnection and collection of expertise of interactive innovation projects at different levels;
 - c. AKIS supporting Infrastructures;
 - d. further development of the EIP approach;
- learning and feedback from interactive project approaches (Multi-Actor Projects, thematic networks, operational groups);
 - to better address the knowledge flows along the whole production/ value/supply chain in the AKIS, for the future;
 - cross-fertilization with other EIPs and sectors: identification and evaluation of experiences from other EIPs (such as Water, Raw materials, Bio-Economies, ICT, Health, Aeronautics) and other sectors not related to boosting and improving the AKIS;
 - analysing the perspective of AKIS in Food and Nutrition Security and Sustainable Agriculture, across developing countries;
 - monitoring interactive innovation policies and benchmarking for sustainability.



Fig. 11 The SWG SCAR AKIS at its meeting in Dublin, April 2019.

The Annex provides the list of all presentations in the SWG AKIS Meetings which contributed to the work, exchanges and discussions related to these 6 challenges of the 4th SWG SCAR AKIS Mandate.

3 The principles that make AKIS work



Text by: Floor Geerling-Eiff and Inge Van Oost, based on SWG SCAR AKIS discussions on interactive innovation projects presented

This section summarises lessons learned from projects following the EIP interactive innovation model

The origin and definition of the interactive innovation model of the EIP-AGRI, as applied in Horizon 2020 Multi-Actor Projects and EIP-AGRI Operational Groups

- 2010: European Innovation Partnerships want to speed up innovation through cooperation and linking existing policies and instruments (EIP-AGRI Commission Communication (2012)79)
- The EIP-AGRI applies an overarching concept based on the interactive innovation model, as applied in EIP Operational Groups and Horizon 2020 Multi-Actor Projects:

Interactive innovation means collaboration between various actors to make **best use of complementary types of knowledge** (scientific, practical, organisational, etc.) in view of co-creation and diffusion of solutions/opportunities **ready to implement in practice.**

- An EU wide EIP network is linking actors for communication, partnering, dissemination, knowledge flows and collecting practice needs

The SWG SCAR AKIS interacted with a varied set of interactive innovation projects and actors (see Annex) to distil experiences and advocate interactive innovation in the different countries and Member States. The lessons learned and resulting recommendations form an inspirational inventory on implementing the Multi-Actor Approach (MAA)¹⁷ and illustrate the search for interaction on project-preparation and implementation. As described in section 1.3 of chapter "AKIS in Europe" the MAA aims to involve actors from different backgrounds which bring together complementary types of knowledge. The MAA helps to make innovative ideas resulting in practical solutions which are implemented by the end-users. The results of MA research are more likely to be applied thanks to the co-ownership of the end-users and actors involved. Also the emphasis on end-users' needs and on broad dissemination – at EU level as well as local – are supporting a better impact of MA research (see also the chapters on on-farm demonstration and

¹⁷ Multi-Actor Approach in the European Commission Horizon 2020 Work Programme 2020, https://ec.europa.eu/research/participants/data/ref/h2020/wp/2018-2020/main/h2020-wp1820-food_en.pdf on page 11-13

communication). In result, many actors are more and more incentivised to work on Multi-Actor (MA) innovation.

Although 7 years old, the European MAA is still a relatively new concept, in particular at a regional, national and global scale. Some actors are still in a learning phase and insufficiently **connected** to find each other. This could mean that processes to achieve interactive innovation or the steps which need to be undertaken are still insufficiently understood by part of the European research and innovation (R&I) community and the many other actors working with them. It is learning-by-doing and it will take more time to fully embed interactive innovation processes. In particular the necessary interactive **skills** need to be developed and fitted into the scientific and vocational curricula of **education** at all levels. Further work in this field of AKIS will be essential.

This section provides insights from the first interactive innovation projects to improve the implementation of the MAA. In several SWG SCAR AKIS meetings, running interactive innovation projects were presented and discussed with the project coordinators, as reflected in this paragraph. In summary the following topics were addressed:

- designing and managing MA consortia for interactive innovation;
- reducing administrative burden and drafting project proposals;
- developing facilitation methods for interactive innovation processes;
- dissemination of resulting knowledge and communication on interactive innovation;
- implementation of EIP-AGRI Operational Groups in EU regions and countries;
- cross-regional and cross-border cooperation in Operational Groups.

Some of these topics are also elaborated further in other chapters of this report.

3.1 Designing Multi-Actor consortia for interactive innovation

MA consortia should be built in such a way that all actors are maximally engaged throughout the project and in particular from the very start of drafting the proposal. Within the MAA it is key to first identify the problem(s) to be solved based on the end users' needs and in a second step to look for the actors who can bring in the specific complementary knowledge needed. Strong interaction will be needed to come up with innovative solutions and best practices. End-users must form part of the consortium which should not only build on existing networks but also embrace newcomers, who are sometimes not familiar with MAA but eager to contribute. An EIP-AGRI search tool for efficient searches, where to find profiles of key players and

connections to the right project, can help newcomers to get engaged. For some subjects it is difficult to get SMEs and companies fully committed as they may have a specific private interest they want to pursue which is not in line with the broad dissemination obligations of MA projects. In such cases dedicated SME project funding may be more appropriate.

The knowledge demand by the end-user or farmer is the primary focal point in agricultural interactive innovation. Based on their practical needs, a next step is to refine the objective of the project and then discuss who can bring in which knowledge and which new insights are to be developed. It might seem that the level of innovativeness is not ambitious enough to researchers as they are often under pressure to draft scientific publications in high impact scientific journals. However, in order to stimulate the use of produced knowledge by end-users/farmers, one has to start with the knowledge demand which is close to the daily practice of end-users. Once there is experience in cooperating with researchers and the knowledge revealed its impact, scientists become interested in taking further innovation steps in a next project. It is a process of learning-by-doing.

It is also about unexpected and unintended changes resulting from interaction with practice. The latter can be quite challenging, especially for administration and more lab oriented researchers involved in MA projects. This is the challenge for scientists in the MAA: ensuring that results will indeed be implemented by end-users and at the same time scientifically justified. Here the entrepreneurial spirit and creativity of end-users sometimes helps to find solutions which scientists are often experts in setting up correct experiments and doing measurements, as well as managing the analysis and drafting results. Once it comes to dissemination to practice, again end-users or their advisors can help a lot to translate the scientifically justified results into easily understandable communication to practice.

Capacity building: a short film illustrating how to co-create solutions in practice:

One of the first H2020 Thematic Networks (Hennovation¹⁸) explains how the interactive innovation model works in their project

<https://www.youtube.com/watch?v=mVsW4--ex0M&feature=youtu.be>

To make different type of actors work together efficiently and interact at a regular basis in a MA project, several approaches can be useful, in particular **physical meetings** but also intermediate Skype meetings with the participation of end-users. An overall view on the implementation of the project contributes to a better understanding of the motivations, expected

¹⁸ <http://www.hennovation.eu/>

outcomes and impact. A strong **democratic leadership** by the coordinator is therefore necessary to make the different groups of actors (e.g. farmers, facilitators, academia) exchange and interact. Co-creation and **co-ownership** is one of the most important features to motivate the actors to work together efficiently. One important difficulty lies in reaching the **trust** between different actors with different cultures and specific objectives in a single project with a common objective. Skilful, frequent and timely **communication** and **facilitation** by intermediate persons is key. In developing an approach for MA projects, it is wise to learn from and listen to previous experiences with MA projects and programmes.

“I not only use all the
brains that I have, but
all that I can borrow”

Woodrow Wilson

President of the USA, 1913-1921

3.2 Reducing administrative burden and drafting project proposals

An important factor in stimulating diverse actors to participate in a MA project from the start and for end-users in particular, is the level and complexity of administration. Reducing administrative burden is an important aspect of getting (agricultural) entrepreneurs involved. Specific budgeting for group work to stimulate interactive innovation on farms or at end-user premises has proven to be effective in several projects and was often key to success and trust-building. It is useful to do this in several bio-climatic regions and countries, to let local subgroups collect experiences and bundle insights or tacit knowledge. An overarching – again mixed - group of actors at EU level may then do the overall analysis and make comparisons, and take care of broad communication on and coordination of the whole project. In this way, the budget distributed for innovation can be allocated in a more efficient manner.

In comparison to EU projects in the previous Framework Programmes, it is considered to be easier in H2020 to work with different partners and to link with the EC, for instance regarding deliverables and financial organisation. Contracts are considered to be less complicated and e.g. reimbursements for traveling are considered less administrative burdensome. Moreover, the

funding rate for H2020 projects (i.e. 100% for CSA and RIA) makes H2020 more attractive for non-commercial partners and actors, and less risky especially for newcomers and small-size organisations. The administration is less time consuming and actors are not so afraid anymore to fill in forms the wrong way. Procedures under H2020 are considered to be more flexible. There is also more flexibility to re-arrange budgets among the partners involved in comparison with the previous framework programmes. Hence, budgets are less fixed, which is appropriate considering that innovation is not a linear process.

However, there is a further need for continuous focus on reducing administrative burden. Some interactive innovation projects indicate that administration still consumes considerable time and the actors involved face difficulties when consortia are changing partners or more partners should or could be involved during the project process than initially planned. There should be more focus on **proposing a flexible budget** in different innovation phases where it is required, even if this means that the specific objectives for allocation of that budget cannot fully be foreseen at the proposal phase. Synergies between different instruments for knowledge and innovation could facilitate this need, for example, matching instruments for (knowledge) development objectives and instruments for market uptake (knowledge valorisation). However, the study on "Funding synergies for AKIS" cited in section 5.1 reveals that implementing the current different possible synergetic mechanisms is still quite challenging.

Most project coordinators are currently multi-taskers. Discussion learnt that it is useful to have **one coordinator on content and an additional financial/administrative coordinator**. The two are separate professions, and those MA projects applying such approach are very positive about it. It could be an option to appoint particular budget (between 5-10%) for administrative coordination. The financial coordinator could also support (a part of) the administration of the different participants involved in the project (in particular for partners with non-scientific background) or advise them, wherever possible.

Another issue is the difference in co-financing support that some EU Member States (MSs) invest in the preparatory and proposal stage of projects and/or during the project. **Some countries actors provide national public support to take part in H2020 proposals, in most other countries they do not**, with effects on the equality of the EU level playing field. In particular for smaller institutes and organisations, it is quite risky to invest in EU proposals without public support, in particular if they would like to coordinate a proposal. The question arises more and more how to create an EU level playing field, both between countries as between partners with varying financial capacities. It happens that smaller organisations are not accepted as H2020 MA project coordinator for reasons of lack of financial capacity, while

they are esteemed fit to coordinate projects with bigger budgets at a national scale.

This is also a matter of efficiency and effectivity. There are many EU, national and regional networks working on same topics and innovation challenges or 'hot' issues and this raises a number of questions.

- how can these projects, networks and knowledge flows be better connected?
- can EU funding supporting preparation of proposals (similar to the preparation support in EU RDPs for EIP OGs under the CAP) help also setting up of EU projects under Horizon?
- can EU innovation hubs help smaller players towards an equal level playing field for setting up Horizon proposals?
- what should be the minimal financial capacity to take part or coordinate a project? Should it be proportionate to the total project budget?
- how to avoid overlap in R&I activities?
- how can we better learn from each other's solutions?

3.3 Knowledge dissemination and communication

Paper or hard copy (like factsheets) are still considered to be important output next to digital output. **Videos and YouTube** are becoming more and more important for dissemination because movies attract attention more easily, besides standard news mail. End-users should be stimulated (more) to spread messages about project results to their peers and on social media, if possible. **Demonstration** events on field, enterprise or farm are of key importance during as well as at the end of the project, as they are based on peer-to-peer effects (see chapter on demonstrations)

Instead of making use of social media for communication in general, it is preferred to utilise specific media (such as professional or specialist journals or websites and – online – platforms, etc.), which farmers often use. This requires more coordination and the involvement of practitioners who know the main existing channels for knowledge flows to practice. You have to get to know what those right channels in each country or region are, considering the European diversity, and how to get access, whom to ask. This is still a key challenge for many MA projects although it is essential condition of the MAA definition. Often this is because in the project proposals, practice actors are insufficiently involved in this part of the work.

It is also important to agree on a plan and a structure during the project, and on how to communicate before, during and after the project finishes. Professional support from skilled people may be useful (see chapter on communication). Furthermore, it is advisable to monitor the outreach and impact of communication and social media use even though it is difficult to indicate direct effects of dissemination activities.

Use of language in communication might become less of a problem in the future because of the improving tools such as google translate, on the one hand, and because of the growing number of non-native Europeans speaking the English language, on the other hand. However, for now, translation in native languages is still very important. In several types of project meetings, working with (mostly non-professional) interpreters seems to be a solution but experiences are that this can be quite hard to follow and slows down the process. Yet, professional interpreters can be quite costly or the costs are mostly not foreseen in the project budget. The most simple and easy solution stays to make use of local **facilitating partners** (often advisors) which organise events and communicate in the language of the farmers and end-users. **On-field events** are valued very much for their strong outreach while at the same time providing a means for further connections between diverse actors.

As pointed out before, it forms part of the MA requirements, so the emphasis on deliverables and communication in MA projects is on end-user material such as practice abstracts and the communication through the existing channels most used by practitioners. Some projects experienced that scientific uptake (scientific publications) may be a bit more difficult for MA projects than for non-applied science, even if the impact in the real world is higher. The challenge here is to persuade the more scientific and technological driven communities and journals to get *their* attention for MA research, which brings a higher impact on end-users and less on scientists only. A mentality change is already on-going, with the research funders becoming more interested in producing impact and ensuring use of research results. Nevertheless, it is expected that it may take another generation before the whole EU scientific world is skilled and ready to accept this new paradigm. And again, for some subjects, there is no real need to work Multi-Actor, e.g. developing a vaccine in a laboratory.

An additional suggestion is to involve (social) scientist(s) from another scientific angle, e.g. to write a paper for a (social) scientific journal, since the scope of social sciences is more related to (human) interaction already than other scientific (beta) disciplines. Even though this is very useful and welcomed, in particular for reasons of capacity and skill building, it is hardly a replacement for effective changing the behaviour and producing real research impact.

Read more on communication and demonstration in the dedicated chapters. The EIP-AGRI Evaluation study published in 2017¹⁹ came to similar conclusions about the importance of early and efficient dissemination.

3.4 Assessment study of Operational Groups

What is an EIP Operational Group?

- EIP operational groups funded under rural development programmes are Multi-Actor, project based and tackle a certain practical problem or opportunity which may lead to an innovation
- The operational group is tailored to this problem/opportunity and makes the best use of different types of knowledge (practical, scientific, technical, organisational, etc.) in an interactive way.
- The operational group is composed of those key actors (farmers, advisors, researchers, businesses, NGOs, etc.) which are in the best position to realize the project's goals and to share experiences broadly.

An **assessment study of Operational Groups** done in 2018 by Idea Consult, focuses on the state-of-play of the setting-up and implementation of the OGs, their results and how these are disseminated, while also reflecting on the support provided by other institutional actors such as Managing Authorities and Rural Networks²⁰. The survey illustrates that the OGs are coordinated and executed by a variety of partners coming together in a large diversity of partnership composition and structures. This is in line with the policy objective to mix complementary expertise in view of developing practical solutions in EIP OGs.

The survey results also show that **farmers and farmer organisations are the most represented type of partner, indicating that OGs do connect the farmers' community with the external expertise and knowledge to help them in solving their practical challenges**. Further findings from the survey and from the interviews confirm that the OGs are in general set-up for exactly this reason, to be able to advance practical solutions for pressing challenges serving regional/national farmers' communities.

Research institutes are the main lead partners, along with farmer associations/organisations. Such institutes are usually better equipped with resources to manage project administration. Although many of the OG partnerships include individual farmers as fully-fledged partners, the interviews made clear that **farmers are currently still reluctant to pre-**

¹⁹ https://ec.europa.eu/agriculture/sites/agriculture/files/external-studies/2016/eip-2016/eval_en.pdf

²⁰ <https://ec.europa.eu/eip/agriculture/en/publications/eip-agri-operational-groups-assessment-2018> , conclusions page 59-62

finance and take up the administrative lead and responsibility for such projects, because they feel they lack the capacity and resources to deal with the related obligations, advance payments in the current period not yet being possible.

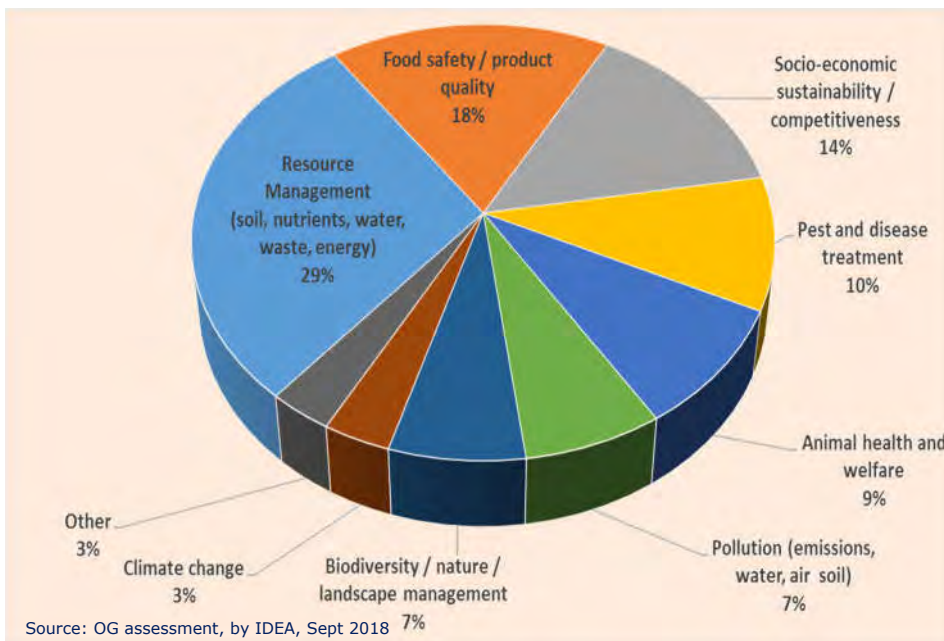


Fig. 12 The diversity of themes OGs cover (Feb 2018).

Some interesting focuses at national level emerge, illustrate the diversity of OG and the flexibility of the EIP-AGRI to adapt to the local context or priorities. For example:

- Almost 40% of the 54 OGs focusing on 'Animal health and welfare' are German;
- Almost 30% of 59 OGs focusing on 'pest and disease treatment', and 23% of 107 OGs focusing on food safety and product quality are Portuguese;
- 30% of the 86 OGs focusing on 'socio-economic sustainability/ competitiveness' are French. Agro-ecology related innovation is also remarkably represented in French OGs;
- 'Resource management' is the dominant focus in Italy, The Netherlands, and to a lesser extent Spain and Germany;
- OGs in Ireland overall have a strong focus on biodiversity / nature / landscape management, which appears to be the result of some specific thematic calls launched by the Irish Managing Authority.

These thematic calls complement the regular “open” calls (i.e. themes are not predefined) with a view to tackle specific challenges in line with national or regional policies. Interesting is that 2 of the thematic OG calls are dedicated to test, prepare the field and motivate future beneficiaries for agri-environmental measures in the next rural development period.

An Irish OG²¹ set up to protect the Hen harrier: an example how to prepare and co-create effective future CAP agri-environmental measures

The Irish authorities see the co-operative model as the key to the stimulation and development of innovative new approaches to tackle environmental challenges at local level. As a preparation to the agri-environment-climate schemes, **Ireland wishes to design and implement habitat specific measures with better delivery on environmental objectives. The OG employs a bottom-up approach** (called 'locally-led') **to agri-environment scheme testing and development**, with a network of stakeholders including farmers, government departments, non-government agencies and other local interest groups collaborating to achieve common local environmental objectives. Moreover, in this way, Ireland provides a mechanism to **build on and use the research outputs of LIFE and other similar projects**, in a manner which will allow the results to be translated and applicable at a wider landscape scale by encouraging larger numbers of farmers and other stakeholders to act in a collaborative manner i.e. at wider catchment/regional scale.

Earlier research on hen harrier habitats has led to list of measures to test in practice in the Hen Harrier OG Project, which now provides an opportunity to experiment **how farmers can be recognised and rewarded for delivering environmental benefits**. The Project gives farmers the incentive to manage their fields in ways that will improve the best habitat condition. In 2007, under Article 4 of the Birds Directive, six Special Protection Areas (SPAs) covering a total land area of 167.117 hectares were classified for the conservation of the Hen Harrier. The Hen Harrier SPAs have similar landscapes: the farmland is dominated by peatland (bog and heath) and wet (rushy) grassland. The low intensity farming carried out in these areas supports High Nature Value (HNV) farmland. These are high input, low output farms that produce high levels of biodiversity and other ecosystem services such as clean water, and high quality air and soil.

Actions undertaken to improve ecosystem services that would benefit the Hen Harrier are for instance planting new hedgerows, grazing firebreaks, putting in water troughs, linear strips of wild bird cover, safer nesting areas etc.

²¹ <http://www.henharrierproject.ie/>

Farmers make the decisions for their own farm. They are **supported with training and advice and rewarded for their achievements.** An annual farm plan will contain a list of actions (jobs) which are nominated by the farmer after advice from his advisor with the aim of improving the site's management and conservation condition for the benefit of the Hen Harrier. **The advisors joining the OG were specially trained for this.** All eligible land within the 6 SPAs will be scored annually with a scorecard app and receives a score. Higher scores receive higher payments. This gives farmers the **incentive** to manage their fields in ways that will improve the habitat condition and their payment as well. The results in the 6 SPAs are supervised and the actions adapted/finetuned by a mixed national team of researchers and other stakeholders.

The OG aims to include all farmers and their respective trusted advisors in the whole area of the 6 SPAs, because it is key to have all involved in order to achieve sufficient results in terms of improved habitat for restoring Hen Harrier numbers.

Structure of the project/partnership

The survey results indicate that the main reasons to set-up an OG are 'solving a practical farmers' problem', 'testing solutions in a real-life setting' and 'the possibility to connect research to farmers'. The case studies support this finding, as the interviewed OGs agree that the **EIP-AGRI OG concept offers a unique funding opportunity for practical development projects based on concrete bottom-up farmers' needs.**

The Operational Groups provide a suitable framework for collaboration between farmers or their representative organisations/association, advisors, researchers, businesses from other sector, etc. OGs enable participating partners to test and demonstrate new methods and technologies in direct interaction with individual farmers and co-develop practically applicable and accepted solutions. At the same time, they **allow for sufficient operational flexibility to structure and develop the project to produce concrete outcomes.** OG partners highlight that such projects could not have been realised within other innovation or rural development funding frameworks, both at the national and European level.

Structure of the project/partnership

The survey shows that **the majority of OG partnerships are new and specifically set-up to perform the OG project.** At the same time, more than half of the partnerships contain partners that had previous connections, extended with new partners, which often knew each other prior to collaborating within their project. OGs thus often build on the work of a few

core partners, and add extra, sometimes more practice-oriented expertise to work with.

Maintaining the right tempo of progress to produce concrete applicable outcomes **requires regular coordination meetings among partners** as well as frequent interaction with the wider target group involved. Specifically, the coordination of the OG works more efficiently with a limited group of partners with well-defined responsibilities and high level of mutual trust, as the cases indicate.

At the same time, the cases highlight the **importance of regular interaction with the target group of farmers** to be able to respond to practical issues in testing phases of the project in a timely fashion. Maintaining a strong interaction also serves to get regular and well-structured feedback from the farmers on the project for most cases. Furthermore, guided visits and meetings at farms can be very beneficial to demonstrate the added value the methods/techniques/solutions developed in the OG and allow other farmers to experience and exchange on their implementation.

The case studies show **that OG partnerships therefore are often structured in three 'concentric circles' to ensure efficient execution of the project**, leading to the desired outcomes and results.

- A limited number of core (leading) partners are responsible for project management, coordination and administrative obligations.
- A second group of partners is directly involved in performing the project tasks.
- Thirdly, the cases show that many OGs activate the networks of their partners to expand the number of farmers where they can test and demonstrate the project outcomes. This involves **a larger circle of 'end-users' (50-100 on average) around their project which are not formally part of the partnership**. These help to test new techniques/ methods/solution in real farming practice and provide direct feedback to better adapt possible solutions to their needs. Interest and demand by farmers for this is remarkably high, cases confirm, while it may be complicated for them to formally take part in the OGs or similar projects as fully-fledged partners because of administrative obligations and budgetary restrictions.

Outcomes and dissemination

The above project structure shows that the OGs actively work to contribute to the development of solutions of practical use for farmers according to the original aim of the EIP-AGRI initiative. **The 'circles' structure ensuring involvement of a wider community of targeted end users** contributes, at the same time, to the dissemination of the project outcomes.

The survey and cases demonstrate that the OGs devote substantial attention to dissemination in variety of ways throughout the project.

The OG partners activate their own regular communication channels (websites, newsletters) and professional publications to make the project results available, which usually ensures reaching target audiences. Furthermore, information about the project is shared with wider groups of farmers during interactive Info Days or Open Days in most interviewed OG projects, as these are seen as the most efficient way to disseminate the results of their projects.

OGs also provide an interesting vehicle to link the rural-agricultural community to other sectors and industries like food processing and bio-based industries, etc.

Collaboration with other projects, initiatives or actors

In general the OGs prove to have strong potential as vehicles for further cooperation and to connect to other relevant initiatives and actors beyond the scope of the project itself. Over 90% of them have established relations with organisations/initiatives outside the partnership or plan to do so, indicating the apparent willingness of the partnerships to actively explore these possibilities even though the current funding framework cannot cover all the costs for this.

The cases further show that **OGs are interested in linking up to other relevant OGs or (European) projects**. The survey demonstrates that a substantial number of them have indeed undertaken efforts to do this. OG partners mainly depend on their own national and European networks for this, either with European sectoral associations, business networks or participation in EU-financed projects. However, only a minority has been able to establish structured exchange of information and knowledge or co-organise events with other OGs or EU-financed projects, as this would require resources which they had not foreseen in their budget framework.

While cooperation among OGs and with other EU projects was probably not a priority at the start of programming period, OGs are increasingly discovering its potential and highlight the need to better facilitate this. Apart from the limited availability of financial resources to invest in broader cooperation, the OGs indicate that they experience a lack of active channels and fora to do this.

Therefore, they stress the need for more structured insight into the themes and approaches of other OGs to identify related projects to connect with. This could link to specific EU funding to further incentivise more structural exchange between OGs, including on a bilateral basis e.g. a separate support for trans-national or trans-regional cooperation of future or running OGs. One example of this are the EIP-AGRI networking events

between different OGs and Horizon 2020 Multi-Actor Projects working on irrigation or on innovative supply chains, which were highly appreciated by the participating OGs. Such exchanges could not be facilitated on a more frequent basis in the current period, but clearly has potential for further productive interaction, be it organised at regional, national or EU level and reaching out to a variety of project types.

Support

The cases indicate that further support during the implementation of the OG projects is varying. The National Rural Networks of some Member States organise collective introduction sessions for all approved OGs at the start of their project. However, it seems that **ongoing OGs would welcome a more pro-active support by national/regional AKIS support structures.**

While OGs did not express a specific need for support in the running of their project, **they do see potential in more exchange with other OGs and H2020 projects in their own countries to learn from each other's results and functioning** and could profit from better support in this regard. This could be further developed with a view on generating EU added value.

OG "Winter Harvest: Seasonal, energy-extensive and innovative vegetable production", Austria

Vegetables that are harvested in winter and produced with a low energy input create a new innovative market niche. This niche represents opportunities for farmers to increase their sales because of a possible extension of their limited range of products in winter. In order to introduce winter vegetables into the local businesses and to raise the awareness among consumers for this, the generation of further expertise is required. The estimated outcomes of the work of the operational group are to find out the most suitable species and optimal cultivation dates for winter vegetables, in order to ensure high quality products in the end. Moreover, the project also takes care of the development of a sustainable packaging solution for the products, the analysis and optimization of the work flow towards winter vegetable production and the development of a sensory „winter vegetable language“ as a way to communicate the unique status of those winter vegetables to consumers.

Furthermore, the economic and ecological assessment of the winter vegetable cultivation is also an expected result. The farmers will finally benefit from the existence of a new lucrative market and the available expertise in the field of winter vegetable production.

Based on the practical experiences and the two studies on EIP Operational Groups, the key elements of interactive innovation were laid down under the new CAP in Art 114 as follows:

EIP Operational Groups shall draw up a plan for innovative projects to be developed, tested, adapted or implemented shall be based on **the interactive innovation model which has as key principles:**

- developing innovative solutions **focusing on farmers' or foresters' needs** while also tackling the interactions across the supply chain where useful;
- bringing together partners with **complementary knowledge** such as farmers, advisors, researchers, enterprises or non-governmental organisations **in a targeted combination as best suited to achieve the project objectives;**
- **co-deciding** and co-creating **all along** the project.

3.5 Implementing Operational Groups in EU regions and linking to MA projects

Operational Groups (OGs) funded under rural development programmes of regions and countries have the same interactive innovation approach than H2020 MA projects. However, they are mostly smaller scale projects and the themes are regionally oriented. It is good to have a starting base for support at regional level, and not only through using the EU level EIP network to connect with H2020 MA projects. The regional/national network may be very efficient too.

The different timing of the two main funding instruments at EU level has made it difficult in the first years. H2020 MA projects were funded immediately as from call 2014 and had a recommendation to link with EIP-AGRI Operational Groups which only really kicked off as from 2017. Since 2014, regions and countries first worked to get their rural development programmes approved and then translated in national legislation. Only after that they could do the calls for projects, make the application formats, and selected the best proposals. It was already at least 2017, and later in several Member States, before a serious number of Operational groups could start their works and make themselves visible.

As a result, a concern from EU researchers wanting to link up with Operational Groups was that regions and EU MSs until now have focused very much on establishing the programmes and procedures first within the country or region and have considered EIP networking a second priority. This should change in a next CAP period. Improving (simplifying) OG procedures, as well as linking

up between OGs and MA projects is essential to learn from other approaches and OG results.

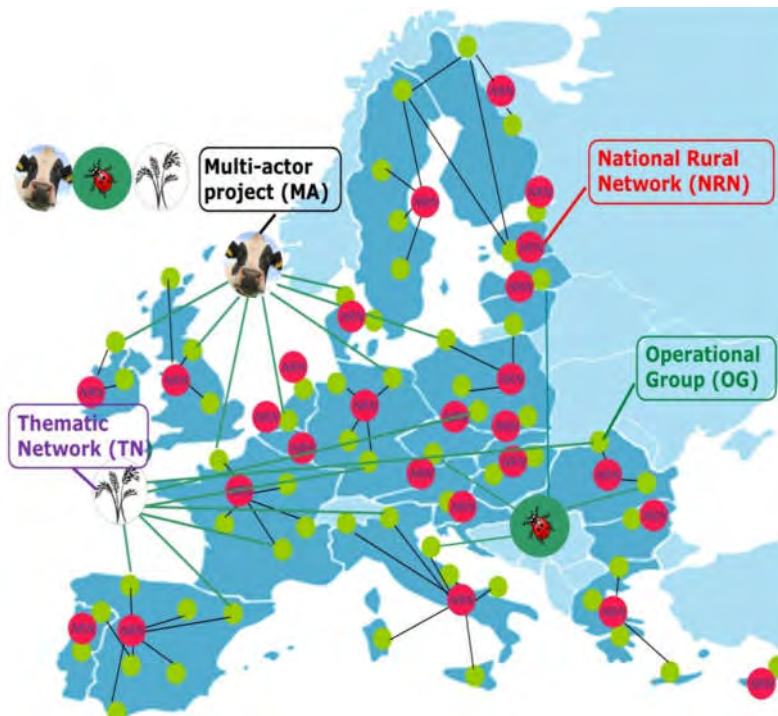


Fig. 13 Linkages between EIP OGs and H2020/Horizon Europe projects produce synergies and EU added value.

An important challenge for OGs is how to evolve from the starting point. Basic cooperation agreements in an OG are established in a contract between the partners involved. There are different types of agreements. Entrepreneurs who are more competitive, may want specific terms or conditions, while farmers' organisations or cooperatives have a culture to share and learn from each other. Lessons learned from early stage OGs which were invited to present their experience in SWG SCAR AKIS, indicate that end-users, advisors, NGOs, businesses etc. are enthusiastic to participate.

For the selection procedure it may be an issue if the regional agricultural network is already interrelated, which may be the case in smaller EU regions. It might then be wise to attract external evaluators to avoid conflicts of interest. However, not each evaluator of innovative projects need to fully understand agriculture, mixed panels work very well. It is not needed to attract only evaluators closely linked with agriculture, having some other innovative thinking evaluators can also judge on the merits of a project. Furthermore, it is important to learn from what went wrong in projects which did not reach the threshold to be granted.

The involvement of farmers can be organised more efficiently. If the AKIS is not sufficiently organised yet, in theory and in some practical cases farmer organisations, advisors, cooperatives, and producer organisations may help to get connected at EU level. However, this is far from happening enough. Some farmers have an idea what EIP-AGRI is, but most of them are not aware of EIP, OGs, MA projects or AKIS, which are all new approaches just starting up and need also promotion at local level and in local language. The rural networks/

It is not needed to attract only evaluators closely linked with agriculture. Having some other innovative thinking evaluators can also help judge on the merits of a project.

Most farmers are not aware of EIP, OGs, MA projects or AKIS. The rural networks/ national CAP networks can play an important role here. The intensity of work load and other activities for farmers is high. If a farmer wants to make time for a project, it has to fit his/her priorities.

national CAP networks can play an important role here, for raising awareness and understanding on the innovation strand of the CAP networks and the funding possibilities for interactive innovation projects. The intensity of work load and other activities for farmers is high. If a farmer wants to make time for a project, it has to fit

his/her priorities and s/he has to see a benefit in it for him or her. NCP

3.6 Cross-border cooperation among OGs

Initiating cross-border cooperation among operational groups could be referred to as 'the ERA-NETting under rural development.' Because it is still in its initial phase there are certain hick-ups e.g. caused by lack of experience in the collaboration between different paying agencies. It is important to identify sufficient common interests and overcome administrative and timing barriers. On the one hand, there are still a few questions left unanswered such as how the different countries will deal with different measure objectives and procedures. They should have an interest in following a similar strategy and Managing Authorities in the different countries need to seek practical approaches to cooperate. The legislation allows for cross-border cooperation but administratively, there are still some issues to overcome in EIP. For example, in the 2014-2020 period, a cross-border OG meant still 2 separate operational groups working together, each one accountable to his own Paying Agency. The managing authorities involved needed to cooperate to set a same time period for the proposal calls, hence their timing schedule should be mutually coordinated. Management of control is also an issue. Support and incentives from Managing Authorities, National Rural Networks (NRNs), EIP networks or other networks on regional/national level helped to develop a supportive environment for cross-border collaboration, but not too often.

Furthermore, sufficient budget needs to be reserved for cross-border visits and exchanges, as well as to introduce other actors in the network, whenever required and for dissemination of results to other regions and countries. A possibility is to form bigger cross-regional projects in which there is a possibility to fund smaller (sub-)projects. Now that more and more OGs are up and running, Horizon projects can make the connection to OGs in this way more easily. Typically, Horizon 2020 or Horizon Europe Thematic Networks are an ideal instrument to do so.

However, note that projects do not necessarily have to be internationally oriented. (Inter)local collaboration and exchange could already lead to significant interesting effects of cross-fertilisation, avoiding double funding and complement each other. Other examples are the possibility of cascading Horizon projects across regions such as cluster projects under regional funding and OGs in different regions which are being interlinked in EU H2020 TNs.



3.7 Recommendations and conclusions from SWG SCAR AKIS discussions on the interactive innovation approach

Table 1 Elements from the SWG SCAR AKIS discussions on interactive innovation projects, including some AKIS failures and some potential AKIS actions.

Multi-Actor Approach (MAA) within H2020 projects	
<p>Main added value of the interactive innovation approach (MAA) during the implementation/realisation phase</p>	<ul style="list-style-type: none"> • clear practical application - ownership of the project and results; • more informed and involved stakeholders, policy makers also profit; • adaptive oriented, experimental and co-generated knowledge; • development of a common language and understanding of challenges and solutions; • implementation under real practical conditions, farmer-driven. • Impact through intensive and effective dissemination (e.g. in demonstrations on farm or field)
<p>Main challenges linked to the MAA during the implementation/realisation phase</p>	<ul style="list-style-type: none"> • to actually get people committed to action; • different interests, incentives, languages, communication and understandings; • the time consuming organization and coordination of the partnership needs particular attention and sufficient funding foreseen at proposal stage • to keep all actors on board to fully work interactive all along the project; • to come to practical results while researchers are more driven by scientific publications • compliance with administrative rules and burdens; • temporary failures that may disappoint some of the actors involved which want to see quick results in practice; • limited time available to come to results, proposals not

	<p>always drafted realistically;</p> <ul style="list-style-type: none"> • lack of social capacity, expertise or commitment in the consortia; • insecurity of projects getting financed. For example in one call there were 70 applications for OGs while 23 projects were funded. In another call there were 55 applications and only 7 projects got funding.
<p>Adaption of attitudes, roles and skills by interactive learning</p>	<ul style="list-style-type: none"> • the awareness on the synergetic effect between MA projects under Horizon 2020 and EIP OGs is quickly rising • the trend is slowly growing, the expectation is that in the long term interactive innovation will become a common approach. • The prerequisite is that the actors involved have an open mind to change and are willing to listen and work together. This needs to be taught and practiced as part of education curricula. • A challenge will be to persuade and stimulate policy makers to adapt policy changes and make MAA a common approach/obligation wherever useful, including in non-Horizon (national) funding sources, since it is not always easy to measure changing mind-sets. The concrete will to realise impact from research funding is still too limited.
<p>How to improve or facilitate implementation of MAA in the future</p>	<ul style="list-style-type: none"> • Go for longer project periods when drafting proposals. Establishing a fluent functioning interaction often takes at least one year (this is similar in non-MAA projects, but in those cases it is less damaging because work packages are delivered in separation, without co-creation) • to improve the sense of responsibility, all beneficiaries need to adhere to the objectives and to feel truly committed to the project and outcomes; • increase the awareness of the pivotal role of the facilitator and to train advisors (and other relevant actors)well, to become innovation facilitators; • to exchange good practices so that actors and networks can learn from each other.

Connection of OGs with MA H2020 projects , or other funding (EFRD,...)	
<p>Bottlenecks in connecting H2020 projects with OGs</p>	<ul style="list-style-type: none"> • synchronisation of the ending of H2020 MA projects and the application deadline of OGs; • language: OGs working in national language versus H2020 results published in English: failing AKISs; • limited flexibility in re-designing projects, whilst innovation is experimental, bottom-up and interactive. For instance, running MA projects may meet newly established OGs along their project period, with which they would like to work together; • lack of competences in the H2020 facilitating structure on agricultural innovation (sometimes the responsible actor is not sufficiently knowledgeable about the sector); • lack of knowledge by national AKIS actors about H2020; • in general, OGs are not sufficiently connected to H2020 initiatives (yet): failing AKISs; • there are no common agendas or systemic inter-connections between OGs (yet): failing AKISs.
<p>Solutions to better connect H2020 MA projects with OGs</p>	<ul style="list-style-type: none"> • national bodies/organizations which facilitate the implementation of H2020 results, could obtain a “mandate” or someone specialized in connecting H2020-projects to OGs (= AKIS action); • chambers of agriculture, national research institutes or innovation oriented national rural/EIP networks (depending on the country) should also acquire sufficient resources and capacity to work as intermediary facilitators between OGs and H2020 (=AKIS action); • the private knowledge sector (consultancy companies, private research institutes, etc.) could also invest in establishing the connection.
<p>Added-value and potential of connecting H2020 projects with other national, regional projects and networks than OGs</p>	<ul style="list-style-type: none"> • engagement of other projects/networks in solving questions which OGs cannot solve; • to increase the dissemination of results. Dissemination that reaches ‘the last mile’, meaning information that should be easily converted into practical benefits (return on investment): e.g. connect with demonstration programmes (AKIS action); • to create space for interactive innovation: the more projects involved in regional/national AKISs, the better the MAA works.

<p>Main recommendations to improve/facilitate the connection of H2020 projects with OGs</p>	<ul style="list-style-type: none"> • build incentives to translate/implement the results of MA H2020 projects in the formation of operational groups and vice versa (e.g. physical events, knowledge reservoirs); • cluster OGs and link them to H2020 MA projects, in particular using support from regional and national AKIS structures (AKIS action); • develop a question data base dedicated to OGs to find relevant material from H2020 projects; • do not replicate what is being developed at EU level but focus on adapting the results and making them accessible to farmers.
<p>Availability of end-user material produced by H2020 projects on the long term</p>	
<p>Acceleration of the uptake of end-user material produced by H2020 projects</p>	<ul style="list-style-type: none"> • accelerate the translation of results into practice abstracts and interactive events such as exchange visits, demonstrations and other physical meetings, already during and at the end of projects or even later (through dedicated dissemination funds = AKIS action); • translation funds could be established to translate results into local and regional languages (AKIS action); • involve actors, especially farmers, advisors, enterprises and associations from the start of the project. Communication and dissemination may be stimulated in two ways: both scientifically and practice oriented.
<p>Ensuring sustainability and easy access of H2020 end OG end-user material on the long term</p>	<ul style="list-style-type: none"> • through EIP abstracts at EU level (EIP-AGRI, knowledge reservoirs,...) for which stable and long term media channels are needed; • every project should use social media such as You Tube and/or already existing platforms (websites). Social media like twitter are good for quick communication. Videos on You Tube can provide subtitles in different languages. Also, Google translate is quite far in its translation possibilities. Dedicated professional support from national AKIS structures to develop such skills is very useful (= AKIS action); • permanent attention to last and sustain results is needed, at both national and regional level. The after-life of the project is also important; • knowledge centres or reservoirs could be set up which link knowledge to innovation hubs. Advisory bodies,

	<p>educational institutions and innovation oriented national networks (EIP/ CAP networks) could help provide/ manage these centres/reservoirs (=AKIS action)</p> <ul style="list-style-type: none"> • use the current EIP-website as a central EU online platform to capture end results of EU projects; • connect CORDIS to the EIP website and future knowledge reservoirs. This should be publicly financed. It is not expected that farmers will pay for this service or that private organisations are going to pay for it; • the challenge is to develop (online) platforms which are sustainable to continue the dissemination of the project's results. Involve them in the (pre)proposal and proposal stages of the particular project already. The experience is that current publicly financed platforms usually end after the financial project support.
<p>Inter-connections and creating linkages of end-user material coming from different projects</p>	<ul style="list-style-type: none"> • keep information alive through interconnecting activities (=AKIS action). • stimulate thematic networks on similar topics to cross-fertilize results and stimulate/organise regular knowledge exchange; • clustering and networking are important to be able to exchange knowledge. A minimal degree of overlap or repetition in projects should be allowed to make the inter-learning aspect more comprehensible and enhance continued learning.
<p>Main recommendations to boost the diffusion of end-user material and ensure its long-term sustainability</p>	<ul style="list-style-type: none"> • communicate and disseminate, build and cross bridges, from the start. Link dissemination to education, in particular vocational and prevocational levels and provide trainings or master classes. Make sure that sustaining results for (future) end-users has permanent attention; • create more peer-to-peer networks • perform analysis on how end-users (farmers, advisors and entrepreneurs) adopt information.

The SWG SCAR AKIS came up with some further ideas to enhance interactive innovation by MA projects.

3.7.1 Synergies

More space for interactive innovation should be created and stimulated by enhancing synergy between instruments and projects in EIP-AGRI. The possibility to connect funds, link projects and networks (synergies) has to be analysed in advance. One incentive for forming OGs could be to give an extra point in the evaluation process to follow-up and adapt H2020-MA projects' evidence-based results to be implemented in practice, when designing an OG project. This could be done in a similar way during the evaluation of H2020 MA projects. Furthermore, a database could be developed to collect questions from OGs for further development which can be translated into calls for new H2020-projects.

3.7.2 Continuation

Another suggestion regarding TNs is to create a system of minimal degree of overlap between these networks so connections can be easier and the different actors involved can learn from each other and the different approaches;

3.7.3 Choice of actors

To enhance the MA approach a thorough actor and network analysis who and when to involve in the innovation process, is essential. Think early in advance why you are doing, what you are doing, who you are doing it for and who should be involved. This analysis can also provide insight as to who will not be that relevant to involve. The choice of actors in an OG or a MA project has to be a careful consideration;

3.7.4 Improve exchange and connections between geographical levels and instruments

Better connections between MA projects at regional, national and EU level should be enhanced. With regard to the lack of competence and budget to facilitating a national structure for agricultural innovation, national EIP contact persons do not always have sufficient knowledge nor enough connections with the agricultural sector.

If we look at national sector organisations, they are not always sufficiently knowledgeable about EIP-AGRI. They are organised around their members, hence the non-members are harder to reach (indicating a gap). The authorities which focus on implementing H2020 results at national level should be better connected to the authorities managing EIP OGs. There is a disconnection between these authorities, meaning Chambers of Commerce, Ministries, H2020 National Contact Points (NCPs) and EIP/rural networks focusing on innovation, in various degrees depending on the Member State.

There should also be **clearer connections between national and EU institutions.**

They could be reinventing wheels because they are not sufficiently aware of what is going on beyond their scope. The national managing authorities and the national EIP networks/EIP Service Point could be more transparent and responsive to releasing lists of selected OGs. **Some syntheses and regular updated lists could be**

disseminated on a regular basis, to improve net-working and cross-fertilisation. It is not always easy to find proper connections between H2020 and national or regional interests. NRNs/ national EIP networks should facilitate these connections, feeding into the back-office of advisory services. Therefore, training of NRNs/national EIP networks on H2020 MA projects (with the support of NCPs) to be able to provide better guidance, is required. Furthermore, EIP/innovation oriented network workshops could be organised

Some syntheses and regular updated lists could be disseminated on a regular basis, to improve networking and cross-fertilisation. It is not always easy to find proper connections between H2020 and national or regional interests.

The authorities which focus on implementing H2020 projects at national level (National Contact Points) should be better connected to the authorities managing EIP OGs and the EIP networks. More attention for practice output is needed, both from the researchers as from the networks.

to disseminate results of H2020 projects to interested actors and to support e.g. researchers in their communication to farmers. Make the knowledge come alive, so that national EIP communities can be better fed with H2020 results and play a role in the long-term availability of end-user material.

Vice versa, **the mind-set of researchers/scientists to publish in a more practice oriented manner needs to change.** EIP-AGRI could provide good examples to help the publication of H2020 practice oriented output, such as attractive practice abstracts and nice videos.

3.7.5 Administrative burden and flexibility

To anticipate and cope with administrative burden, make the threshold as low as possible for different actors to get involved. Focus less on fixed and **focus more on lump sum budgets**, to be able to involve additional partners in the project stages and enable financial actions when it is relevant. This also allows the opportunity for actors to get on board of the riding train when they 'hear about' the project. Furthermore, reserve budget for unidentified purposes in the project and make sure there is ample budget

Allow the opportunity for actors to get on board of the riding train. Make sure there is ample budget calculated to organise cross-visits and for knowledge exchange.

calculated to organise cross-visits and for knowledge exchange.

3.7.6 Communication and listening

With respect to **communication**, projects should already communicate about their aims and ambitions from the start and continue communicating up-dates during the project.

Listening is very important. What are the end user's needs? Implement and disseminate results when and where needed. Is it really needed to set up another project website (costly) or can existing channels be more effective? Language is an important issue. Google translate can help overcome language barriers. However, it is still recommendable to translate (practice oriented) output in native languages. Each interactive innovation project should aim at setting up a **YouTube** channel and connect it to existing national and regional platforms. It is also recommendable to build in a digital counter e.g. on the project's website, where actors can ask questions (Q&A). Focus communication around a set of knowledge hubs focusing **first and for mostly farmers and advisors**.

Implement and disseminate results when and where needed. The **target groups** are first and mostly **farmers and advisors**. Is it really needed to set up another project website (costly) or can existing channels be more effective?

3.7.7 Cross-border cooperation

A joint workshop on cross-border cooperation between the SWG SCAR AKIS group and potentially other organisations could discuss possibilities for enhancing cross-border interactive innovation, to share experience in supportive instruments such as EIP, LEADER, INTERREG, H2020, ERA and initiatives such as EUREKA and PRIMA (Article 185). Information should be collected in a common EU database. There is a need to deal with these overarching actions. The national EIP and innovation oriented CAP networks should have a pivotal role as contact points in their agricultural networks. Also, the CAP proposal for enhancing AKIS in the member states, offers momentum to encourage more cross-border cooperation in interactive innovation. The SWG SCAR AKIS Could support development of a platform where multiple actors can exchange knowledge, experience and network for cross-border cooperation. This platform should not only focus on EIP-AGRI's funding instruments but broadly connect and exchange knowledge and experience from all kind of instruments such as national R&I projects, INTERREG, LEADER, sectorial research etc. This will also provide opportunities to seek for synergies. The EC should take on a

The CAP proposal for enhancing AKIS in the member states, offers momentum to encourage **more cross-border cooperation** in interactive innovation.

guiding role in steering, informing and stimulating the member states regarding possibilities for synergies.

3.7.8 Linking knowledge production and education

The link between new knowledge production and education should be enhanced so that MA **project results and the interactive innovation approach can be incorporated in curricula and teaching material**, to educate both current farmers, advisors, researchers, entrepreneurs and those of the future. EIP networks and CAP networks oriented to innovation and education could be involved to form and animate knowledge reservoirs with a view to continue utilising the knowledge developed, for instance in trainings and through teaching material. A link with the advisors' back-office(s) could be efficient in order not to overlap efforts.

3.7.9 Erasmus+

Finally, **an Erasmus+ programme for young farmers to exchange experiences inter-regionally and to visit other farms to discuss mutual challenges**, could have added value. The potential amount and level of knowledge that can be exchanged between farmers is huge. The main challenge is to connect the right level of knowledge to various farmers. Advisors could play a role in organising these different level study/knowledge exchange groups.



4 Advisory services post 2020



4.1 SWG SCAR AKIS policy brief on the future of advisory services

Text by Inge Van Oost based on a series of discussions within the SWG SCAR AKIS and replies to a questionnaire to Member States

The Strategic Working Group (SWG) of the Standing Committee of Agricultural Research (SCAR) on Agricultural Knowledge and Innovation Systems (SWG SCAR AKIS⁴) zoomed in on one of the cross-cutting topics identified in its 4th mandate: exploring the "Future of Advisory services" in an evolving AKIS.

The group cooperated to develop this policy brief in 3 meetings, on 14-15 June 2016 in Brussels, on 5-7 October 2016 in Budapest and on 30-31 May 2017 in Bonn. The brief builds not only on the views and exchanges between SWG SCAR-AKIS members but also on the outcomes from relevant projects and programmes invited to the meetings and on the input from a number of experts with relevant competences in Member States who informed the members of the SWG SCAR-AKIS along this period.

Since the specific context in each Member State may differ and this policy brief was made by a group, it cannot state individual positions of the participating Member States' experts. This policy brief represents the consensus of the SWG SCAR AKIS as a think tank. The conclusions of the discussions were endorsed in the meeting in Bonn and provide food for thought for all involved in the future role of advisory services in Europe.

4.1.1 Future roles of advisory services²²

4.1.1.1 Farmers need the right form of affordable farm advice more urgent than ever

In essence, **what farmers need is timely, tailored, trusted and simple advice**, even if they do not constantly need it, and if sometimes they don't always know the value of it until afterwards. For a farmer to take time out of their day is a larger sacrifice than it might seem. Therefore, when they do so to ask advice, this advice needs to be the best it possibly can be, to make the best use of everyone's time.

Farmers' organizations notice that low profitability in farming results in the fact that **paying for advice is lower down the priority list for many farmers**. This is made worse by the need to pay for advice to comply with rules and fill in forms. With so much advice needed to simply comply with

²² with the range of interactive advisory functions/activities in the diagram in Annex in mind, and including the classic linear knowledge transfer role

rules, there is **little time or resource left to advise farmers on how to improve their systems**. They advocate funding from governments to help, but currently this is low on the national/regional political agendas.

Careful attention must be paid to the **suitability of the advisor** involved. Farm advice is increasingly privatised. While this itself might not be bad, the problem is affordability. Privatization of advice supports the bigger farms. Digitization will even reinforce this evolution and incentives are needed to counter this.

4.1.1.2 Production system oriented advice is lacking

A recent study²³ shows that young **farmers' main knowledge needs are still very production oriented with a focus on technologies**. What farmers most expect from an advisor is tailoring this technological knowledge to their farm.

Due to demands, a lot of technical advising has gradually been replaced by support for farm subsidy application as well as for production certification schemes for which there is a rapidly increasing demand. This has led to a **reduction of competences of the remaining (public) advisors by lack of practical field experience**. The public or private-public farm advisory services are more focusing on non-profit and public services.

4.1.1.3 A new role for agricultural support: impartial and farm-tailored advice

The future advisory services need to be able to give **holistic advice to farmers while at the same time top-of-the-art advice for specific problems**. The advisor needs to be able to consider all aspects of farming, from the overall effect on the **farms' profitability** from changing parts of the production to **specific technical advice**. Advice related to markets and farm viability has always been required and will continue to be essential in the future.

Overall many private advisors, be it impartial ones or those linked to commercial companies (selling/buying agricultural products, suppliers of inputs etc...) have filled the **gap of the lacking technological advice from public services**. An effort to **increase advisors' technological competences is needed**.

Advisors need to be able to integrate a broad spectrum of specific issues in order to give impartial and farm tailored advice. Besides far-

²³ Pilot project on Exchanges Schemes for Young Farmers, see slides 23-28 on https://ec.europa.eu/eip/agriculture/sites/agri-eip/files/field_event_attachments/sem-knowledge-20151203-pres02-inge_van_oost.pdf

ming practices and technology, mitigation and adaptation to climate change, increasing the value added of farm products, diversification of sources of income, and many more issues are challenges to tackle through appropriate advice.

4.1.1.4 Reconnection of advisors within the AKIS is vital

Advisory systems in the recent past have become too static and oriented to pure one-way “knowledge transfer” to cope with **current challenges, widening the gap between small and big farms.**

Therefore, in general the role of advisors should be put more **central** in the AKIS system. **Improved connections with the rest of the AKIS are of vital importance for the future and to realize a reorientation of advisors to sufficient technological competences and a “knowledge exchange” attitude.** Therefore, advisors’ role within the AKIS should be highlighted, in order for them to become more involved in the development of the sector.

This would support advisors to better **pick up farmers’ needs**, contribute to **strengthening links between farmers and researchers, and increase their participation in research and innovation projects.** In some Member States, knowledge flows through the AKIS are still close to non-existing and the first priority remains to establish a linear model of knowledge transfer through advisory.

The regional/national advisory services might be too small to attain all knowledge and skills needed and therefore **more networking of advisory services is needed.** Additionally, as the advisors become more involved in the development of the sector, they need to **communicate farmers’ needs back to the researchers to a higher degree and participate** in research and innovation projects. However, to ensure this, financing and incentives are mostly missing. Also, incentives for researchers to present the results of their work in a comprehensive way are needed.

Last but not least, advisors are **poorly involved in the definition of policies and programmes.** They usually become active in the implementation stage, when decisions are already taken. **Advisors should be part of the programming process in an early stage** and not only beneficiaries/targets of one or more measures. Such participation would surely help to better tailor programmes on farmers’ as well as advisors’ needs while enhancing advisors’ ownership of programmes adopted. In fact, art. 4 of the European code of conduct on partnership in the framework of the European Structural and Investment Funds (Commission delegated Regulation (EU) of 7.1.2014) mentions advisors as one of the main categories of actors to participate in the programming process.

Supporting an interactive role of advisors already in the early stage of definition of policies and programmes would help **creating an enabling environment to better connect practice and science.**

4.1.1.5 From a linear role to a listening and coaching role

As challenges become more complex, **advisors should also be aware that systems are moving and be ready for change**, both in the ways they manage their own service and as in their relation with farmer/clients. Linear advising will always continue to play a role, but it should be noticed that farmers respond poorly when someone simply stands in front of them and tells them what to do.

The future advisor should be more **listening** oriented, able to take an intermediate position and support the farmer in particular by **tailoring the breadth of information to the specific farm conditions and aspirations of the farmer**. Farmers may find some technical issues themselves and share them peer-to-peer. However, this does not reduce the important position of the farm advisor who is needed to bring in the "**landscape view**", being able to reply to questions such as "how does it work on other farms?", "is a specific strategic or production system approach also the best one for my farm?", etc....).



Fig. 14 The future advisor should be more listening and support the farmer by tailoring the breadth of information to specific farm conditions and aspirations of the farmer.

With knowledge levels increasing in the agriculture sector, **the role of an "advisor" is becoming less and less linear and moving towards "coaching"**. Advisors will have an increasingly important role as facilitators and brokers for cooperation and innovation development. Hence, these skills need to be improved and new techniques for knowledge exchange and management enhanced, additional to the classical linear role and with a stronger focus on technological competences. Gathering practical experience in doing so is from utmost importance for the advisor of the future.

4.1.1.6 Accompanying peer-to-peer processes

Farmers more than before are learning from their peers, thanks to the ICT possibilities but also because they have always wished to do so. They trust their peers because peers are expected to have practical experience and in particular have a keen eye on the holistic aspect of farm solutions, while some advisors may be too specialized or linear thinking (dominant). **Advice is always better when it comes from someone with experience or at least real understanding of farming.**



Fig. 15 In group coaching the advisor acts as a facilitating specialist-agronomist with the knowledge on basic farming and production techniques.

Therefore, **group coaching** in certain Member States becomes more in fashion and important (e.g. Teagasc discussion groups in IE). The advisor in this case is not just a simple facilitator but acts as a **facilitating specialist-agronomist with the knowledge on basic farming and production techniques**. He/she brings in the broader view on the elements behind the variability between farms and between the production systems of the farmers in the group. The advisor should also be able to facilitate the exchange and

cross-fertilise between different farmer groups, for example, between organic and conventional farmers or between beef and dairy farmers.

It is very helpful to use **techniques** that keep the interest and attention span of farmers, e.g. following farm trials, focus on machinery, sending each other WhatsApp photos to follow the evolution or to exchange knowledge on a pest. It is also important to use simple IT technology for sharing and receiving feedback (FR Agricultural Chambers).

To support such group coaching role, advisors need communication and intermediating skills while keeping an eye on strategic farming issues. **This role may not fit each advisor at any time, but teamwork** and exchanging tips and tricks between colleague-advisors with more competence and experience in specific technologies or in strategic advice should be able to solve this.

4.1.1.7 Increasing possibilities for online and automated advice necessitate stepping up advisory competences and tools enabling the multiple use of data

Farmers and advisors are more and more using IT tools and working with digital info and data (internet, smartphones, e-learning, twitter, apps, various kinds of digital tools etc....). **Many existing and new data flows could fulfil multiple uses and be brought to a higher level through improved ICT applications if supported by independent advisory services and made interoperable with harmonized standards for data exchange.** For instance, compulsory recorded animal data can help improve breeding and husbandry on farms. Recording the application of plant protection products under IPM schemes and data collected in the framework of CAP direct payments and Agri-environmental measures can help optimizing cost-efficient production. Nutrient application data and soil analysis linked to area based payment mapping systems could provide valuable input for regional farm nutrient recycling, waste management and to monitor environmental impact. **All those data can also serve research purposes.**

Farmers will have to be informed on the potential, the cost and benefits of investments in digital technology, and need impartial help to understand their position in a digital environment (data ownership, interoperability etc...). They will need support from intermediaries such as farm advisors to take up the newest technologies and help with tailor made decisions on ICT use which are adapted to the specific farm context. The advisors of the future need dedicated support and efforts to be ready for such tasks.

4.1.1.8 The essence of future advising is face-to-face on-farm, tuning blended learning to the farm context

Various types of information are coming to the farmer through a variety of means (internet, smartphones and apps, e-learning, group work, bench-

marking, innovation projects and also input from the non-agricultural sector). Even with all this blended learning, it stays beyond doubt that **face-to-face on-farm advisory activities stay key**, because they enable correct **tuning of the blended messages to the specific farm context** and ensure a **full understanding of the farm conditions** before advice and farm decisions are made. Face-to-face and on-farm work is also important for convincing/communication purposes and for giving the **farmer the opportunity to express his views** and give feedback on the received external information.

4.1.2 Criteria for advisors

4.1.2.1 Impartial, having the competence and means to enhance the ability to change

Many kinds of people are so-called "advisor". What should be the criteria for being considered an advisor?

Advice comes from an individual advisor, which may belong to an entity (private or public/small or big), with a conscious ambition to intervene so that the customer (broadly defined) improves his/her ability to change. The purpose is communication and an intervention in order to support change. This is only possible if the advisor has the competence and the means (e.g. financial resources) to do it. **The advisor should be impartial and not promoting a specific product or technology.**

One definition of extension/advisory services is that advisory services are 'conscious interventions in order to create better preconditions for change, carried through by an entity having the means and competence to do it'. Farmers may receive substantial and often valuable information from companies in the context of their commercial objectives. However, farmers need to be enabled to receive independent "advice" that is not part of a "product service" package.

4.1.2.2 Providing tailor-made knowledge tuned to the farm

It is important that the advisor provides **knowledge tuned to the specific farmer needs**. It is equally important that the advisor operates on a tailor-made basis, i.e. that he/she acts based on what the farm and the farmer would serve, which is perhaps is not necessarily what the farmer is expressing as his/her need, nor what the employer of the advisor may want.

An AKIS should be constructed with an open approach so as to benefit from new actors entering the system, coming from for instance the regional innovation systems, other sectors, etc... They will add their knowledge and experience to those of advisors, and this is hard to pre-define.

How the quality of the advice can be assured is an ongoing discussion among advisory organizations today, not least due to the implementation of new management concepts like Lean Production Philosophy (SE). It will be **hard to pre-define quality criteria for advisors as well as to delimit who are allowed to call themselves advisors**. A single unique EU certificate for advisors was rejected some years ago because there was a fear for lack of adaptation to local conditions and structures.

A code of conduct or guidance built among advisory services may be a useful initiative at EU level. Also farmers' organizations may want to be consulted with a view to help ensuring that advice given is as relevant as possible to the realities faced by farmers.

4.1.3 An advisory system ready for the future

4.1.3.1 Emerging new challenges

How to shape an advisory system ready for the future? Beyond existing challenges for linear advising, following issues will have to be tackled for future advisory systems:

- covering new needs (incl. innovation brokerage and market issues);
- adapting to new farmers' profiles (new entrants, part-time or hard-to-reach farmers);
- broadening access to information (incl. inter- and transdisciplinary cooperation/collaboration, use of ICT tools);
- closing the gap between research and advisory services;
- promoting holistic approach to advice (connect technical advice to farm production profitability and market issues) and at the same time seek more specialized advice;
- linking to international networks to find knowledge and advisors with specialized competences where needed;
- need for receiving input from specialists from other countries on specific techniques.

4.1.3.2 Key is to enable advisory services with hard and soft infrastructure for enhancing knowledge flows

The above mentioned pilot study on knowledge needs for young farmers shows that knowledge infrastructure and the educational systems are key, because **they enable the possibility to get 'real' impartial advice and sufficient quality of knowledge/advisory services**.

Therefore, the advisory services of the future should be enabled with **hard and soft infrastructure enhancing knowledge flows in the agricultural knowledge and innovation system** (the latter to be understood in the broadest way, including the whole bioeconomy and in particular connecting to

other sectors and the regional and national innovation systems). It is important to build **cross-cutting** solutions because of ever changing challenges and the overall need for more interactivity. Not only farming knowledge counts, a lot can be learnt also from areas outside farming.

4.1.4 An enabling environment to connect practice and science

How should future policies and programmes make an enabling environment where advisors play an interactive role connecting between practice and science?

4.1.4.1 Strengthening support systems which enable advisors in their job

In research on advisory services a distinction is often made between front-office and back-office issues. "Front-office" relates to the advisors' interaction with the customer (farmer) and "back-office" the **organizational support system that enables the advisors** to do a good job and develop their skills.

Many advisory organizations do not have strong back-office processes (e.g. no development or innovation funding, no internal process support, no time allocated for developing skills in innovation, not enough contact with researchers and other AKIS actors, etc.). This is becoming one of the **main bottlenecks** when trying to strengthen the AKIS. In order to compete effectively with sales representatives, public or private impartial agricultural advisory services require professional back-office support to gather information on innovative technologies, modern management and application of new ICT technologies.

In order to be able to keep knowledgeable, impartial and experienced advisors continuing their job, **correct wages, career opportunities and promotion systems** are needed.

4.1.4.2 Public funding for market failures according to policies creating a level-playing field

How this might be overcome is a hard question, because one supposes advice to be financed by the receivers themselves. However, this is not happening, partly because of low profitability in farming, shrinking the market for high quality advice, and more and more importantly because of the hard competition with so-called private advisors, which are in fact staff financed by companies selling or buying products and technologies (see AKIS III first scenario). These companies see more and more an interest in what they call giving "advice", because this is a very effective way to influence farmers' decisions.

Public funding should be considered when a **market failure** is present. For instance supporting disseminating research results and improving knowledge

transfer techniques can take on some of the risk associated with development work. Additionally, education for advisors should be strengthened and publicly funded (cfr. AKIS III second scenario).

Authorities should not act too “top down” when designing advisory systems. Individual countries and regions should be allowed to design their own organization of advisory services to meet their needs. Overarching structures however can help to **ensure quality throughout the EU and a level playing field** to make sure that all farmers are receiving the best advice possible, while at the same time strengthening the links between research and practice

4.1.5 Researchers and advisors together help knowledge flowing and stay public

How can collaboration and networking between researchers and advisors make knowledge flowing and stay public (i.e. avoid knowledge to become mainly privatized, the risk indicated in the first scenario of the AKIS III Foresight)?

4.1.5.1 Develop approaches making knowledge generated with public funds better utilized and shared

The collaboration and networking among researchers and advisors needs to be improved and this could be supported by public funds. This **cooperation between universities, research institutes etc. and the advisory services** (along with other actors in the AKIS) **is key to ensure that new publicly funded knowledge stays public in the first place** and is broadly spread.

Public authorities and research entities must be much more active in this area and facilitate interactive innovative processes themselves to a higher degree. There must be a **continuous monitoring and evaluation of how publicly funded knowledge is utilized and policies should be adapted according to the findings**. Often so-called “leverage” (partly private financing of research), even in low percentages, leads to reduction in the sharing of the research results.

4.1.5.2 Improve connections for knowledge to be shared and developed further

Additionally, it is important to improve opportunities to connect actors creating and using knowledge better with each other so that they are able to find each other in order to share and develop the knowledge further. For instance, **an open source approach for ICT tools incentivizes further innovation processes**. New publicly funded knowledge should be shared, for instance online, and turned in a format that is comprehensible to all actors within the AKIS. **Using additional channels beyond scientific journals** which are often only shared within the research community, for instance EIP-AGRI

practice abstracts, farmers' journals or broadcasting, websites of advisory services, ministries or farmers' organizations, etc.... will improve impact. **Researchers will need incentives** to share the results of their work in an understandable, comprehensive and interactive way with advisors and farmers. Furthermore, various EU funds could be engaged to support introduction of ICT tools supporting advisors and in consequence also farmers.

4.1.6 Structure, funding and training of long-term interactive advisory services

How should interactive advisory services be structured, funded, trained and networked to move to a more interactive innovation model? How can continuity and viability of the services be guaranteed?

4.1.6.1 Advisory services are in crisis and need to be put high on the political agenda

We need to **rethink the role of advisors, make them more central in AKIS, refinance them, support their training and reconnect them** to tackle current challenges. **The role the government should take in this process needs to be reconsidered. Government funding should be used in case of market failure.**

4.1.6.2 The funding and organization of future advisory bodies should be made resilient through a mix of public and private funding

Ensuring resilience of advisory bodies and improvement of the structuring of national/regional/local advisory services is urgently needed. The **funding and organization of future advisory bodies should be made resilient through a mix of public and private funding while keeping their governance independent.**

Coherent public governance of the interactions – in particular avoiding a complete governmental top-down “control” of advisory services - and incentivizing the whole AKIS system to this effect is necessary, while not crushing the private initiatives. **Various Ministries need to be connected** (linking Ministries of Agriculture, of Education, of Research, of Innovation, etc....). This could be done via transversal programmes, **a jointly governed body** or other approaches. It needs to be considered what should be the responsibility of the government and the private actors and how they should interact.

Providing continuity of staff in advisory bodies is key to safeguard (practical) competences of being lost or taken over by private companies for their own commercial purposes. It is considered not possible to build an advisory service on temporary projects, even if these projects may be very

supportive to upkeep or build connections with researchers and other innovation actors, and provide some sort of training/awareness raising on arising issues or challenges for advisors.

4.1.6.3 Key elements for resilient advisory services are support and continuity for a publicly funded back-office which enhances knowledge flows

The following elements are key for the organization of farm advisory services (including innovation support services with a focus on agriculture):

1. **Public support for a back-office strengthening links with research is needed.** This investment in knowledge infrastructure should be made available to all advisory services taking up front-office tasks because these influence farmers' decisions. The back-office support should be built with a view to support public policy goals such as improving research impact, dissemination and keeping agricultural education knowledge updated (basic education and vocational training), tackling issues related to public goods (water and waste management, climate change, biodiversity etc....), common management of ICT tools to avoid digital divides, etc..... This back-office approach should support continuity of staff in order to keep agro-food knowledge public, manage it and make it easily available. The back-office can enable thematic orientation where needed and get in intelligence from multiple sources. For instance, at certain instances, input from international specialists (not included in the national advisory services) may be needed for specific purposes, and could be catered for by the back-office which should have broader international connections.

2. **Input from researchers' work into this back-office needs to be organized.** An important part of the back-office is developing a "translation" from purely scientific language with limited practical application potential towards information which meets the receivers' capacities and is adjusted to the needs and requirements of farmers and advisors. The back-office at the same time could also be used to collect research needs from practice and give input for research and innovation programmes and policies.

3. In short, this publicly funded back-office should ensure **a high degree of connectivity in the AKIS system, in particular with researchers, advisors at other geographical levels, H2020 Multi-Actor Projects and EIP Operational Groups** bringing in innovative knowledge, but also with suppliers of inputs, other parts of the chain, with policy makers and with the broader society. The examples of Agridea, SEGES, and Teagasc may already partially illustrate this, as well as the idea of creating a "Baltic Advisory Service". **A strong back-office is the basis.** Besides managing the necessary knowledge for front-office use, also networking activities for various purposes can be actively built by these back-offices, e.g. rural development networking, dedicated innovation platforms (groups with specified membership) as a meeting place, organizing various "agro-food communities" (no

fixed membership groups but series of events where everybody is welcome) where farmers and other stakeholders can meet and where start-ups or innovative projects can be given a start, etc.

4. The back-office should support the **front-office**, which is delivering general or specialized on-farm advice directly to farmers. The front-office is taking in questions and where needed guiding them to the specialists in the back-office. Public funding for the front-office activities may be appropriate in particular when geared to dedicated areas or specific policy goals, for instance advice on public good issues, climate change, waste and water management etc.

5. Support the **peer to peer learning between advisors** will be building trust among advisors in a world of changes and uncertainty.



Fig. 16 Support the peer to peer learning between advisors will be building trust among advisors in a world of changes and uncertainty.

6. **Support for advisory team-leaders** who organize and train advisors both on skills (e.g. how to organize a field visit, how to handle difficult clients, etc....) and farm practices/technology/new crops etc. These team-leaders are multipliers of messages produced by the back-office but also carriers of e.g. messages with societal relevance which **deserve public support because of the leverage effect advisory services** have on the agricultural world. In Sweden, SLU and the competence centre RådNu is conducting research related to the transition to a more interactive and

networked advisory service. The advisory organizations themselves sometimes have a bit too naïve answers to the questions (more money, better customers, stronger signals from society, etc.). However, the experience is that this transition is much a question of **organizational culture and the leadership of advisory organizations** (as well as of other supporting organizations). One measure is of course increased competence on many levels, but there is also a need for a space for experimentation of new approaches, etc. An advisory service needs to optimize the performance of the whole farm, not one branch, in a holistic approach.

7. **Innovation brokering.** Advisors are in continuous contact with their clients (end-users of knowledge) and are ideally positioned for capturing needs of the producers and **encouraging the building of interactive projects**, capturing innovative ideas from practice. They should be able to allocate the right person to the right problem **and connect complementary actors around a common objective tackling a practical problem or opportunity.**

4.1.7 Towards modern advisory services in MSs

Is this structuring of modern advisory services happening and if not, why is it or why not? Who should take what initiative? Which incentives are useful?

4.1.7.1 Install a reliable platform oriented to empowering end-users, creating enhanced interactiveness and knowledge flows

Currently, **it is very difficult to find the best advisor and the best information.** For minor crops and specific themes, this is even more the case. A case illustrating this is that in Portugal knowledge on almonds is very much sought and even imported together with US business (Californian farmers are looking for Portuguese land), while simultaneously in Spain a 700 people seminar bringing public knowledge on almond production is being held without the Portuguese being aware of it. **The EIP is providing big value in sectors which are minor in their region and for issues where quick learning is needed** and can be made possible by the connectivity at EU level, e.g. emerging and innovative issues.

The information found on internet is not always qualitative or reliable, farmers need a quality check by impartial advising of high quality. EIP Practice abstracts could fulfill that role in the future AKIS infrastructure ("Agri-Wikipedia") on condition that sufficient investment is done in this unique EU database. Practice abstracts need to be produced and full information to end-users spread from all projects and all sources (national, regional and EU funded), not only OGs and H2020 Multi-Actor Projects.

There is a need for a reliable, qualitative information platform of user-oriented information enhancing and creating more interactivity. For the interactive aspect, one could think about initiatives such as the scoring system in e.g. "Booking.com", or producing 'likes' (Facebook) to give positive comments. **Quality checks will be needed** and such interactive system linked to each EIP practice abstract would be an asset to capture feedback, make advances and develop new issues/ possibilities or solve additional problems found during or after the initial projects. **This interactive platform should link to further research work.** "Monitoring"/ reflection on actions may induce feedback. Evaluation by the advisor on the actions taken by the farmer could feed into new interactive innovation projects and **create continuous innovation loops.**

4.1.7.2 Build an efficient, sufficiently open and comprehensive advisory system with a holistic approach

Building efficient advisory services in a region/Member State requires a holistic approach, staying sufficiently open for in-flow from outside the main existing knowledge organizations and advisory bodies. New advisors may come into the sector from various backgrounds, covering certain gaps in the market, and we need to capture those coming in and accompany them to bring the wanted messages, e.g. by training, networking and other types of support. The necessity to keep their advisory system open and comprehensive was the reason why Cataluña has stopped using the CAP RD support for the advisory measure in the period 2014-2020. **The use of public procurement does not function in a sector where there is no "market"**: some advisors for small sectors are unique and needed in the knowledge system, but could not be included because they were deterred by the administrative burden of tendering. In a well-functioning AKIS system, connections with such unique advisors should be integrated, and not lost.

An AKIS should be built as comprehensive as possible, comprising all kind of advisors. A number of interesting initiatives beyond the classical publicly funded advisory structures which support this in-flow are arising in this regard, for instance the Irish ConnectEd services for non-farmer agricultural professionals, such as Agri-food businesses, veterinary services, accountants, solicitors, etc. Another interesting example is the Belgian Innovation Support Service which started with funding from a series of innovative projects undertaken by staff of the study service of the Flemish farmers' organization 20 years ago. Meanwhile, the service evolved into a full blown advisory service whose only mission is to inspire innovation for farmers and rural actors, be it through informing and training or through innovation prizes and consultancy on both technological and more strategic and entrepreneurial issues. **Flexibility is very important, stimulating mental openness and learning farmers to share also in regions where they are not used to do so for historical reasons.**

4.1.7.3 Education and training for advisors

Lifelong education for advisors should be publicly funded, in particular in areas where education would not otherwise take place and where there is a societal demand for the outcome. Education programmes for advisors could be **commonly defined by advisors, education centers (like universities, training centres, etc.), and public institutions responsible for policies/programmes**. Systemizing such approach would support aligning advisors skills' enhancement and messages to farmers related to policies, programmes and strategies focusing on agricultural development.



Fig. 17 Lifelong education for advisors should be publicly funded, in particular in areas where education would not otherwise take place. To gain farmers' trust, advisors first need technological skills, and then soft skills.

A too strong focus on non-technologic advisory skills in training of advisors is risky. **To gain farmers' trust, advisors first need technological skills, and then soft skills.** If the advisor does not have sufficient technical knowledge, he will have difficulties to become trusted by the farmer.

This also is an argument to connect advisors as much as possible into the AKIS. Advisory services should cover the needs of a variety of farmers, both small and large scale, as well as have a deeper understanding of agro-ecological & organic practices and production techniques and how these can be applied in the context of conventional farming systems. Advisors' training on sustainability issues with agro-ecological focus should be fostered.

In many cases, specific advisory competences are missing (e.g. new techniques, new crops, minor sectors, drones etc....). **For building competence and practical courses on these novel issues for advisors, public funding is very much needed** since adequate impartial advising moves the collective intelligence of farmers ahead. For private impartial advisors, keeping up with the latest knowledge is key to keep a competitive advantage to staff from private firms which are paid for commercial goals. However, for impartial public advisory services, this is equally valid. Public authorities moreover have a responsibility to push the knowledge frontier even further, undertaking research and communicating research results in a format so that the advisors can incorporate the new knowledge in their advice and cover it from different perspectives (e.g. specific societal challenges, public goods, policy goals etc.).

Since **agricultural higher education is more and more going away from practical applications** and getting into smaller and more specialized niches, oriented to the most “publishable” research results, **the need for a more holistic approach offered by advisory services becomes more urgent**. An example of an effective way educating possible future advisors is a Masters’ degree on innovation support, a post-graduate study of 2 years where students work on concrete challenges for advisors. This Irish **M. Agr. Sc. Innovation Support programme** is organized by University College Dublin and co-supervised by Teagasc, the main state funded advisory service in Ireland.

Learning by advisors should not be linear but circular, it **should be taking into account existing knowledge, organizations and infrastructures**.

4.1.8 The adequate geographical levels to incentivize modern advisory services

Reflection about the adequate levels which can incentivize modern advisory services, be it at regional, national or EU level, and the connections between them

4.1.8.1 A supportive EU AKIS and advisory policy will provide EU added value and an incentive for national and regional policies

A clear and supportive EU AKIS and advisory policy is needed, not only for providing EU connectivity and EU added value but also because it **would fuel national and regional policy initiatives for innovative advisory services**. An EU framework with sufficient flexibility to adapt to national and regional context is however very important. This was one of the recommend-

dations from the Evaluation Study on the EIP-AGRI conducted by five independent consultancies and published in February 2017²⁴.

At regional level you may get access to additional funding mechanisms and regional networks, as well as closeness to practice. Some regions today have well defined ambitions in relation to the green sector, but we should avoid reinventing the wheel in each region. This is one reason why the **national level is important, to connect all initiatives** that are taken and also make sure that specific competence centers of strategic importance are supported. At **EU-level a conducive policy is important**, but also taking initiative on high quality competence development and development projects. Increased EU-level networking and cooperation will be beneficial.

4.1.8.2 Rethink EU support for advisory services and systems: making it more networked and comprehensive

Further to the key points mentioned in the above sections, **the current public procurement approach for EU supported advisory services is considered detrimental and based on the false understanding that there would be a free competitive market for advisory services.** In practice, advisory services are mostly working in rural areas. Localization of farms and advisors, as well as the limited size of some advisory services severely limits the possibilities for open competition. Moreover, what cannot be omitted is that advisors' **effectiveness relies on the trust they gained over many years**: often they cover niches and have to take into account relations with farmers' unions, cooperatives, buyers etc.

Also in case of training for advisors, introduction of public procurement rules influences negatively the effectiveness of the training. If advisors are to get the newest/updated knowledge, there is no market for training companies offering such knowledge, which would rather be available from research institutes.

In short, to have a broad impact on all advisors to influence farmers and multiply messages public policy wants to bring, the current public procurement approach for advisory services is counterproductive. For this, **all advisors need to be included in the knowledge system**, be it public or private or cooperative based.

Exchanges and an innovative approach to build peer-to-peer learning among advisory services should be actively encouraged. In France, a publicly organised "Vivea" training fund is made available by the government

²⁴ https://ec.europa.eu/agriculture/sites/agriculture/files/external-studies/2016/eip-2016/eval_en.pdf: « The flexibility of the EIP-AGRI allows it to be shaped to widely different circumstances »

to organize such exchanges and benchmarking. The reflectivity and peer learning among advisory services is which e.g. EUFRAS are offering is esteemed useful for supporting the building of insight in the structuring of local/national advisory services. Such initiatives are very useful, both at regional/national and at EU level. **Networking among advisory services at all geographical levels should be funded** and networking with research and rural development actors strengthened.

Finally, **co-location of advisors and researchers** is esteemed an effective approach which can incentivize informal contact and exchanges: knowledge exchange also happens when passing in the hall or drinking coffee together.

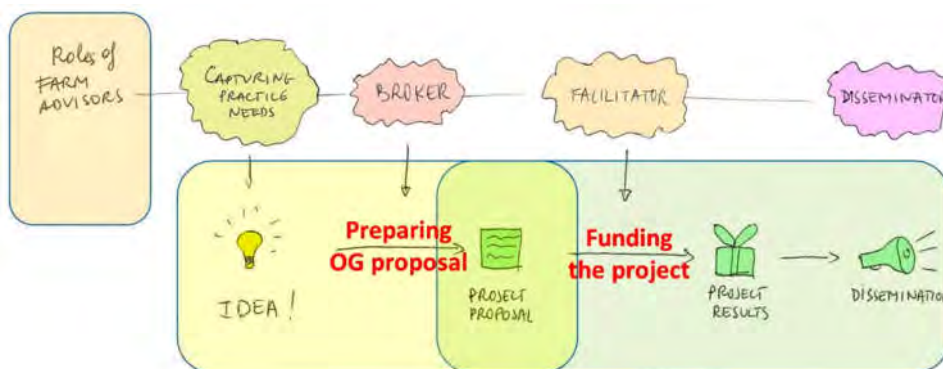


Fig. 18 Overview of advisors' new roles in interactive innovation processes.

Farm advisors "coaching" role in interactive innovation processes:

- capture practice needs;
- broker to set up interactive innovation projects;
- facilitate interactive innovation projects;
- disseminate newly generated knowledge;
- +



4.2 Two main instruments to integrate advisors within the AKIS and get them involved in interactive innovation projects

Text by Inge Van Oost based the SWG SCAR AKIS Policy Brief on the Future of Advisory Services (section 4.1)

In accordance with the conclusions of the SWG SCAR AKIS “Policy brief on the future of advisory services” (in particular section 4.1.6.3), 2 modern advisory approaches will help connecting advisors with research and CAP networks and support them to deliver qualitative advice and innovation support. As in described in Art 102 and 13(2) and 13(4) of the post 2020 CAP proposal, such actions may funded as intervention under the Strategic CAP AKIS plans. They help at the same time the integration of advisors within the AKIS (section 1.2.7), the provision of quality advice through knowledge flows and bridging between science and practice (section 1.2.6) as well as the emergence of interactive innovation projects (section 1.2.8). They are in line with Articles 102 and 13 of the CAP post 2020 and can be funded with interventions under Article 72. Both instruments are further elaborated in section 4.3.

4.2.1 The “Back-office” for advisors – integrating advisors within the AKIS

A dedicated “**back-office**” for advisors can provide up-to-date knowledge in support of **all** advisors in the field. In this advisory “back-office”, “specialist advisors” will **offer the latest scientific and practical know-ledge** to “on-field” advisors in daily contact with advisors who have to take a holistic approach to farm decisions. The “back-office” may help by replying to **on-field advisors’ specific practical questions** and provide them with regular **training** on the latest knowledge which they derive themselves from close connections with researchers and CAP/EIP networks. Based on the practice knowledge reservoirs (unique database of EIP Practice Abstracts) and further input from the CAP/EIP networks with a focus on innovation, the service may also develop a number of digital tools to be put at free disposal of all impartial advisors, for instance, provide:

A dedicated “**back-office**” for advisors can inclusively provide up-to-date knowledge in support for all advisors in the field. In this advisory support office, “specialist advisors” will offer the latest scientific and practical knowledge to “on-field” advisors.

- a Whatsapp group service for advisors to help solving advisory questions from the field,
- databases with IPM solutions per crop,
- info on pest and disease levels,
- data for sound nutrient and pest management, etc.).

Profiting of economy of scale for collecting and sharing data is also an positive effect of such advisory “back-office”.

An advisory “back-office” needs to be built in strong **collaboration between all researchers and impartial advisors**, as well as with existing farmers' groups, organisations and the **national and regional CAP/EIP networks who have a focus on spreading knowledge and innovation**, in particular capturing the innovative knowledge from EIP OGs and Horizon 2020 MA projects.

The functions of a “back-office” should also include a task to **systematically capture farmers’ needs and pass them to research** and may as such help to build interactive innovation projects through close connections with the innovation support service(s). Regular dedicated events, e.g. an event bringing together farmers, advisors and researchers to exchange practice needs and recent outcomes of research appear very useful for knowledge exchange. This could in summer e.g. take place on-farm and in winter in a conference setting with break-out groups where actors are mixed and reflect on challenges.

The “back-office” functions should also include a task to **systematically capture farmers’ needs and pass them to research**. As such, they may help building interactive innovation projects thanks to close connections with the “innovation support service”

The specialist advisors will probably be paid 100% for all tasks listed, since

The advisory “back-office could help collecting from “on-field” advisors what are most urgent farming needs and pass them to research for further inquiry or to training bodies to adjust their training programmes. This may also incentivize interactive innovation projects

these are public functions serving all farmers and advisors (even if such functions would be outsourced). The on-field advisors making use of the services of the advisory “back-office” will be probably be paid 100% for the training time organised by the “back-office”. One could for instance think about using a point system similar to the permanent training requested already now from veterinarians to keep

their license to execute their profession. All CAP interventions and

requirements or conditions (as listed in Article 13(4) of the post 2020 CAP proposal) in the CAP Strategic plan will form part of the content that the advisory supporting service(s) must deliver to on-field advisors.

Specific attention will need to be given to involve private advisors in the services provided, taking into account that their linkages with research and CAP/EIP networks on innovative know-ledge usually are quite limited. It can be very helpful that private advisors get full information on a number of priority practices linked with tackling societal challenges, such as integrated pest management, climate change, environment, reducing water use etc. It would be even more useful if they could get engaged also in innovative projects such as Operational Groups, as it will help their motivation to share the outcomes of the projects.

4.2.2 Innovation support services

Dedicated **innovation support services**²⁵ (sometimes called “**Innovation hubs**”) should be at free disposal of farmers in order to capture their innovative ideas and problems. A few Member States may use their existing innovation services or actors already doing so. Such services will be useful to comply with Article 13(4) of the post 2020 CAP proposal.

A main task of an innovation support service is **innovation brokering**²³: to incentivise innovative projects of operational groups, by capturing grass roots ideas and looking for existing info on the subject. They should be in a position to connect the relevant actors who may form an operational group, with a view to develop a coherent and feasible innovation project plan. The advisors will be supported for specific issues by the national or regional innovation strand of the CAP/EIP network, which will help guiding them to existing knowledge provided for by the EU level CAP innovation network. It could for instance happen that a ready-made solution already exists, and then a simple advice can be sufficient to find a solution. Or the idea may be really worthwhile, not only for setting up an Operational Group, but maybe even to build a European Horizon MA project.

Project facilitation is also a main task for innovation support services. Working with intermediates in the EIP operational group projects, the so-called “facilitators”, is important in view of keeping the discussion on the farmers’ problems and bridging between farmers' practice and the scientists or entrepreneurs which may have different objectives and time horizons.

²⁵ See more info on the role of an innovation facilitator in section 4.3.2 and 4.3.3 on how to facilitate interactive innovation processes in AKIS



Fig. 19 Innovation support services should incentivise farmers to participate in innovative projects to solve their needs.

Besides providing innovation brokering and facilitation services, innovation support services may help **promoting innovation** in general and guide potential innovators towards the right innovation funding formats, organise **brainstorming events** and an annual **innovation prize**, animate thematic or cross-sectoral groups, **coordinate projects**, and support broad **dissemination of innovative project results**. Providing innovation support services is a new "interactive" role which advisory services are expected to take up within the national post 2020 AKIS, if not done already. To this end they need to **(develop) interactive skills** and **need specific training**.

Furthermore, the innovation support service, in collaboration with the national CAP/EIP network focusing on innovation and knowledge exchange, may **facilitate participation of partners in consortium building** for H2020/Horizon Europe Multi-Actor Projects, in particular with regard to operational groups, farmers and advisors.

Some **seed funding will be very helpful to motivate potential partners to join preparatory meetings** for developing innovative ideas and drafting proposals. This can be funded with Art 71 interventions.

Existing innovation support services with experience can be found in Belgium²⁶, Schleswig-Holstein (Germany)²⁷, Scotland²⁸, the west of France²⁹, just to name a few.

The Innovation Support Service „EIP Agrar“

„EIP Agrar“ is a new services provided by the Chamber of Agriculture in Schleswig-Holstein, additional to all its usual tasks such as vocational training, animal husbandry, crop cultivation, energy, building and farm technology, horticulture, forestry, nature and environment. The Innovation office works on behalf of the Ministry of Agriculture, and supports the EIP-AGRI process in the region, organizing the regional EIP-network, public relations and knowledge transfer. The objective is a new innovation culture for the agricultural sector. In June 2015, 17 selected EIP projects have been launched (5,4 million euro for 3 years), and in the second call 13 projects were selected and funded for the period 2018-2022 (4,6 million euro). EIP OGs are a success story in Schleswig-Holstein.

Advisors in EIP Operational Group projects

In Schleswig-Holstein, agricultural advisors are involved in 100% of the 30 EIP projects (overall in Germany in more than 80%). There is minimum one adviser in each OG. Mostly, two or more advisors from different services or associations work together in innovation projects. Advisory services are lead-partners in more than 50% of the EIP OG-projects in Schleswig-Holstein.

Good reasons for advisors´ involvement in EIP Projects

Advisers are close to and used to work with farmers: they speak the same language, they know their changing needs, and they have the farmers´ trust. Together with farmers they are able to create ideas for innovations. All members, also advisors, can benefit from working in OGs. The project´s content could be interesting for further advisory work. Advisory services have the opportunity to be (better) known and to get more farmers as customers. Advisors´ work in EIP-projects is funded.

Best practice of advisors´ involvement in EIP Projects

Advisers take the initiative for possible projects initiated by farmers or by themselves. They draft agricultural projects and support the OG´s work. Advisors are not only experts but also moderators and organizers in OGs. They are able to translate between scientists and practitioners and help fasten the implementation of innovations. EIP needs knowledge transfer and advisors are the best disseminators in the agricultural sector.

²⁶ Innovation Support Centre, since early 2000, with links to the Flemish farmers´ organisation - www.innovatiesteunpunt.be

²⁷ Chamber of Agriculture, since 2014 - www.eip-agrar-sh.de

²⁸ Innovation Hub supported by the CAP, RD Technical Assistance, since 2018 - <https://www.innovativefarmers.org/welcometoriss>

²⁹ www.seenergi.fr

New tasks for advisory services in Schleswig Holstein:

- work with farmers groups and identify farmers' needs;
- initiate innovation projects together with farmers;
- support the innovation process, connect people;
- write funding applications;
- lead the OG;
- organize and support the project work;
- communicate and do the knowledge transfer;
- bring the EIP-project to the best results.

Carola Ketelhodt, Innovationsbüro EIP Agrar, Schleswig-Holstein, Germany.



Fig. 20 Once a farmer has had a good experience in an innovative project, peer to peer learning helps spreading the outcomes further in the agricultural community.

4.3 Zooming in on interactive innovation processes

Text by Inge Van Oost and Floor Geerling-Eiff, with input from the AgriSpin consortium.

4.3.1 Why do innovation processes need facilitation?

A lot of information derived from research is ready available on many agricultural topics. However, it is still a challenge to valorise this information into real knowledge. Knowledge can be defined as the outcome of the

An innovation facilitator helps to move the group of actors towards innovative solutions and supports their energy, on condition s/he has the trust and the believe of the group. Combining information with various experiences, skills and attitudes forms quite a challenge in terms of building trust among all actors involved, mutual understanding and ability to cooperate.

multiplication of information with experience, skills (expertise) and attitudes (Wegge-man, 1997). Therefore it is wrong to refer to knowledge as output of research results only.

The challenge is to mobilise knowledge supply and demand for innovation together, in a joint search and learning process for knowledge co-creation and valorisation. The Multi-Actor Approach (MAA) supports this process to enhance interactive innovation. One of the key acknowledgements in the MAA is the recognition that research and innovation (R&I) does not occur in a vacuum, nor that success depends on single actors and individual work.

The benefit of combining information with various experiences, skills and attitudes forms quite a challenge in terms of building trust among all actors involved, mutual understanding, capacity, time frames for being able to cooperate and other conditions and factors for innovation to be successful.

An innovation facilitator helps to move the group of actors towards innovative solutions and supports their energy, on condition s/he has the trust and the believe of the group. Combining information with various experiences, skills and attitudes forms quite a challenge in terms of building trust among all actors involved, mutual understanding and ability to cooperate.

Mobilising the positive energy (enthusiasm, motivation, willingness to contribute and attuning) of the group and its capacity for fruitful interactive innovation, is of utmost importance (Wielinga et al., 2008). Any actor (from the farming sector, other business, research, advise, education, policy, etc.)

could in theory be an innovation facilitator and help move the group of actors towards innovation. As long as s/he has the trust and the believe of the group to do 'what it takes' to support the energy of the group towards enlarging the strategic space of the actors involved, referring to the capability to innovate.

However, innovation facilitators in agriculture are mostly related to types of advisory functions but also from research or education. Matching knowledge to practice and stimulating novel entrepreneurial approaches on farm is an important part of their core business. This is more and more required and stimulated through the MAA.

4.3.2 AKIS setting an enabling environment for facilitators

The idea that knowledge flows from researchers, trainers and technical experts only, is out-dated. Mutual learning between practitioners and other key actors is at least equally important. New forms of media and information technology provide new possibilities for working together and exchanging knowledge.

Synergy and cooperation between the different parts of AKIS (governed by different incentives) and its actors is needed to close gaps between disciplines, sectors, institutes and organisations. We need a better holistic view on how farmers and other innovation actors create and utilise knowledge, where they get their information from. AKIS should provide sufficient support for interactive learning and innovation.

An innovation facilitator, sometimes also referred to as a "free actor" (Wielinga et al., 2008; Wielinga & Geerling-Eiff, 2009), has a neutral role, the capacity and the pro-activeness to support interactive innovation and the actors involved in their particular needs during the different development stages. He/she can support the individual farmer and/or groups in defining common objectives, identifying creative ideas, in finding alternative solutions and finding relevant actors who can offer their expertise required in the particular innovation stage. For scientists it can be difficult to get out of their scientific mode into a facilitator's role. It is also a matter of mind-set.

Because of their intermediary function within AKIS, agricultural advisors could play a key role in facilitating interactive innovation. More advisors ought to become experienced and skilled as innovation facilitators. Advisors also need to learn peer-to-peer, from other advisors.

Because of their intermediary function within AKIS, agricultural advisors could play a key role as intermediaries in facilitating farmers and other actors in interactive innovation. However, not many of the current advisors have had

the opportunity to develop skills for facilitating interactive innovation and being involved in projects.

Hence, more advisors ought to become experienced and skilled as innovation facilitators even if not all have the competence or feel the urge to do so. It is important to learn from best practices in innovation projects and activities, become more acquainted with interactive innovation and learn how to support this type of advice. Advisors also need to learn peer-to-peer, from other advisors.

Changing the mind-set from farm advisor to innovation facilitator needs to be supported by the enabling environment. This also requires adjusting and embedding (new) funding instruments. Innovation support services should concentrate on incentivising bottom-up ideas from farmers, getting farmers in contact with other actors and their peers, and bridging the gap between research and practice within the AKIS.

4.3.3 What is innovation brokering?

Preparing for innovation projects needs reflection on the right steps to take, as well as on the necessary skills to enable the processes. The EIP-AGRI aims at a flexible and open system for the creation of a multiplicity of Operational Groups. One of the essential conditions for effective interactive innovation is to capture creative ideas which have a chance to bring solutions or develop opportunities.

More specifically, the brokering which enables interactive innovation processes within AKIS is about:

- discovering innovative ideas;
- refining these;
- connecting the right partners which have complementary knowledge;
- looking out for the appropriate funding source;
- to finally prepare a project proposal on which all actors want to engage and agree that it will bring what they expect (find win-wins).

If through effective innovation brokering a good interactive innovation project plan is born, it is likely to have a better chance of passing a selection process for innovation projects from whatever funding source. It is worthwhile to invest in it with seed funding, which will generate and nurture emerging and novel ideas to be tested out. A number of meetings with the right partners will be essential, as well as the search for existing knowledge on the topic, which then needs to be shared and discussed with the partners in the future innovation project.

These are typical tasks for an innovation broker, and the funding of such a process does not need to be over-expensive. "A good start is half the battle", goes the saying. The brokering process ends when the partners come to an agreement on the project plan and on the roles of each of the partners in the activities. A cooperation agreement finalises the preparation process, and forms part of the project proposal.

"A good start is half the battle", goes the saying. At the start of an innovation process, it is worthwhile to invest in seed funding to prepare the innovation project. This will generate and nurture emerging and novel ideas to be tested out.

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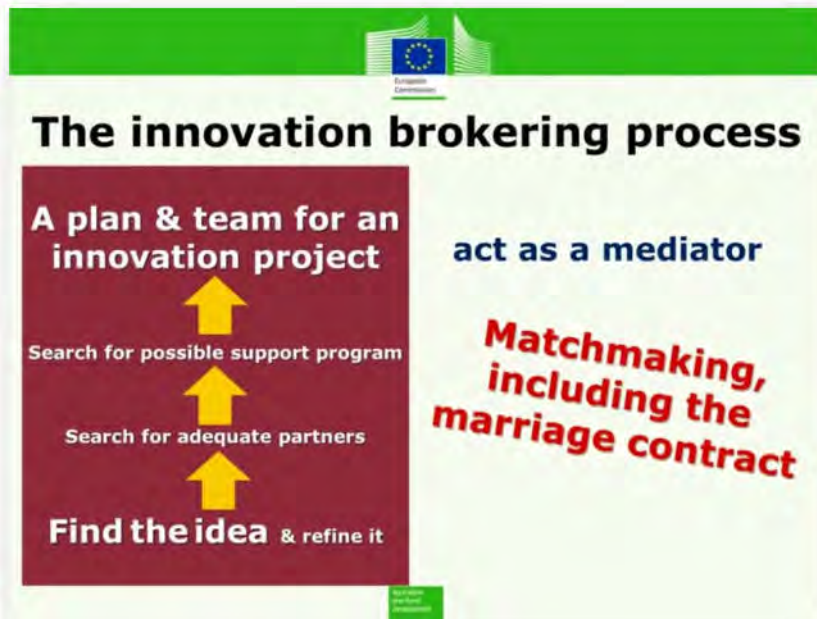


Fig. 21 Main steps in the innovation brokering process (Van Oost, 2016)

4.3.4 Skills for innovation brokers

Innovation brokers should thus be able to capture bottom-up ideas from the grass-roots level and get an innovation project ready to start by acting as a go-between. They are expected to help single actors which might have difficulties in finding the adequate partners.

For an innovation broker, a close connection with and understanding of agriculture is important. On the other hand, a cross-cutting approach beyond existing sectors, regions, initiative and institutes will bring added value. This balance is essential, as well as the listening attitude and the capacity to make the analysis what is feasible and how to tackle an issue.

Skills for Innovation brokers:

- be able to listen to understand exactly the problem/opportunity and the context;
- be capable to analyse the problem/opportunity: how can it be tackled in the best possible way (costs, actors, funding source etc.)?
- have a good network to find people and information;
- have intermediating skills to seek compromises where needed;
- be quality orientated: plans made have to work out eventually, responsibilities taken, don't create audit problems,
- where useful, think out of the box and do not defend your own position/research.

See also the Overview of advisors' new roles in interactive innovation processes (Fig. 18)

4.3.5 What are Innovation Support Services?

Besides the innovation brokering function (section 3.2.3) before the project starts, and the facilitation during the innovation project, a number of other services can support innovation processes (Van Oost, 2013). The various functions which can contribute to support innovation are listed in short below:

- **brokering** function;
- coordination and **facilitation** of projects as an intermediate between partners;
- innovation promotion and awareness raising;
- coaching farmers towards innovation (individual advice);
- brainstorming events and thematical animation;
- dissemination of innovative results;
- creating and maintaining linkages with SMEs, other innovation services and funding bodies.

4.3.6 Examples of innovation support processes

A few **practical examples** collected during the AgriSpin project may help understanding how innovation support services may work.

Some short videos of innovation prepared and supported by the Belgian Innovation Support Centre³⁰

- “Advisory Board”: Strategic innovation on a goat farm
<https://www.youtube.com/watch?v=KtC1CQCgZn4&feature=youtu.be>
- “Distrikempen” – Improving logistics in short supply chains
<https://www.youtube.com/watch?v=DmWWp4p9C04&feature=youtu.be>
- “Food Innovation Academy” – How farmers get innovative inspiration on a one day bus tour
<https://www.youtube.com/watch?v=bis7LbXKIlg&feature=youtu.be>

Further cases of the same project are available on the AgriSpin website:
https://agrispin.eu/wp-content/uploads/2016/10/Synthesis_report.pdf

The “Best practices” describe for a number of innovation cases the different stages of an innovation process:

<https://agrispin.eu/wp-content/uploads/2017/08/Best-Practices.pdf>

Interesting is also to look into the Inspirational Booklet page 11 which explains **how to observe innovation processes**, in particular through collecting information with observation cards, a simple method which helps to bring a lot of insights in how innovation projects run and what trajectories they follow. The observation cards zoom in on the innovation itself, the process, the support, the environment, actors and networks, as well as critical incidents, dissemination approaches and future perspectives:

<https://agrispin.eu/wp-content/uploads/2017/08/Inspiration-booklet-Agrispin-2017.pdf>

A manual for such observations is also available:

https://agrispin.eu/wp-content/uploads/2017/08/Manual_Cross_Visit.pdf



³⁰ <https://www.innovatiesteunpunt.be>

5 The actors that make AKIS work



5.1 Recommendations for on-farm demonstrations

Text by Anne-Charlotte Dockès, Marleen Gysen, Boelie Elzen, Peter Parea and Lies Debruyne based on the deliverables of AgriDemo-F2F and PLAID including input from the SCAR AKIS SWG members

Despite a widespread recognition amongst stakeholders that demonstrations are an effective way to exchange knowledge and facilitate transition, change and innovation, we observed several barriers, existing at various levels: in the organization, facilitation, hosting and attendance and access of on-farm demonstrations. Specifically farmers, advisors and (agricultural) students were mentioned as having most problems to overcome these barriers. (risks, money to attend). More specifically, a weak aspect of demo activities is the lack of compensation for using farm assets and farmers' time for demo activities. The same is true for advisors and researchers, if not directly involved in the organisation of the particular demo event. Farmers involved in demo activities are often engaged through personal involvement, however this can lead to a situation where the long term sustainability of demo activities relies heavily of personal approaches of some individuals. Provision of public funds for farmers operating as demo farms is seen as a precondition of an effective and systematic inclusion of demo farm event funding in any national AKIS plan.

Furthermore, calls for projects, guidelines for proposals, evaluation criteria and project management requirements often do not pay attention to the strong relation between peer-to-peer learning and impact, as is clearly seen from the instrument of on-farm demonstrations which is often missing (see also Recommendation 1). Unfortunately, existing possibilities in Rural Development Programmes (RDs) to create easy-to-access funding possibilities for demonstrations are often not used.

Based on the case study analysis, and further discussions with stakeholders, it is clear that the current EU rules for RD programmes offer ample opportunities for incentives and targeted funding of on-farm demonstrations. At the same time, there is a wide diversity in AKIS structures and composition across EU countries, resulting in very different ways of organising and supporting on-farm demonstrations across Europe. So, as a result, RDP measures and AKIS funding schemes are translated into national legislation in very different ways across Europe. The advantage of these national and regional structures in RDP is that they consider the existing local contexts and barriers (which are again diverse across EU countries), and adapt locally to help overcome them. There are lessons to be learnt, inspiration to be found in the way this is organised in other countries. This may help to vary the type of events and improve the own demo approaches.

It is up to the national AKIS coordination platform to take up this task.

5.1.1 Introduction

This chapter is based on the work of two Horizon 2020 MA projects (AgriDemo-F2F and PLAID) focusing on on-farm demonstration. The SWG SCAR AKIS interacted with the two projects and provided extra comments and suggestions on these recommendations which were included in the text. Beyond good practices for on-farm demonstration, also some elements on AKIS governance and policies to support demonstration and farmer-to-farmer learning are included.

The entire process resulted in four specific key recommendations, entitled '**Policy briefs**', as listed above and further described in this deliverable. Each description contains the main challenges, lessons learnt from PLAID and AgriDemo-F2F and the recommendation itself.

5.1.1.1 Role of on-farm demonstrations

PLAID and AgriDemo-F2F Horizon 2020 MA projects cooperate to form the Farm Demo network. The main objectives are to develop an EU inventory of demonstration farms and to collect best practices for demonstration events and processes.



The projects have the joint aim to enhance peer-to-peer learning and focus on on-farm demonstration as a tool to boost innovation. On-farm demonstration events focus on showing and understanding innovations within a commercial working farm context or a local setting. FarmDemo zooms in on demonstration activities from the early stages of conception right through to impact assessment, leading to the identification of best practices, innovative approaches and overall recommendations to foster demonstration activities. FARMDEMO will in the next years also cooperate with the follow-up project Horizon 2020 MA project NEFERTITI which will set up concrete demonstration activities based on the outcomes and learnings of PLAID and AgriDemo-F2F.

In general, the findings of these projects confirm that:

- on-farm demonstration is an effective way to innovate/to foster innovation/to disseminate research results and best farming practices or systems to a wider audience;
- effective demonstrations foster knowledge exchange among farmers but also between students/farmers/advisors/researchers/businesses which join the events;

- effective demonstrations are a way for scientists, students, teachers, farmers and advisers to build and share innovation and knowledge, including discovering real farmers' needs;
- on-farm demonstration events are a very effective education tool, particularly if farmers have an active role to play in the demo;
- on-farm demonstrations have evolved from being a mainly one-directional way to introduce farmers to new techniques and learn about innovation, to 'meeting places' where experiences are shared in a farmer-to-farmer setting and to support knowledge co-creation between farmers and the other actors;
- **the degree of social interaction** between the demonstrator and participants and the active engagement required by the farmers is thus crucial. This should become the new understanding of what a demonstration event entails, to be called a peer demonstration or a demonstration 2.0.

On-farm demonstrations have evolved from being a mainly one-directional way to introduce farmers to new techniques and learn about innovation, to 'meeting places'. The degree of social interaction between the demonstrator and participant and active engagement is thus crucial.

On-farm demonstrations have evolved from being a mainly one-directional way to introduce farmers to new techniques and learn about innovation, to 'meeting places' where experiences are shared in a farmer-to-farmer setting and to support knowledge co-creation between farmers and the other actors. The degree of social interaction between the demonstrator and participants and the active engagement required by the farmers is thus crucial.

5.1.1.2 Objective of this report

PLAID and AgriDemo-F2F have cooperated to formulate a set of key messages, primarily intended to support R&I policy-makers and funders in the European Commission, in National Ministries and Regional authorities to increase the impact of their programmes with these advantages. These recommendations are also intended to provide value to the Agricultural Knowledge and Innovation Systems (AKIS) including educational bodies, the demonstration organisers and many more.

The key messages have been developed into four **policy briefs**. Demonstration as part of the dissemination activities in the innovation support projects in EU:

- education and training to enhance demonstration for farmers, facilitators and demo organisers;

- supporting demonstration through Agricultural Knowledge and Innovation Systems (AKIS) Funding Schemes;
- setting long term (EU) demonstration networks and exchange programmes.

These recommendations have been designed and improved in interaction with experts and stakeholders, and inspired by data collected throughout the project. This was a multi-step process, which was initiated at the start of both projects, with the development of a visionary framework. Data was collected through a **Pan-European inventory of demonstration farms**, developed by PLAID and AgriDemo-F2F. As part of this process, consortium members and sub-contractors identified the trends in on-farm demonstrations in the EU 28, Norway, Serbia, and Switzerland. Furthermore, an in-depth analysis of a set of 56 case studies was conducted of demonstration activities on commercial farms in 18 European partner countries to assess the processes involved in achieving efficient and effective on-farm demonstration activities.

Based on this data, a **set of best practice guidelines** were developed for organising, doing and evaluating on-farm demonstrations. Data was discussed and validated during 3 supra-regional workshops (Southern Supra-regional workshop Venice, Italy 7 February 2018; Eastern Supra-regional meeting Krakow, Poland March 2018; Northern Supra-regional meeting Leuven, Belgium March 2018), during a number of National Consultative Stakeholder Group meetings in partner countries and during two recommendations workshops (Alberese, Italy 25-26 February 2019; Den Bosch, Netherlands 2 April 2019). In addition to these international workshops, data was also presented and discussed during several national stakeholder consultancy group meetings. As a final step, policy recommendations were presented and validated in two workshops, one during and one after the FarmDemo conference (Brussels, 21-22 June 2019).

5.1.2 Demonstration as essential part of dissemination activities in EU innovation projects

5.1.2.1 What is the challenge?

Inventory results and observations provided by consortium members of PLAID and AgriDemo-F2F projects as well as discussions with stakeholders showed that there is a general consensus that on-farm demo events are well-accepted by farmers, advisors, researchers and agricultural industry members as valuable opportunities for knowledge exchange and co-creation and learning about innovations.

There is a general consensus that on-farm demo events are well-accepted as valuable opportunities for knowledge exchange and co-creation. Despite this, demonstration activities are seldom part of project proposals and projects.

Despite this general consensus about the fact that demo events are useful instruments to stimulate innovations and to disseminate and validate research results in practice with a view to bridge the gap between science and practice, demonstration activities are rarely

included in project calls, and as a result, are seldom part of project proposals and projects.

There is a general consensus that on-farm demo events are well-accepted by farmers, advisors, researchers and agricultural industry members as valuable opportunities for knowledge exchange and co-creation and learning about innovations. Despite this, demonstration activities are rarely included in project calls, and as a result, are seldom part of project proposals and projects.

5.1.2.2 What did we learn from PLAID and AgriDemo-F2F?

Analysis of the inventory data, country reports, case studies and workshop recommendations yield the following key messages with regard to integrating on-farm demonstrations as part of dissemination activities in EU innovation support projects:

Demonstration is not a 'one way knowledge transfer', it also gives scientists a chance to **listen and learn from farmers' practices and expectations which can help to improve research findings**. Demonstrations work well on research farms but a demo activity might have more **impact** when the host farm operates under the same 'real life' conditions as average farms. Farmers want to identify with the host farm. Demonstrations on commercial farms increase the credibility of research findings.

Demonstrations work well on research farms but a demo activity might have more impact when the host farm operates under the same 'real life' conditions as average farms. Farmers want to identify with the host farm.

- demonstration is not a 'one way knowledge transfer', it also gives scientists a chance to listen and learn from farmers' practices and expectations which can help to improve research findings. On-farm demonstrations bring a range of stakeholders together in the context of collaborative relationships and opportunities for interaction and exchange on a range of topics;

- demonstrations work well on research farms but a demo activity might have more impact when the host farm operates under the same 'real life' conditions as average farms. Farmers want to identify with the host farm. Demonstrations on commercial farms increase the credibility of research findings;

Increased farmer involvement in leading demonstration activities could be achieved by making funding directly available to them. In EU rules for rural development programmes this is possible, but some national regulations do not make use of this opportunity.
- demonstrations and cross-visits at regional, national and international level are a good way to engage farmers and practitioners in EU research and innovation projects, in particular when demonstrating what is in their view an interesting novelty with regard to profitability or sustainability. Increased farmer involvement in leading demonstration activities could be achieved by making funding directly available to them;
- there is a clear demand for more organised on-farm demonstrations, especially where agriculture is regionally based (e.g. Italy and France), where farmer networks are generally weak (much of Eastern Europe) and at the EU scale;

Agricultural advisors are often the key stakeholders that bring together multiple actors to organise and host a demonstration event.
- agricultural advisors are often the key stakeholders that bring together multiple actors to organise and host a demonstration event;
- organisers of on-farm demonstration (e.g. public, private and charity-funded advisors, farmers, researchers) would benefit from opportunities to network across regions and countries in Europe. Projects at a European level can act as a platform to host such exchanges. Thematic networks and Interreg projects are good examples of successful projects including demonstration activities.

Increased farmer involvement in **leading** demonstration activities could be achieved by making funding directly available to them. In EU rules for rural development programmes this is possible, but some national regulations do not allow this. Agricultural advisors are often the key stakeholders that bring together multiple actors to organise and host a demonstration event.

5.1.2.3 Recommendation

In each application form of EU research and innovation projects there is a section about the dissemination of the project outcomes. Many project programmes also emphasize the need to involve end-users in project results and innovations.

For example, the H2020 manual states that:

"Dissemination means sharing research results with potential users – peers in the research field, industry, other commercial players and policymakers. By sharing your research results with the rest of the scientific community, you are contributing to the progress of science in general."

"Involve potential end-users and stakeholders in your proposal. If they're committed from early on, they may help guide your work towards applications. End-users could come from the regional, national and international networks of the partners in your consortium, or from the value chains they operate in. They could be involved as partners in the project, or, throughout its duration, as members of an advisory board or user group tasked with testing the results and providing feedback."

Demonstration should be put forward in Horizon Europe programme manuals as a key tool to effectively disseminate research results and actively involve end-users and stakeholders.

Visit to demonstration farms could be supported with a voucher scheme. We also propose that on-farm demonstration should be an essential part of the dissemination activities of EIP Agri Operational Group innovation projects, Thematic Networks and other European project programmes such as Horizon Europe and Interreg. This way, we encourage researchers to work together with end-users and other stakeholders in the agri-food chain (farmers, advisors ...) and to build demonstration activities together in order to improve, to validate and to disseminate their research findings and innovation. Do not limit the scope of demo –actions. ALL the projects that create new information, better practices, wider understanding, should use demo–actions and blogging, videos etc. to get the ideas rooted. There is also potential in providing extra funding to the big scale farm modernization investments with a bit higher aid rate on condition of including an obligation to act as a demo farm for a certain period. This is currently used in the EMFF European programme of Finland.

On-farm demonstration – in the case it brings benefits (which are understood as such) to end-users/farmers – should be an essential part of the dissemination activities of EIP Agri projects, Thematic Networks, Operational Groups and other European project programmes such as Horizon Europe and Interreg, in particular when aiming at innovation. This way, we encourage researchers to work together with end-users and other stakeholders in the

On-farm demonstration – in the case it brings benefits (which are understood as such) to end-users/farmers – should be an essential part of the dissemination activities of EIP AGRI projects, Thematic Networks, Operational Groups and other European project programmes such as Horizon Europe and Interreg, in particular when aiming at innovation.

agri-food chain (farmers, advisors ...) and to build demonstration activities together in order to improve, to validate and to disseminate their research findings and innovation.

Furthermore, we suggest that a specific focus is included on the follow-up to stimulate further learning after the event and evaluation (see also Recommendation 3), to improve i) the impact of the actual demonstration (through follow-up), and ii) future demonstration events (through monitoring and evaluation). However, this focus on follow-up and evaluation should not lead to administrative overload for the demonstration organisers.

In the ideal case, also the thinking and actions of the farmers joining a demonstration event change. That could be followed with barometers that measure e.g. their attitudes in environmental or animal welfare questions. Also agricultural media, press and web content providers are important to invite, not for delivering input for the event but for spreading the outcomes more intensively. Farmers say they are getting much information through the

professional press and internet, in particular in remote areas where advisory services are not well developed and in the case of part-time farmers. The more advanced farmers try to combine all that information and want to analyse it with the advisors and farmer colleagues. Note that the amount of online platforms, blogs etc. originating from projects are

The amount of online platforms, blogs etc. originating from projects are already overwhelming, which ultimately hinders access to relevant information.

Development of project web platforms can take up a significant part of a project budget. Therefore a balance is needed, taking care that in demonstration projects the payment and motivation of the farmers is not affected by overly paying for web services.

already overwhelming, which ultimately hinders access to relevant information. Development of project web platforms can take up a significant part of a project budget. Therefore a balance is needed, taking care that the payment and motivation of the farmers is not affected by overly paying for web services.

5.1.3 Education and training to enhance demonstration for farmers, facilitators and demo organisers

5.1.3.1 What is the challenge?

Demonstration events, or in short 'demo events', focus on visually showing and understanding testing and innovations within a working farm context or a local setting. There are many different types of demo events, but they all

have in common that they provide authentic showcases that facilitate knowledge exchange: farmer-to-farmer and with innovation actors (advisers, researchers, input providers...). However, to be effective, demo events must be well targeted, prepared, carried out, evaluated and improved. They are a complex activity that require high and diverse specific soft and hard skills. A real bottom up- approach requires that the farmers are asked on beforehand what they want to be shown about subject X, when, under which kind of conditions etc.

The demo events we observed and analysed in PLAID and AgriDemo-F2F projects often showed some place for improvement, in their organisation, in the demonstration methods, or in the organisers' skills, hence the need for training. Training courses can also give demo organisers the opportunity to exchanges ideas and practices.

A real bottom up-approach requires that the farmers are asked on beforehand what they want to be shown about subject X, when, under which kind of conditions, etc.

To be effective, demo events must be well targeted, prepared, carried out, evaluated and improved. Training courses can give demo organisers the opportunity to exchanges ideas and practices, and upgrade their skills.

5.1.3.2 What did we learn from PLAID and AgriDemo-F2F?

Best practices for on-farm demonstration activities

From the 56 PLAID & AgriDemo-F2F case studies, we learnt how to target, prepare, carry out and evaluate effective demonstration activities (more information on <https://trainingkit.farmdemo.eu/demo-design-guide/>). The essential elements for best practices are listed below:

a. Defining the demo objectives and target groups

Defining clear objectives of the demo determine all the other decisions an organiser makes during the preparation and organisation of the demo event.

Having a clear objective and key message aids to the success of the

To be effective, demo events must be well targeted, prepared, carried out, evaluated and improved. Training courses can give demo organisers the opportunity to exchanges ideas and practices, and upgrade their skills.

demo. However, case studies showed that the specific objectives of a demo event were rarely made explicit.

The demo objective should specify what the organisers seek to achieve with the demo. It

should start by addressing the '**why**' (why are we organising this demo), then the '**what**' (what do we want to demonstrate, what 'message' should visitors take home), and also the '**who**' (the targeted audience for the demo and the

actors you want to involve in the organisation). These three aspects together have a big influence on the **'how'** (how will the demo set-up and learning methods be organised).

b. Preparing an on-farm demo event

Good preparation and planning is key for a successful demo event:

- choosing an effective host location (host farmer, facilities and equipment, location ...);
- a suitable demo period (season and time);
- establishing the implementation team (including people with good facilitation skills);
- preparing a balanced programme adapted to the target groups;
- timely recruiting of the right audience;
- budgeting.

The resource intensity of preparing a demo event is also due to the effort that goes into selecting a suitable farm which is considerable. It is a team effort and it is more about the farmer than about the farm. Furthermore, to avoid fatigue of participants, there is a need rotate farmers with the skills needed for demonstrations: they have to be able to bring a credible message to visitors: this is where I come from and this is where I aim to go, these are my values and that is why I am interested in this solution (e.g. more technology oriented or more organisational). They must be open for change and to share their own situation, be well accompanied and prepared to cooperate. For example the vision, financial and physical performance, lifestyle and contentment of the demonstration farmer are often hidden behind the latest technical innovation adopted on the farm. So, as a best practice, greater efforts should be made to be honest and open and to tell the good and the bad as individual person, to create trust. Rotation is also useful to avoid the risk that funding of demo farms this becomes a mini commercial enterprise on the farm (in particular if commercial products are involved) and as such loses its independence and authenticity. Some of the best demo farms may be happy with non-monetary rewards e.g. recognition through independent (innovation) advice, free soil samples etc.

Good preparation should start well in advance, for example: for a small to medium sized event one needs two months to make sure the right people can be involved in the organisation and can be well informed about how to actually carry out the demo; for a large event planning can start as

While organising one demonstration event may take till five days from a team of advisors, for a serious programme which runs for 3-5 years we devote a full time advisor to every 6-10 demo farms in projects. (T. Kelly)

Farmers want to see very specific benefits before they do something. It is not easy to involve normal farms into EIP-AGRI projects or other innovation actions. Our farmers WANT to use innovations, but they do not want to "waste" their time creating something new and demonstrate it.
(G. Kučinskienė)

early as a full year ahead of a demonstration especially if live demonstrations of field trials are to be used.

Communication between people involved during the preparation and the demo event itself can be facilitated by periodic preparatory

meetings, virtual discussions and a collaboration platform, etc. This includes early reflection on the participant list and those to be invited in particular for their expertise.

c. Carrying out an on-farm demo event

It is important to take special care to set up the agenda of the demo event. The consecutive activities carried out during the demo event should create good learning opportunities:

- relate learning content to the farming practice of visiting farmers;
- communicate and highlight a few clear and concise key messages of the demo;
- engage participants in active knowledge exchange – allow participant interaction through questions and answers;
- use a variety of learning methods and educational tools.

Mix learning methods and educational tools:

- facilitate the whole meeting in a professional way to ensure smooth running of the event which results in good learning opportunities and exchanges;
- help participants to actively network;
- anticipate troubleshooting.

d. Follow-up and evaluation of an on-farm demo event

A good organised evaluation and follow-up can help to increase impact and effectiveness. Doing an evaluation of the event, to reflect on what happened according to the demo event plan with a focus on what can be learnt for future events, can support organisers to learn from the experiences during the demo event. In addition to evaluating the demo set-up, also evaluating the learning outcomes of the demo provides valuable information.

Follow-up can substantially increase impact through 'anchoring' and 'scaling'. Anchoring is having dedicated attention for the application of the demo content by the participants of the demo event. Scaling refers to the impact of the demo on the wider farming community, including not only those who

participated in the demo event. Follow-up activities can, therefore, make an important contribution to achieving the demo objectives set at the beginning.

Main skills and roles of the demo actors

Usually, preparing a demo event is a team effort and not all left to one person. It would be rare to be able to appoint an event manager, as for instance in teams of advisors the work can be distributed to benefit from the specific strengths of individuals.

a. Host Farmers

The host farmer contributes to the success of a demo event, specifically when his or her role goes beyond that of merely providing the demo site. A host farmer can be involved in different degrees in the preparation and the demo event. The host farmer can be involved in a wide range of activities such as

- providing and/or preparing the demo site and infrastructure;
- providing or organising catering; contributing to the overall management of the demo;
- (co-)deciding on the demo topics;
- providing content for the demo topic;
- providing the introduction and word of welcome of the demo event;
- performing the demonstration;
- providing answers;
- guiding a farm walk ...

Willingness to cooperate and to share knowledge vary greatly between Member States, so tailor-made solutions will be needed. (A. Györfy)

The role of the host farmer is essential to establish a trust between the participants and host.

Projects including farm demonstrations should involve demo farm owners in planning the project from the very first step (MAA from the first step). If demo farms are positioned in grant proposals almost as end-users, the convertibility of project results into practice will be questionable. (A. Györfy)



Fig. 22 A guided farm walk can help to establish a trust between the participants and host.

b. Demo Organisers/Logistics manager

The role of demo organiser is to supervise the overall organisation of the demo activity, which is targeting, preparing, carrying out and evaluating the event, but also managing the demonstration team. A good communication manager is also needed in order that demo event is well visited by various types of actors.

Logistics manager refers to the person who has close contact with the hosting farm in the run-up of the event taking care of administration and organisational issues, taking care of a good follow-up of the programme and who keeps track of time during the event, and is the contact for troubleshooting.

c. Demonstrators or speakers

The demonstrators or main speakers are the people who provide information and content to the demo event. They can give presentations, demonstrate machinery or practices, demonstrate the results of field experiments, but can also be involved in the preparation of infographics, information panels, leaflets and booklets.

The quality of the demonstrators can have a big impact on the perceived effectiveness of the demo event by the participants. In general, participants refer to a demonstrator as someone being: expert in his/her field, aware of the local context, good speaker able to communicate and transfer knowledge

It is most effective if at least one of the demonstrators is the host farmer, who can go into the specifics of using the demonstrated innovation in practice, also addressing possible downsides or the skills that are required to apply the innovation. Visiting farmers see such a farmer as one of their peers, and are more inclined to accept what he/she has to say. (V. Milicic)

to the end-user, known and trusted. Certain host farmers are excellent demonstrators, some may prefer to take a lighter role.

It is most effective if at least one of the demonstrators is a farmer who can go into the specifics of using the demonstrated innovation in practice, also addressing possible down-

sides or the skills that are required to apply the innovation. Visiting farmers see such a farmer as one of their peers, and are more inclined to accept what he/she has to say because this is more related to the situation at their farm.

d. Demo Facilitators

Besides the demonstrator, the presence of someone performing the mediating role of a neutral facilitator is crucial. His/her role is:

- to facilitate the group processes;
- to encourage the discussions;
- to articulate questions and comments from visitors;
- to reword and summarize the main issues;
- to keep the focus on the topic of the demo event and the atmosphere positive.

Facilitators can be specialist facilitators, researchers, farmers or advisors. In any case, they should foster active listening, learning, and questioning by providing (non-confrontational) feedback, raising questions, stimulating people to talk, as well as translating and structuring information.

5.1.3.3 Recommendation

Training programmes to enhance demonstration should be supported and implemented in each of the EU countries and regions, targeting host farmers, demo organisers, demonstrators, and facilitators. Specific interactive training should be organised at national level to train the trainers, where possible using live practice during real demo events. Training of demonstration organisers and demonstrators is crucial to develop and improve the

It is crucial to develop and support in each of the EU countries and regions training programmes improving the necessary technical and social skills for on-farm demonstrations.

afore-mentioned skills, and to raise awareness on good practices for on-farm demonstrations.

We propose training at three levels:

- specific training courses for demo trainers (train-the-trainer) in each EU country, followed by training for demo actors in each region;
- integration of demo activities in agricultural vocational education in each country followed by modules that enhance young farmers and all advisors to take responsibility in demonstrations;
- organization of regular cross visits at national and EU level, learning from each other's approaches for on-farm demo-events.

Training programmes to enhance demonstration should be supported and implemented in each of the EU countries and regions. in on-farm demonstration. It is crucial to develop and improve technical and social skills for on-farm demonstrations: specific training should be organised at national level for all involved.

Monitoring and evaluation should be done as much as possible in an interactive format. A study on the understanding of farm innovativeness revealed that "The idea that farm innovativeness depends only on the possibilities to invest in a certain area is not fully valid. Staff creativity and the position of the management regarding certain areas of business make an essential contribution to the sustainability of innovation in the organisation. In order to achieve a more sustainable innovativeness assessment result, it is appropriate to use both economic and organisational indicators." Further reflexion is needed on who could provide tools to report on demonstration in an easy way and on the best ways to communicate results. If this is to be done by external monitoring and evaluation experts, how could this be funded? From what source? At which level, national, regional, etc.

For instance, the evaluation can be done:

- on site with the on-line questionnaire. The link of the questionnaire is sent to the participants via texts on their smart phones and they can fulfil it on site after the event. For this mobile data connection is needed on site;
- on site with printed questionnaires which are distributed at the end of the event;
- after the event the link of the questionnaire is sent to the participants via e-mail;
- with the help of students at the end of the demo event.

Follow-up activities to stimulate further learning and networking could include e.g. providing online videos and reports of the demo event or creating an online platform, social media groups, blogs or physical networks.

Follow-up activities to stimulate further learning and networking could include e.g. providing online videos and reports of the demo event or creating an online platform, social media groups, blogs or physical networks in which researchers and practitioners can report their experiences with interested farmers. Projects could also be encouraged to find innovative ways to reward the best practices of demonstration and knowledge exchange. It would be valuable to stay managing the online inventory and platform of demonstration farms in the EU, keep it updated and include awarded projects

Follow-up activities to stimulate further learning and networking could include e.g. providing online videos and reports of the demo event or creating an online platform, social media groups, blogs or physical networks.

A training programme about demonstration activities could be carried out by each country's agricultural training and education bodies, and research bodies, with an involvement of scientists, facilitators and demonstration practitioners. Actors of FarmDemo Projects could be involved in the setting-up and the implementation of these training programmes. The funding of this programme should cover at least training of trainers and the initial development of the training programme. Some regions or countries could choose to fund all the training courses in order to support the development of demonstration activities and skills in areas where they are still less common. We see this set-up of a training programme as largely national and regional. Consequently policy stimulation is needed at these scales. EU level funding should be focused on the facilitation of trans-national learning (3.3.3; see also Recommendation 4).

Specific training courses for demo trainers and for demo actors

Specific training courses should be supported by training funds in each of the EU countries (relevant level for training the trainers) and regions (for the demo actors). These funds could support the direct training cost, the time spent for training, and the costs of cross visits to facilitate learning between demonstrators. This is particularly important for farmers' training.

Possible target groups for such training:

- demo trainers (experienced and skilled demonstration organisers, interested in sharing their knowledge, and with training abilities);
- host farmers;
- demo organisers and logistics managers;
- demo facilitators;
- Demonstrators or speakers.

Possible objectives of training:

- to professionalise the organisation of demonstrations;

- to support the development of demonstration skills;
- to communicate demonstration best practices and tools developed by the FarmDemo team.

Possible content of the training course for demo actors:

- presentation and testing of 'best-fit' demonstration practices;
- showing videos of demo events to illustrate the different demo steps and roles;
- visits to demo events with a role of monitoring and evaluation and organized feedbacks to the organisers;
- practical work to prepare, implement or evaluate demo-events.

Possible content of the training of trainers:

- pedagogical tools and approaches for training demonstration actors;
- participatory elaboration and test of training courses for demonstration actors.

Integration of demo activities in vocational and basic education

Demonstration activities should be part of the agricultural vocational education at different educational levels, as well as in agricultural education at all levels. This can include:

- participation of students to demo visits with preparation before the event, a role of monitoring during the demo day and a feed-back organized after the event, about what was observed and learnt on the topic of the demonstration;
- invite the demo organiser into the classroom to discuss the set-up of a planned demo with the students;
- similar activities for advisors to help them taking up roles during demo events;
- organisation of demonstration events on educational farms (belonging to schools) targeted to farmers and advisers of the area as well as to students and involving students into preparation, carrying out

The key role of the teachers and the setting within the course is very important. It is the role of the teachers to help prepare the interaction between students and demo presenters. Students (especially in vocational training) do not constitute an easy to drive public. The pedagogy and vocabulary, and the place in the study programme where the intervention is fitting, are very important. Quite often an event or presentation which is not mandatory in the course is a presentation that students might avoid or skip. (M. Chourot)

and evaluation of the events;

- implementation of specific courses about demo activities and learning methods in order to develop the specific skills needed for demo activities and to do the best practices known to the future hosts, demonstrators, and facilitators;
- also, reflection is needed about how to develop demo events where producers and consumers can meet in order to work towards more sustainable food systems. Creating win-wins between them can be enhanced through more intensive contacts and interaction. A better mutual understanding and raising awareness on developing potential new business models may be the result.

Organization of regular cross visits at national and EU level

These cross visits should specifically have the aim to exchange about experiences with organising on-farm demonstration events, and associated skills. We suggest to organise them around an effective demo event in the hosting country:

Possible target groups of the cross-visits:

- demonstrators' trainers;
- demonstrators;
- demo organisers and facilitators;
- host farmers.

Possible objectives of training:

- to support the development of demonstration skills;
- to find out more about interesting techniques and tools in the country where the visit takes place, adding them to the list of good practices;
- to communicate best practices and tools, e.g. those developed by the FarmDemo team;
- overall, to facilitate the exchange of knowledge and experiences on demonstration activities at national and EU levels and share knowledge on the various types of practices.

Possible content of the training:

- presentation of a set of 'best-fit' demonstration practices;
- showing videos of various types of demo events and the different demo steps and roles;

*In Finland, many of the "non-commercial" demonstrations are organized as part of a wider advisory/training/information project or EIP/cooperation project M16. This is a nice way to connect all the aspects of dissemination and building trust between the actors/ farmers.
(S. Karjalainen)*

- visits to demo events. Visitors focus on evaluation and provide feedback/exchange with local demonstrators afterwards;
- practical work to prepare, implement or evaluate training about demo-events.

5.1.4 Supporting Demonstration through Agricultural Knowledge and Innovation Systems (AKIS) funding schemes

5.1.4.1 What is the challenge?

Despite a widespread recognition amongst stakeholders that demonstrations are an effective way to exchange knowledge and facilitate transition, change and innovation, we observed several barriers, existing at various levels: in the organization, facilitation, hosting and attendance and access of on-farm demonstrations. Specifically farmers, advisors and (agricultural) students were mentioned as having most problems to overcome these barriers. (risks, money to attend). More specifically, a weak aspect of demo activities is the lack of compensation for using farm assets and farmers' time for demo activities. The same is true for advisors and researchers, if not directly involved in the organisation of the particular demo event. Farmers involved in demo activities are often engaged through personal involvement, however this can lead to a situation where the long term sustainability of demo activities relies heavily of personal approaches of some individuals. Provision of public funds for farmers operating as demo farms is seen as a precondition of an effective and systematic inclusion of demo farm event funding in any national AKIS plan.

Demonstration is a specific tool that fits as a part of the advisors' toolbox. In professional advisory activities, it should be coordinated with other tools to incentivise the take up of innovations. It may be less efficient if it is managed in the separated way. (A. Vagnozzi)

Furthermore, calls for projects, guidelines for proposals, evaluation criteria and project management requirements often do not pay attention to the strong relation between peer-to-peer learning and impact, as is clearly seen from the instrument of on-farm demonstrations which is often missing (see also Recommendation 1). Unfortunately, existing possibilities in Rural Development Programmes (RDPs) to create easy-to-access funding possibilities for demonstrations are often not used.

On-farm demonstrations should be topic oriented (e.g. vegetable production, fruit production, herbs production, livestock production). Many farms can then form a cluster of demo farms for one specific type of agricultural production, at regional, national and international level. The clusters can demonstrate different innovative technologies. (V. Milicic)

Finally, here is a lack for follow up and evaluation activities related to on-farm demonstration events, and demonstration organisers have very little incentives to do so. This lack hampers opportunities for continuous learning from past experiences.

5.1.4.2 What did we learn from PLAID & AgriDemo-F2F?

Based on the case study analysis, and further discussions with stakeholders, it is clear that the current EU rules for RD programmes offer ample opportunities for incentives and targeted funding of on-farm demonstrations. At the same time, there is a wide diversity in AKIS structures and composition across EU countries, resulting in very different ways of organising and supporting on-farm demonstrations across Europe. So, as a result, RDP measures and AKIS funding schemes are translated into national legislation in very different ways across Europe. The advantage of these national and regional structures in RDP is that they consider the existing local contexts and

It should be stressed that (financial) compensation of the owner of the demo farm is indispensable for the sustainability of the demo farm system. Demo farmers invest time and take a certain business risk by presenting their farm and know-how to their market competitors. In fact, all actors in the demo process should be compensated. In order to be able to allocate reasonable amount in project budgets to the demo events, budgets allocated to each project should be larger. (A. Gyórfy)

barriers (which are again diverse across EU countries), and adapt locally to help overcome them. There are lessons to be learnt, inspiration to be found in the way this is organised in other countries. This may help to vary the type of events and improve the own demo approaches.

Evidence from the AgriDemo-F2F and PLAID

case studies clearly indicate that:

Funders of innovation support, advisory services or education have a lot of influence, and can couple funding to specific requirements or requests. As such they can specifically require:

- to organize and carry out on-farm demonstration activities, at varied moments all along the project period;
- that host farmers, advisers, facilitators, demonstrators and organisers are trained for demonstration activities;
- to support funding for farmers for on-farm demonstration activities;
- for education bodies: to organize participation and to assign a specific role to the students during on-farm demonstration activities. E.g. students could play a role in evaluation and stay at the end of the demo day with the organisers to share their evaluation;

- similar for researchers: to attend on-farm demos in order to better network with practitioners and cooperate in the building of demo events.

Increased farmer involvement in hosting/leading demonstration activities contributes to effectiveness. This could be achieved by making funding directly available to farmers for this purpose, and could cover:

- the time they dedicate in organising and hosting demo events;
- the investments made, necessary to facilitate demonstration activities: on farm trials, meeting rooms, accommodation and catering facilities;
- following trainings on competences needed in demonstrations;
- associated risks (e.g. hygiene and biosecurity equipment, or damages on and around the farm (equipment, yield reductions, ...)).

Funding should be conditioned to the implementation of the essential basic ingredients for good practices for on-farm demonstration events: there should be a focus on facilitating access, creating a learning environment (mediation methods...), and increasing impact through evaluation and follow-up activities. The latter are crucial to improve the quality and enhance reflection and learning on past demonstration activities. Evaluation should not lead to an overload of paperwork, but should be aimed at enhancing interaction between practitioners. Support can be more effective on the long term, when networks between stakeholders are created and supported (see Recommendation 4)

5.1.4.3 Recommendation

Existing programmes and funding schemes (at EU, national and regional level) have the potential to create more opportunities for on-farm demonstrations, but to achieve this potential, there needs to be a more specific and **explicit focus on on-farm demonstrations in the various project calls, guidelines, criteria and requirements**. These funding systems should create favourable conditions for demonstration activities, keep the basic ingredients for good practices for on-farm demonstration in mind, consider farmer involvement, and ensure a clever design of the regulations in order to minimise administrative burden. The focus of support should be on rewarding and raising enthusiasm rather than control (possibly using KPI's) and additional paperwork. Attention should be given to coordination of demos within and across programmes to avoid fragmentation and duplication, and to facilitate integration into advisory landscapes/AKIS to reinforce messages. **It is up to the national AKIS coordination platform to take up this task.**

Not all recommendations can be brought in action at the same time, so we suggest a phased approach, offering specific recommendations for different

phases of building up support structures. We focus on the process of organizing RDP.

In 2019, the Member States will start preparing their CAP AKIS Strategic Plans. In these plans the AKIS is described as follows: "the combined organisation and knowledge flows between persons, organisations and institutions who use and produce knowledge for agriculture and interrelated fields". A more inclusive AKIS induces better knowledge flows supported through interventions, supported by advisory services and networking activities. We recommend to firmly position on-farm demonstrations as an effective tool to organize, test and disseminate innovations. Quantification of the activity is possible: an impression of the type and amount of demonstration farmers can be found in the FarmDemo Hub. All countries and regions should start with following up what exactly is happening in order to gain understanding and improve their AKIS with the appropriate actions.

In 2020, after agreement between EU Ministers of Agriculture, European Parliament and European Commission (EC), the Member States start the design of national plans, to be approved by the EC. In this phase we recommend to include such measures in these plans that on-farm demonstrations become an essential instrument, and include this explicitly, wherever possible:

- funding for EIP Operational Group (OG) innovation projects through the "cooperation" intervention (Art 114 and 71). For the understanding of the EIP-AGRI, see Art 114 is useful. The EIP interactive innovation model principles are the basis for practical innovative solutions: actors with complementary knowledge cooperate must tackle concrete farmers'/foresters' needs and opportunities and work together intensively all along the project. Note that OGs can support all 9 CAP specific objectives;
- funding Knowledge exchange and Information Actions, including one-to one advice, organising Information Actions, setting up modern advisory & innovation support services, etc.; through the intervention "Funding for knowledge exchange, advice & information" (Art 72);
- in this planning phase, we recommend to include also to fund the interventions that support these OGs and Information Projects;
- fully integrate farm advisory services covering economic, environmental and social dimensions and delivering up-to-date technological and scientific information developed by research and innovation in the AKIS (Art 13). These farm advisory services also include innovation support (= innovation project brokering, innovation project facilitation, etc.) for preparing and implementing innovative OGs;

- create conditions to form CAP networks at EU level and national levels, which foster innovation and knowledge flows and thus contribute to a well-functioning AKIS (Art 113).

When the national/regional CAP plans are fixed, and the AKIS coordination structure is organised, we recommend to

- communicate early enough about the possibilities of the new CAP for on-farm demonstrations through Knowledge exchange and Information Actions and OGs and, via the channels and in the language that farmers use. Communicate about the quality of support needed for successful projects;
- start reflection early, so that so that the first calls can be opened asap;
- reflect on a few specific themes that need to be covered by the first calls for OGs and Information Projects;
- ensure also openness of themes to get bottom-up ideas in, for instance short supply chains connecting consumers and producers, care farming, or whatever project proposers may see as potentially innovative and authorities have not thought about yet;
- include in the management authority people who can judge plans (proposal phase) and reports (execution phase of projects) and communicate in an stimulating, effective way with the stakeholders;
- include independent people with experience in on-farm demonstrations in the committees that do the selection of projects submitted;
- although they may be useful for farmers, avoid funding of purely commercial oriented demonstrations by companies with public money. It is up to the companies to organise this themselves from their promotion budget and it should be clearly visible that the funded demonstration takes an impartial approach.

When projects are running, we recommend to:

- open demonstrations for a broader public, where suitable;

According to project plans, about 15 of 160 Operational Groups in the Netherlands currently use demonstrations to disseminate the results, which is not much. To increase numbers, we should encourage this at the front: e.g. give explicit suggestions or conditions in the calls and use it in the selection criteria and in the communication about the calls. Stimulation is also useful at the back: i.e. give support to the OG's that make use of demonstrations. If there is recognition and support for this work, it will be used more and become more professional. For the next period we will need budget/ facilities to support this. (C. Anker et al.)

- do not wait until the end of the project, mid-term demonstrations help to promote the project and awareness about the solution to come. It is also a moment where the invited participants may come with additional interesting ideas which may add value for the other participants or help the project by enriching it while still running;
- use various local, regional, national and EU websites, like the local agendas from EIP/rural networks, or the agenda at EU level of the EIP-AGRI and in Farmdemo.eu, to communicate about these demonstrations. Farmers need to read about the demonstration in their local language, apart from English, otherwise we may lose them from the start. Thus, interaction between agenda's at the various geographical levels is important.

In the review of the projects, we suggest to:

- support people responsible for the project with tools to report on demonstrations in an easy way;
- communicate about the results in local language as well as in English.

5.1.5 Setting long-term (EU) demonstration networks and exchange programmes across borders

5.1.5.1 What is the challenge?

When it comes to fostering European agricultural innovation and sustainability, policy is largely driven at the EU level, while demonstrations are organized mostly at a local level. This possibly results in a mismatch between demonstration programmes, often focusing on the national/ regional level, and the challenges that need to be faced at a European level. There is a need to coordinate demonstration networks and events at both regional and EU

On-farm demonstrations should be topic oriented (e.g. vegetable production, fruit production, herbs production, livestock production). Many farms can than form a cluster of demo farms (e.g. demo cluster) from one specific type of agricultural production. Clusters of demo farms can be formed first at regional level and then at national level and international level. Different farms in cluster can demonstrate different innovative technologies from one specific type of agricultural production in order to achieve multiple knowledge and innovation transfer effect. (V. Milicic)

level. Experiences from the FarmDemo projects also clearly showed that demonstrations are organised very differently within Europe, and the approaches that are being used differ greatly between countries and regions. For instance, Eastern European countries tend to have less interactive demonstrations, while demonstra-

tions in the south of Europe are less commonly used as a means of dissemination). Also, in most countries, demonstrations are mainly organized on normal farms, while in others only experimental farms (applied research) or vocational schools are in the capacity to do demonstrations. The best-fit solution may be to combine both.

These differences however create learning opportunities. By broadening exchanges and networking across borders, we believe that this will create more opportunities for cross-fertilisation, and should allow to broaden the vision of demo organisers and to develop the number and the quality of on-farm demo events. Experiences can be shared on on-farm demonstration approaches, but also on content, such as technical or agricultural innovation aspects.

5.1.5.2 What did we learn from PLAID & AgriDemo-F2F?

Analysis of the inventory data, country reports, case studies and workshop recommendations yield the following key messages with regard to setting long-term demonstration networks and exchange programmes:

- participants and demo organisers express the need to improve their skills and experience and to benefit from exchanges with their peers, at national and EU level. The case studies showed that exchanges are a good way to improve practices on demo activities both at local, national and EU level;
- the 56 demo cases we studied in the projects showed very different demonstration activities and approaches, indicating an important diversity of interactive practices, according to the regions and countries;
- demonstration organisers expressed a great interest in a better knowledge about demonstration practices in other countries. Learning from each other is the main objective when they get involved in projects like PLAID or AgriDemo-F2F. They are motivated by knowledge exchanges about the "how" to demonstrate, as well as exchanges about the "what": topic and content of the demonstrations;
- during the PLAID project, a demonstration workshop was organized in Croatia with practitioners from each case study. Small interactive

Long-term demonstration networks will only really exist on the long term if they have enough resources (financial, human etc.). Specific calls aiming at funding such networks should be announced. Project mentors should be involved in developing the networks so that interested actors (mainly the demo farmers) could successfully apply. The actors should be helped by mentors to set up a realistic budget that covers their real costs and expected benefits. (A. Györfy)

groups among the practitioners were organized to share the exchanges between countries. The participants explained that to see each other's context helps to reflect on their own context and practices;

- the follow-up H2020 MA project NEFERTITI will make use of these analysis. NEFERTITI organizes cross-visits among EU countries, which will disseminate the best practices from FARMDEMO and build further capacity on demonstration while spreading a lot of information on 10 themes by organising demonstrations in the EU countries;
- both host farmers and organisers of on-farm demonstration, whether they are public, private and charity-funded advisors, farmers, or researchers would benefit from opportunities to network across regions and countries in Europe.

5.1.5.3 Recommendation

The organisation of exchanges about on farm demonstration at EU level, and of a network of demo organisers at that level are an excellent way to help:

- improve the skills of demo organisers (demonstrators, facilitators, host farmers);
- increase the number and quality of demonstration activities;
- build the general knowledge about practice on sustainability issues in agriculture;
- share specific technology and practices.

As such, we propose two main recommendations. Firstly, we suggest to running projects, like NEFERTITI, EURAKNOS, EUREKA, many other Horizon Europe project programmes like the Thematic Networks and Interreg projects, where cross-border exchanges across the EU are implemented, to capitalize on experiences, in order to improve methods, bring renewed insights to demonstrators, offer more opportunities for accessing new knowledge to further fund work on demonstration methods and practices and on diverse technical issues in agriculture.

Secondly, we propose long term demonstration networks at European level, including concrete requirements on innovation and sustainability aspects. These long-term networks can reinforce trust among partners, allow further expertise development in the network and consequently build a network of real "demonstration experts" to support technology and practices that develop more sustainable agriculture in their countries, and at EU level.

Two target groups can be identified for this EU network:

- all actor types involved in the organization and facilitation of demonstrations. They will benefit mostly in cross-topic networks, centred on exchanges about demonstration methods, facilitation practices and tools, policy supports ...;
- host farmers and thematic experts involved in demonstration. These will possibly be more interested in thematic demonstration networks, focusing on their specific sector. However, focus should be both on exchanges about thematic content and demonstration methods and approaches.

Our recommendation thus combines several aspects:

- the EU Commission could directly fund under Horizon Europe a network of demonstration organisers and trainers, on a long term basis (at least five years), based on cross visits, skills exchanges and cross methodological trainings;
- the EU Commission could fund under Horizon Europe specific calls aiming at funding of networks of demonstration farms, including accompaniment with advice for such activities and ensuring that the demo farms are compensated (paid) for their efforts. Farms taking part in EIP-AGRI OG projects, normal farms and experimental farms may all be involved, in a mixed or layered approach;
- some EU projects could put an emphasis on networks about demonstration. We recommend to support and fund more thematic networks and Interreg projects after 2020, which include cross-country demonstration activities, directly involving farmers and advisers or demonstration organisers. The projects could benefit from a funding duration over a period of 5 years and should be evaluated on their capacity to propose longer term knowledge and practice exchanges, but also rewarding of the best exchange initiatives (See also Recommendation 1).



5.2 SWG SCAR AKIS policy brief on programming R&I for improved impact

This Policy Brief on programming Research and Innovation (R&I) is based on inputs from experts of the SCAR Strategic Working Groups AKIS, ARCH and Food Systems and the discussions and conclusions from a joint workshop in Rome on 6th April 2018. The brief primarily targets R&I policy-makers and funders in the European Commission and in national ministries. However, it is also intended to provide value to researchers and their institutions.

5.2.1 Introduction

Agricultural R&I systems are increasingly open, complex and changing rapidly. In recent years, the R&I community has been asked to focus on, measure, document and demonstrate ex post impacts of their activities be they economic, societal or environmental in addition to traditional scientific impact. Although there are funding programmes that list the impacts required up-front, it is necessary to do more to increase the general focus on impact during proposal development and in the planning and early stages of R&I activities. There is a clear rationale for this, but relatively little attention has been paid to the likely effects of initiatives *before* activities actually start - how to foster impact, and to the generation within the R&I community of a culture of impact (Hainzelin et al., 2017). Similarly, there is little understanding of how policy can support ex ante approaches.

Therefore, research and Innovation needs to be developed with impact in mind and a greater focus should be given to impact during proposal development, planning and the early stages of research. There is a need to promote and support a culture at policy, institution and individual researcher level that enables and encourages greater attention to understanding, planning and assessing impact ex ante, in addition to the usual ex post assessment. Key to addressing this challenge is improving understanding of the pathways to impact, including the feedback loops between pathways that can generate both intended and unintended positive and negative impacts, often in complex non-linear systems. This means a co-designed approach to research programmes, projects and the identification of impact pathways is necessary, although the approach will likely differ depending on whether the research is basic or more applied. In terms of innovation, the need to support the type of interactive processes that underpin innovation means that a co-designed, Multi-Actor Approach³¹ is also required³².

³¹ See the requirements for "Multi-Actor Approach" in H2020 Work Programme 2018 page 8-9: http://ec.europa.eu/research/participants/data/ref/h2020/wp/2018-2020/main/h2020-wp1820-food_en.pdf

5.2.2 Research and innovation pathways

According to Douthwaite et al. (2017) impact pathways can be subdivided into three categories: technology development and adoption pathways; capacity development pathways and policy influence pathways (see Fig. 23). It is crucial for all stakeholders to have these interactions in mind when starting an ex ante impact assessment of research activities.

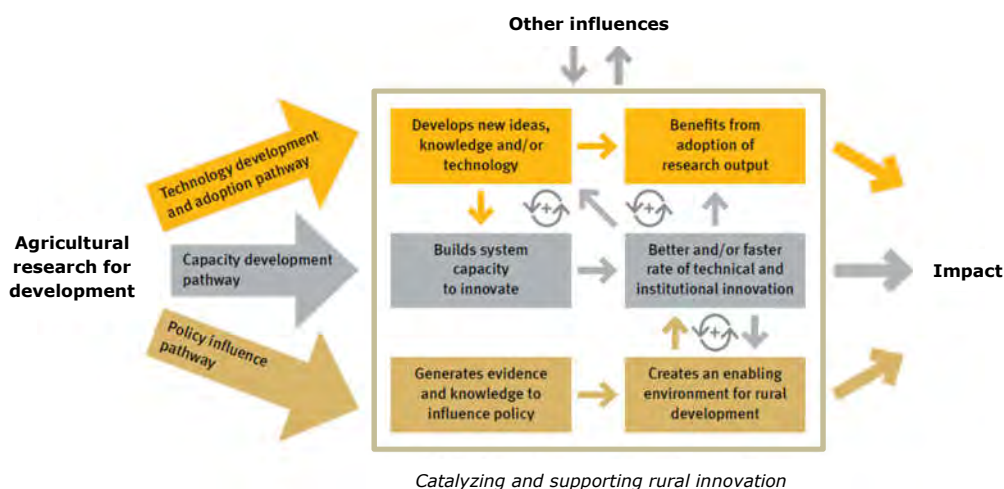


Fig. 23 Research and Innovation pathways (Douthwaite et al., 2017).

R&I policy makers and funders have considerable influence in shaping the enabling environment for research and innovation. Policy makers provide the direction for research issues through various R&I policies and funders provide a framework for working through different R&I funding modalities. Researchers are often involved in setting research agendas, but in order for them to secure funding, it is increasingly necessary to measure, document and demonstrate impact prior to implementing research activities, towards the end and after activities have been completed.

However, impact in complex agricultural or food systems is often hindered by market and policy distortions, barriers to the diffusion of new technology and by the difficulties for researchers to clearly define the end-users of their research and the kind of impact they, therefore, have to achieve. In many cases this requires a Multi-Actor and interdisciplinary approach where research is embedded within a broader context of economic, political, social and cultural aspects. A clear understanding of the impact pathways is, therefore, key for programming research and innovation for impact.

³² EU SCAR (2012), Agricultural knowledge and innovation systems in transition – a reflection paper, Brussels Available at <https://scar-europe.org/index.php/akis-documents>

5.2.3 Why ex ante evaluation?

By definition, ex ante evaluation, which focuses on how R&I programmes might generate impact, is conducted before implementation, whereas ex post evaluation, which analyses the actual impact of a programme, is carried out after implementation. Increasing the focus on ex ante evaluation will require a cultural shift, as it demands moving the framework from a purely linear approach to a multidimensional model of the R&I pathways. A better understanding of the interactions between the various elements and actors and how this can be used to generate changes in practices and behaviour will be key to programming research that will ultimately lead to better impact. Such an approach to ex ante programming, where researchers and other actors through a six stage process, construct in a participatory and strategic manner, a shared vision and identify plausible impact pathways through which research teams and their partners expect to contribute to impacts is outlined by Blundo Canto et al. (2018) as shown Fig. 24.

Fostering and documenting impact both in the short and the long term will increase impact to R&I programmes and, in addition, provide useful insights for R&I policy makers, helping them to better shape future R&I policies. Furthermore, there is an increasing demand from public and private funders, as well as from society, to measure, document and demonstrate the impact of research, requiring research institutions to improve the uptake of research outputs and the transfer of knowledge, as well as fostering innovation. From both a research and an innovation perspective, a co-designed and co-delivered Multi-Actor Approach is most likely to deliver on these demands. An interdisciplinary approach will help underpin this through, for example, the role of social scientists in facilitating the integration of research and innovation outcomes in society and the evaluation of cultural impact.



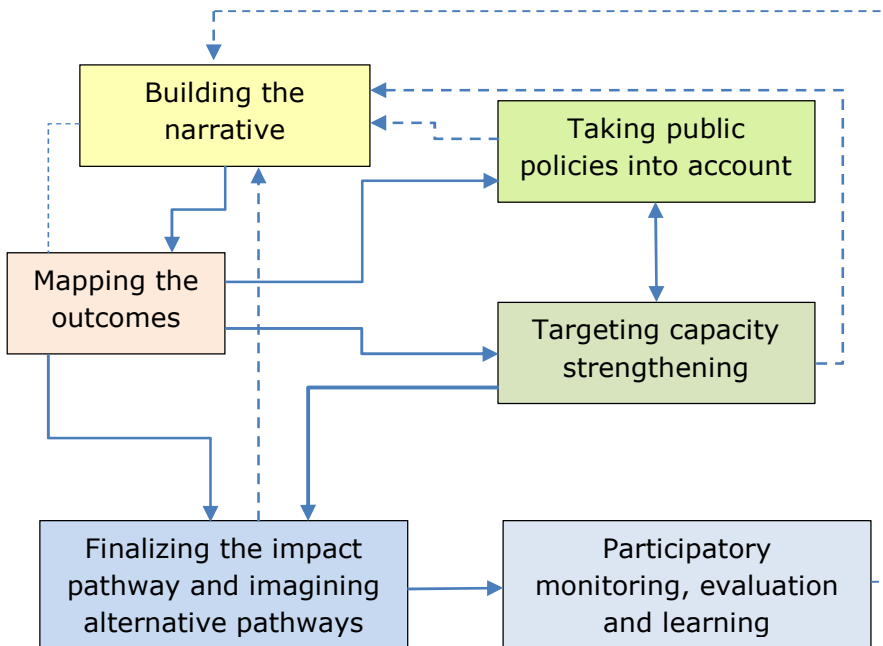


Fig. 24 CIRAD flowchart for ex ante programming (Blundo Canto et al., 2018).

5.2.4 Fostering impact

Better understanding of the different impact pathways will enable research managers and funders to influence or even take advantage of the interactions and feedback loops between the different pathways. Furthermore, to foster impact, research and innovation, actors from both the public and private sectors need to be brought into a Multi-Actor dialogue following an approach such as that outlined in Fig. 24. The Multi-Actor Approach will vary depending on the type of research being undertaken i.e. from basic to applied, as it is clear that not all research needs to integrate stakeholders to the same extent. This will require a change in the culture of research organisations as researchers can no longer define their research goals in isolation, but have to interact with other stakeholders to define the real needs of end-users of research results. Researchers must encompass “knowledge exchange activities” and consider potential applications for end-users of project results. An environment for supporting impact generation should be strengthened by including actors from knowledge transfer organisations as well as innovation support services and innovation brokering. Following recommendations from the SWG AKIS in its 2nd mandate, European Horizon 2020 work programmes started in 2014 to gradually introduce the Multi-Actor Approach and since have improved the definition, and refined the requirements for, the Multi-Actor Approach.

Impact must be taken into account by researchers when designing projects so that, while producing knowledge, they are able to work with others on co-designing and co-delivery of outputs and outcomes. To make all this happen, incentives to encourage researchers' engagement in interactive research and innovation processes should be improved³³. Success in using and achieving impact indicators by researchers should be used in a novel way to provide incentives. It is also necessary to build or strengthen relevant capacities at all stakeholder levels as new competencies are required. This could be supported by fostering closer collaboration with knowledge transfer organisations as well as innovation support services and innovation brokering to create an environment for supporting impact generation.

Policy makers and funders should ensure the application of research results by ensuring appropriate and timely participation of end-users as well as knowledge transfer organisations and innovation support services and innovation brokering.

Changes could be encouraged by providing more flexible funding regulations. Funding agencies could adapt project time frames in order to encompass a more complete process to also include impact assessment. They should also allow a broader involvement of stakeholders and beneficiaries from a very early stage, addressing their needs and taking into account the broader framework for research and innovation. The need for evaluation of impact should be emphasised and the attention given to defining impact in the overall proposal evaluation must be increased.

5.2.5 Recommendations

A number of recommendations are provided below for different target groups.

Research institutions:

- develop a culture of impact at institutional level including the capacity to understand and work with impact pathways from project design to project completion in order to strengthen the impact of R&I policies and programmes;
- widen collaboration and communication to include all relevant stakeholders in the research and innovation pathways including end-users of project results, knowledge transfer organisations and innovation support services and innovation brokering;
- include use of and achievement of impact indicators as a parameter for assessing researchers.

³³ See Chapter 5 in EU SCAR (2013), *Agricultural knowledge and innovation systems towards 2020 – an orientation paper on linking innovation and research*, Brussels.

Funding agencies:

- require a consideration of impact both ex ante and ex post and that projects and programmes are co-designed and co-delivered, where appropriate;
- examples of, and learning from, existing good practices of ex ante evaluation planning and monitoring in, for example, EIP Operational Groups and H2020 Multi-Actor Projects should be collated and analysed with a view to translation and implementation in other programmes.

R&I policy makers:

- foster an enabling environment for impact and provide researchers with the support needed to develop the capacity for this;
- ensure that funding regulations are flexible enough to support impact by, for instance, **supporting the preparation of project proposals** with a view to better planning of activities which help non-scientists and end-users of project results to effectively co-operate all along the research project (as is done for EIP Operational Groups).

SCAR working groups:

- provide advice on ex ante evaluation planning and monitoring.

All:

- **ensure a co-design and co-delivery approach to research and innovation** where appropriate. At a strategic level, enable regular exchanges between researchers, funding agencies, policy makers and end-users at the national and European level including through the better use of existing mechanisms such as SCAR and its working groups;
- **strengthen incentives and evaluation criteria for research organisations and individual researchers to encourage a focus on impact and a Multi-Actor Approach** in addition to purely scientific excellence, and also to encourage individual researchers to take part in Multi-Actor research and innovation processes;
- **strengthen the environment for supporting impact generation** by including actors from knowledge transfer organisations as well as innovation support services and innovation brokering where appropriate;
- **train researchers in Multi-Actor and co-creative working methods.**

5.3 SWG SCAR AKIS policy brief on agricultural education systems

Text by Andres Montero and a number of SWG SCAR AKIS members, based on based on presentations and discussions in the SWG SCAR AKIS meetings

The Strategic Working Group (SWG) of the Standing Committee of Agricultural Research (SCAR) on Agricultural Knowledge and Innovation Systems (SWG SCAR AKIS4) decided on 14-15 June in Brussels, to write this Policy Brief. The group zoomed in on one of the cross-cutting topics identified in its 4th mandate: exploring the **“New approaches on Agricultural Education Systems”**.

The purpose of this position paper is to bring the importance of agricultural education within the AKIS to the scene and to better understand the evolving needs of education. Especially since the set-up and implementation of the EIP-Agri and the promotion of the interactive innovation model in the EU agriculture in AKIS, are evolving. The role that the different actors within AKIS performed in the past, is changing, due to these evolving needs of the farmers and the framework conditions that allow a further interaction between the different AKIS actors. E.g. digitization, less farmers but better trained, as reflected in the recent SCAR AKIS reports and in the outcomes of different FP7 and H2020 related projects (such as PRO-AKIS and AgriSpin). This paper contributes to identifying main drivers for the agricultural education systems and its evolving needs within the interactive innovation model. It provides food for thought for the H2020 Multi-Actor Approach and also for national and regional education engaged at different levels (tertiary, secondary and primary formal education and lifelong training).

Since the specific context in each Member State may differ and this policy brief was made by a group, it cannot state individual positions of the participating Member States' experts. This policy brief represents the consensus of the SWG SCAR AKIS as a think tank. The conclusions of the discussions were endorsed in the 30-31 May 2017 meeting in Bonn and provide food for thought for all involved in the future of education services in Europe.

5.3.1 Evolution of farmers' educational needs

As stated in the report *Economic returns to formal agricultural education* (Heanue & O'Donoghue, 2014), farmers' needs are evolving quickly. They face a future of challenges and opportunities, marked by an increased demand for food and non-food products. They have to produce in a more efficient and profitable manner, in a volatile market environment and at the same time, they have to live up to sustainability requirements.

The education profile of EU farm managers is improving. In fact, the trend indicates that there will be fewer farmers but they will have higher qualifications. In 2005, 79, 5% of European farm managers relied on practical experience as their main qualification, while in 2013 this percentage had decreased to 69%. In countries like Germany, France and the Netherlands, this percentage was around 30% in 2013. In Ireland, in this same period (2005-2013), the percentage of farm managers relying on knowledge based practical experience only, decreased from 69% to 50%. As shown by Heanue & O'Donoghue (2014), farms that are managed by better skilled professionals, achieve higher yields and profits. They also confirm that private and social returns on investment in agricultural education, are high. Farming systems are evolving towards value chain and cross-sectoral approaches. More integrated production processes and multi-functioning organisational networks need different skills.

We notice the following challenges for the agricultural education sector in Europe³⁴:

- hard, basic skills and technical knowledge stay key, but continuous input is needed to upkeep this knowledge;
- more attention is paid to soft skills, entrepreneurship and willingness to learn, adapt and evolve;
- scale enlargement;
- diversification of business models;
- process innovation;
- cooperation and networking;
- inter-disciplinary understanding;
- collective cost reduction and quality improvement;
- political sensitivity to different views of different stakeholders;
- meeting consumer demands such as high quality, sustainable and locally produced products.

5.3.2 Evolution of the agricultural education system

5.3.2.1 Actors in the agricultural educational system

Agricultural actors have different degrees of education (see Fig. 25). As explained in Annex 1, not many farmers follow tertiary education. Although the trend from the last decade is that the number of farmers with higher

³⁴ CEDEFOP Skillsnet Sector Flash on Agrifood, Feb. 2008.

education degrees is increasing, the percentage is still rather low in relation to the total number of farm managers. Although there is not a direct link between successful farming and tertiary education, farmers with tertiary level education could have an exemplary role in promoting a higher level of education among peers, especially among young students who want to become farmers.

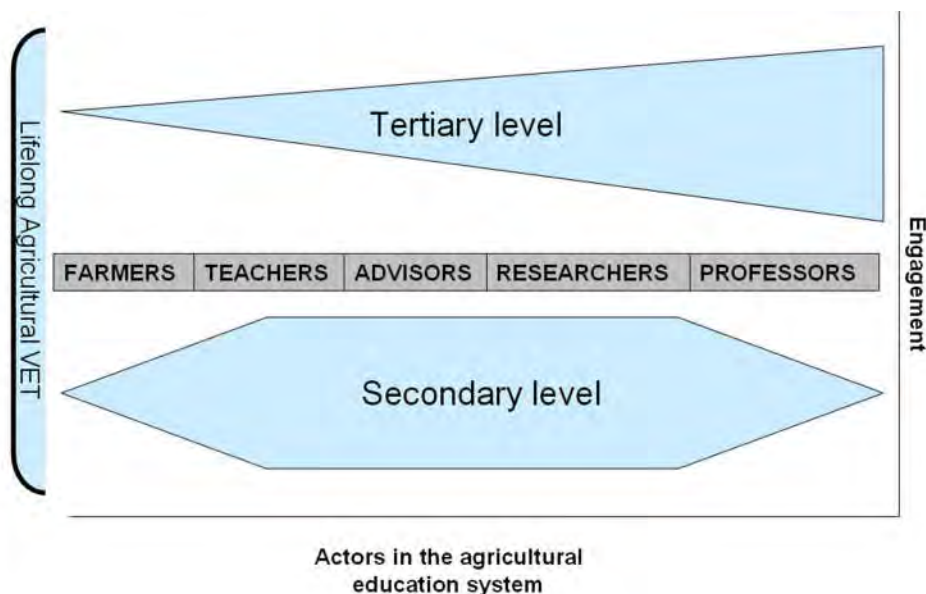


Fig. 25 Agricultural actors' degrees of engagement.



Fig. 26 Continuous input is needed to upkeep hard, basic skills and technical knowledge.

5.3.2.2 Connecting education stronger with the AKIS and its actors

AKIS are evolving and this also implies an evolution of their education component in relation to other AKIS actors. For example, vocational and lifelong training programmes are developing stronger connections between research and education, allowing researchers, teachers, lecturers and other actors, such as advisors, to work more closely together. Within this context the interactive innovation model promoted at EU level via the EIP-Agri, should contribute to the further enhancement of these linkages and interactions among different knowledge players. The involvement of actors from education systems in interactive innovation projects within the EIP-Agri framework, is of relevance for the further development, dissemination and uptake of the innovative project results. It enables stronger long-lasting effects through embedding the results in curricula and thereby strengthening the impact of projects. It can be of interest to learn from different novel education initiatives developed in different EU MSs which involve education in Multi-Actor Projects such as EIP-Agri. A few examples are mentioned below.



Fig. 27 Vocational and lifelong training programmes allow researchers, teachers, lecturers and other actors, such as advisors, to work more closely together.

5.3.2.3 New forms of education

Old paradigms based on 'presential' education, when the student is actually present in the class room, are being enriched with new innovative pedagogic methods and remote learning. Examples are: blended learning (integrating presential and virtual methodologies), mobile learning (when students work from different devices like tablets, notebooks and smart mobiles), and flipped classrooms (when students develop videos for fellow students to gain better comprehension on a certain topic).

5.3.3 Initiatives for innovating education

Different initiatives have been tested to innovate education with a view to adapt it to the farmers' present and future needs.

5.3.3.1 Developing better connections between researchers and teachers: the example of BOGO and WURKS - the Netherlands

Two Dutch examples are the programmes BOGO and WURKS (Wageningen UR Knowledge Share) for knowledge transfer between (WUR) research and education. The aim of the programmes is to update educational material and to innovate curricula. The main target groups are universities for applied sciences, higher vocational, secondary vocational and prevocational education. However, there were also projects that aimed at improving vocational trainings for (current) agricultural entrepreneurs. During the period 2013-2015, 40 projects were conducted in the BOGO-programme addressing several topics in plants, horticulture, animals, livestock, food and nature. Several products were developed such as readers, chapters, presentations, digital learning methods such as video, guest lectures, master classes, etc. Agricultural sectors were involved because the knowledge needs of different centres for expertise and innovative entrepreneurship formed the basis for the projects. The programmes allow better connections between researchers and teachers in particular.

Lessons learned:

- networks of researchers and teachers from different education levels, learning together;
- quality improvement of innovative education content;
- difficulty to get teachers 'out of the class room';
- not all researchers and teachers speak the same language.

It is important to note that the BOGO programme cooperated with the specialized centre for the development of teaching material in the Netherlands (ontwikkelcentrum.nl).

5.3.3.2 Bridging the gap between agricultural research and farm advice: the example of Advanced Training Partnership (ATP) - Wales-UK

The motivation of ATP, developed by Aberystwyth University with 4 other universities in Wales, is to bridge the gap between agricultural research and farm advice (in the ruminant agriculture value chain). Its aim is to provide access to cutting edge research findings and give clear overviews of topics relevant to agriculture. The training comprises postgraduate distance

learning³⁵ modules which can be built towards a range of postgraduate qualifications. **It is mainly oriented on advisors and sometimes on farmers as well and creates opportunities for combining work with education**

Lessons learned:

- the ATP started with 6 month on-line modules, but it did not work. Now there are modules of 12-14 weeks which allow students to discuss the topics amongst themselves;
- the programme allows people to learn at a high level whilst still working. This means that they have a context for what they are learning and in many cases, they can directly and immediately begin integrating their new acquired knowledge in their work.;
- they started both with presential workshops and on-line training. Now, only on-line training is provided as they have concentrated on more in-depth learning, giving people skills to acquire new knowledge, rather than just providing them with contents.

5.3.3.3 Strengthening linkages between university professors, researchers and advisory services: Mixed technological Networks (RMT in French)- France

The RMT concept was launched after the approval of the Agricultural orientation law in 2006. This programme contains the participation of different actors from research, development and education with 3 qualified technical institutes or chambers of agriculture, 1 agricultural school, and 1 agricultural high school or 1 research institute. This initiative allows to develop stronger linkages among university professors, researchers and advisory services. Around 30 RMT addressing cross-cutting agricultural challenges are running in France.

Main activities:

- delivering new knowledge to teachers;
- gain technical knowledge;
- build relationships between people coming from different worlds;
- have a different operational approach;
- provide information support;
- involve teachers in the creation of new trainings.

³⁵ <https://www.aftp.co.uk/>

A key characteristic of RMT is that a time release is sometimes granted for teachers, in order to be involved in the RMT. They have to apply through a call for proposals.

RMT has (inter alia) the following education objectives:

- changing the education programmes;
- building new trainings and curricula;
- creating specific modules in high schools;
- working with regional authorities and participation in the development of rural areas;
- go further on experimentation while integrating students;
- communicating agricultural issues.

5.3.3.4 Building advisors' capacity - Master in Agricultural Innovation Support (MAIS) - Ireland

MAIS was organised by Teagasc & the University College Dublin-Ireland, during the time period 2010-2015. The programme is oriented on those who are willing to work as agricultural advisors or education officers. There are two options: innovation support, and extension and innovation. The first option is based on traditional delivery whereas the latter is based on blended learning. The first programme includes a 15 month placement in a Teagasc advisory office or agricultural college, whereas the second has a 24 month placement. The program comprises the following characteristics:

- advisory & education focused research – topics put forward by Teagasc staff;
- the opportunity to learn the practical work of knowledge transfer and agricultural education;
- 2 supervisors (UCD and Teagasc);
- regular round table seminars.

Lessons learned:

- students want to work in advisory services, the apprenticeship is highly valued;
- the student's own motivation and enthusiasm are critical aspects;
- performing well on most of the critical competencies, especially in terms of knowledge of advisory systems, approaches and skills for advisory work;
- experience from the students' feedback shows that this programme allows students to: (1) develop their ability as advisors and identify farmer's individual problems and (2) come up with solutions that are

- both within the farmers' means and capabilities and will have an effect on the field;
- the programme shows successful results during its evolution, with a high employment rate of the MAIS graduates within the sector.

5.3.3.5 Involvement of students through gamification – the MezőGÉPész contest – Hungary

Gamification is an interesting tool to get students more involved in learning, especially younger, less self-conscious students (pre-university). A good example is the Mezőgépész initiative which has vocational school students in agricultural engineering, as target group. The project is part of the awareness raising programme called «Be an agricultural engineer » (Legyél te is mezőgépész: <http://mezogepesz.hu/miert-legyel-mezogepesz>). Through this programme, a contest was initialised by Agro Napló, a monthly agricultural magazine, which cooperated with MEGFOSZ (National Association of Agricultural Tool & Machine Dealers). The contest was supported by the Hungarian Ministry of Agriculture. The contest exists of three rounds for 3-5 member groups of vocational school students (15-21 years) in agricultural engineering. All these schools are managed under the authority of the Ministry of Agriculture. From 2015 and onward, the contest had immanent success. In the first experimental season there were 15 teams organised by 10 schools. In the second season 47 teams were formed by 32 schools. In the first round a community was built around the contest (see the Facebook group: [mezogepeszek](https://www.facebook.com/mezogepeszek)). This Facebook community now has more than 15.000 members. It is a vibrant professional discussion forum for agricultural engineering students, teachers and agricultural companies. In the second round, BINGO was established. During 16 days, a slogan had to be published related to agricultural machinery each day. Teams had to send in photos or videos related to these daily slogans. The third round consisted of an online test compiled by MEGFOSZ member companies. After three online rounds, the best 6 teams were invited to the live finale at AGROmashEXPO, Hungary's biggest trade fair for agricultural machinery. The first prize to be won, was a trip to the SIMA exhibition in Paris, supported by the Hungarian Ministry of Agriculture. For more information, see: <https://www.facebook.com/megfosz/videos/1889530101259395>.

The most important effect of this contest was the continuous involvement and active learning by a large and growing number of vocational school students. Key success factors were:

- the use of social media as a natural communication channel for the young students involved. The teachers understood the importance of this and they involved social media from the beginning;

- the gamification element and the prizes to be won through the contest, increased the motivation among students;
- the involvement of companies and the AGROmashEXPO, meant that they could show their skills in front of a lot of people and most importantly, in front of possible future employers.

5.3.4 SWG SCAR-AKIS recommendations for agricultural education

5.3.4.1 A people centred interactive approach connecting production with consumption

Agricultural production and consumption form the seeds for our existence. It is important that people are knowledgeable how to both produce and consume agricultural products. Agriculture should be seen as a solution for socio-economic and societal challenges. Societal awareness on the importance of agriculture should be stimulated, starting at an early age. In education this means that activities and knowledge of agriculture ought to be taught at primary school level already.

To achieve future-proof agriculture, education should focus on three levels: 1) the individual level, to develop talent and skills, 2) the economic level, regarding the labour market, with a focus on entrepreneurship for agri & food and innovation, and 3) the social level regarding connectivity, transition, sustainability and green goals. Changes in agricultural education systems should be derived from a people centered-approach. This means putting people, behaviour, connectivity, interaction, values and learning at the heart of the development of agricultural education. Human capital in agriculture has to be considered as: talent, labour, change-agents and critical consumers - human capital for a responsive approach.

5.3.4.2 Basic agricultural education for efficient valorisation of new developments and innovation

To be able to dynamically reflect the trends and needs of the sector and society, a Multi-Actor Approach in education should be stimulated. However, there is still a lack of basic agricultural education, particularly in Eastern European countries. Many new education tools address technical novelties but omit the gap with basic knowledge and skills, preventing efficient valorisation of these novelties. Hence, it is not only about developing new tools and methods for education. Within EU education systems, there should remain sufficient attention to providing basic agricultural knowledge and skills and to making learning techniques more interactive and effective. Vocational training should provide a broader range of skills for farmers but it is important not to lose practical knowledge and skills out of sight, sometimes

neglected, even at this level. Furthermore, curricula need to be able to adapt to regional/local needs and capacities and should connect with up to date knowledge sources.

Teachers, trainers, advisors and researchers should cooperate with the farming community and policy makers on both (re)defining agricultural education and training, as well as agricultural related policies on education. This can help to better reflect on new and emerging challenges for education and training programmes. In this setting, industry could be considered as a stakeholder rather than a decision maker. Experiences should be shared between MSs regarding approaches to involve education, advice and the farming community in policy making on education.

5.3.4.3 Cross-sectorial education

Similar to the AKIS as a whole, also agricultural education is evolving towards a broader approach. This means that education is not only focused on teaching agricultural technical skills pur sec. Many agricultural schools are already focusing on cross-sectorial education within the curricula, including nature management, agro-ecology, climate change, interaction with food or bio-based chains etc. One advantage of this trend is the acknowledgement that agricultural sectors do not operate in a vacuum. They are part of the wider management of rural areas and encompass value chain issues and green growth. Cooperative education with other sectors such as health, ICT, water (e.g. management, technology) should be stimulated to respond to future challenges. However, the focus on basic agricultural skills and the quality of agricultural education should not be undermined because of cross-sectorial approaches.

5.3.4.4 Lifelong learning

Lifelong learning forms the frontline for innovation. It consists of formal learning, informal learning and non-formal learning. More attention should be paid to lifelong learning training adapted to farmers, advisors, professionals and entrepreneurs' needs. Focus on Multi-Actor instruments to enhance lifelong learning, like e.g. master classes that could be developed by researchers, teachers/education and advisors together with agricultural entrepreneurs. Farm advisors need to develop more skills and experience in enhancing peer to peer learning initiatives (e.g. study groups). Peer-to-peer learning could be fostered through field schools, groups exchanging skills and expertise and inter-disciplinary workshops for both conventional and organic farmers. Stimulating peer to peer learning amongst farmers is important in lifelong learning, also with regard to the facilitating role of advisors. Especially when resources for advisory services are diminishing.

5.3.4.5 Students learn better in real life practical settings

Further to stimulating peer-to-peer learning amongst farmers, initial education systems in the different Member States should incorporate practical learning projects with agricultural enterprises ('practice learning'). This includes making it procedurally possible that students learn (more) outside the classroom, next to (general) traineeships. Research results show that students learn a lot from practical settings in which they work for, or together with enterprises (see also the ATP and MAIS initiatives above). They gain many different competences. In general, they are very enthusiastic about working in real life business cases. The entrepreneur gains by getting fresh, open minded ideas and interested new 'work forces'. Students are not hindered yet by work experience.



Fig. 28 Students learn better in real life settings.

5.3.4.6 ICT tools can enrich teaching methods

Classical on site learning is needed, particularly in regions where access to internet is difficult. However, blended learning could be further developed by making use of ICT tools, to enhance the agricultural education system. The ATP example shows that full time interactive on-line education methods increase the targeted population (this was oriented mainly on advisors). It is predicted that more people in rural areas who live far away from knowledge and training centres, will make use of digital education methods in the future. However, for a successful learning process, on-line learning tools should focus on providing adequate conditions for interaction and exchanging knowledge and views among the participants. The experience of the INOVISA entrepreneurship programmes illustrates that methodologies which allow students to prepare the lessons beforehand, with focus on exchanging ideas and experiences during presential lessons, are very effective.

5.3.4.7 Promote Multi-Actor cooperation through EU instruments for knowledge and innovation

Education should be positioned as an active partner in (regional and international) ecosystems for learning and innovation. Linkages and interaction between research, education and advisory services, should be enhanced for learning and innovating. Education and schools could be developing into knowledge centers or institutes with an important function in bridging knowledge and SMEs in the agri-food system, if knowledge input and interaction with those who generate new knowledge is incentivized to a greater extent in education. Policy makers play an important role to integrate instruments and to facilitate cooperation between different knowledge players and public authorities, to enhance synergies.

Transnational exchanges between farmers, advisors, teachers, students, researchers and other actors through instruments like ERASMUS+ or specific Thematic Networks in H2020, should also be stimulated. To realise this, it is important that there are interpreters or other methods utilised to overcome language barriers.

Teachers and students should not only be involved on academic level in (H2020) Multi-Actor Projects. Thematic networks and EIP-Agri Operational groups can arrange permanent interaction for impact. Hence it is important that instruments stimulating Multi-Actor agricultural developments and innovation are analysed or redefined, for education to be able to participate and become more involved in innovation and Multi-Actor Projects and activities. Students are the entrepreneurs of tomorrow. They form the new drivers towards a future-proof agriculture.



Fig. 29 Transnational exchanges of farmers, advisors, teachers, students and researchers should be stimulated.

Table 2 Evolution agricultural training of farm managers: numbers per country in basic, practical and full training (Source: EUROSTAT, 2016).

GEO/TIME	2005			2010			2013							
	Total	Basic	Practical	Full training	Total	Basic	Practical	Full training	Total	Basic	Practical	Full training		
Belgium	51,540	12,280	26,940	52%	12,340	42,890	9,160	22,360	11,330	37,760	7,450	22,310	59%	
Bulgaria	534,610	22,860	506,290	96%	5,470	370,490	9,610	357,920	3,070	254,410	3,360	236,300	99%	
Czech Rep.	42,250	8,260	23,360	56%	10,630	22,860	4,480	9,910	4,3%	8,470	26,250	4,910	12,250	47%
Denmark	51,680	20,380	28,700	56%	2,590	42,100	18,340	21,670	2,080	38,890	..	38,830	100%	
Germany	389,880	89,210	122,940	32%	177,730	299,130	165,230	94,000	39,910	285,030	151,690	91,010	32%	
Estonia	27,750	2,920	18,610	67%	6,210	19,610	2,740	12,450	63%	4,420	19,190	2,660	60%	
Ireland	132,670	22,460	91,950	69%	18,260	130,890	21,170	96,510	69%	22,210	139,600	35,620	50%	
Greece	833,590	42,250	788,640	96%	2,700	723,060	22,790	697,910	97%	2,360	709,500	39,050	94%	
Spain	1,079,420	99,300	966,590	90%	13,530	989,800	136,610	838,040	89%	15,150	965,000	156,710	82%	
France	567,140	62,190	258,990	46%	246,020	516,100	148,170	256,390	50%	11,550	472,210	152,260	38%	
Croatia	..	..	..	..	..	233,280	6,540	221,700	96%	5,030	157,450	..	..
Italy	1,728,530	140,900	1,534,520	89%	53,110	1,620,880	1,472,370	80,510	5%	68,010	1,010,330	917,260	3%	
Cyprus	45,170	2,630	42,270	94%	270	38,860	2,050	36,660	94%	170	35,380	2,460	32,740	99%
Latvia	128,670	15,680	84,850	66%	28,140	83,390	10,330	51,270	61%	21,790	81,800	10,750	47,800	58%
Lithuania	252,950	48,370	174,780	69%	29,800	199,910	35,020	139,920	70%	24,970	171,800	33,110	112,300	65%
Luxembourg	2,450	340	1,080	44%	1,030	2,200	320	870	40%	1,010	2,080	250	790	38%
Hungary	714,790	34,990	619,130	87%	60,710	576,810	65,290	492,360	85%	19,140	491,330	70,670	403,620	82%
Malta	11,070	30	11,020	100%	20	12,530	1,060	11,300	90%	170	9,360	1,130	8,160	87%
Netherlands	81,830	54,490	23,360	29%	3,990	72,320	46,660	20,840	29%	4,790	67,480	43,290	18,990	28%
Austria	170,640	33,590	88,610	52%	48,450	150,170	33,690	78,090	52%	38,450	140,430	31,820	70,410	50%
Poland	2,476,470	548,850	1,522,960	61%	404,640	1,506,620	320,960	814,460	54%	371,180	1,429,010	288,830	746,140	52%
Portugal	323,920	33,930	286,660	88%	4,330	305,270	31,810	268,560	88%	4,900	264,420	39,160	218,720	83%
Romania	4,256,150	289,040	3,942,630	93%	44,490	3,859,040	81,460	3,761,970	97%	15,590	3,629,660	113,750	3,498,870	96%
Slovenia	77,170	16,370	56,580	72%	5,220	74,650	19,940	48,040	64%	6,670	72,390	27,640	36,220	50%
Slovakia	68,480	7,700	59,490	86%	2,300	24,460	3,670	18,640	76%	2,150	23,570	3,590	17,840	76%
Finland	70,620	23,110	41,940	59%	5,570	63,870	22,200	35,790	56%	5,890	54,400	20,920	27,800	51%
Sweden	75,810	11,860	50,370	66%	13,680	71,090	8,600	49,130	69%	13,360	67,150	7,740	46,500	69%
United Kingdom	286,750	31,640	220,170	77%	34,940	186,800	19,430	144,330	77%	23,040	185,190	30,160	126,390	68%
Iceland	..	..	..	..	..	2,590	840	1,030	40%	730	..	..	..	..
Norway	53,000	4,770	27,430	52%	20,760	46,620	12,430	27,240	58%	6,950	43,270	7,810	30,750	71%
Switzerland	63,630	..	..	..	..	59,070	30,580	13,150	22%	15,340	..	..	..	..
Montenegro	..	..	..	..	..	48,870	1,850	46,220	96%	810	..	..	..	..

5.4 Views from agri-food SMEs

5.4.1 Lessons learned on collaboration for innovation in the agri-food value chain

For successful co-creation in the agri-food value chain, it is important to bring together diverse expertise, knowledge and to develop a clear work plan. This means joint efforts by academia, the industry, innovation experts, (representatives of) consumers and civil society, NGOs networks, etc. All parties in the value chain that are related to the innovation being developed, have to be involved from the beginning. Therefore actor and network analyses are required and the partners involved need to develop a clear and common vision on the objectives to tackle (problem/opportunity). Collaboration on innovation may start from a personal level initially but this personal strategy has to fit with the strategy of the other partners involved in co-creation. An urgent common need to solve a problem, is often the main reason to co-innovate. Selecting the right partners is crucial. To guarantee financial support, a network of SMEs and larger companies could be formed, possibly facilitated by venture capital depending on the context of the innovation. Innovation clusters could be used. These are groups of independent companies, innovative start-ups, small, medium and large companies as well as research organisations that operate in a particular sector and region. Innovation clusters are designed to stimulate innovative activity by promoting intensive interactions, sharing facilities, exchanging knowledge and expertise, in order to contribute effectively to technology transfer, networking and information dissemination amongst the companies involved.

All parties in the value chain that are related to the innovation being developed, have to be involved from the beginning.

Another main challenge, is to better connect farmers to the other partners in the food chain which are closer to the final consumers, or support them in more direct connections with the end-consumers of their products. The gap is still too big. This means there should be more focus on both the attitudes of farmers to better understand the process towards consumption, as well as the attitudes of the other links in the food industry that farmers

An urgent common need to solve a problem, is often the main reason to co-innovate. Selecting the right partners is crucial.

are the pivot in the agri-food production process. However, co-creating innovation in agri-food is not only about better connections between the different links in the chain. It could also be about involving local and regional communities. Local agri-food chains play an important role in local economies

and the socio-economic development in rural areas. Also, connections between rural and urban areas are relevant in this regard.

Innovative approaches to small scale food processing should be promoted, as well as small scale commercialisation and distribution. SMEs and start-up entrepreneurs can play an important role in developing new paradigms and innovative approaches. Additional research may be necessary but in order to stimulate innovation, there should be focus on instruments and actions by public and private actors that enhance the innovation ecosystem (like EIP AGRI, EIT Food, public procurement, innovation brokers, innovation prizes, financial incentives, etc.). The partners in the co-creation process need to have synergetic ideas and have to be willing to exchange internal expertise and combine this with external (technical) expertise, where useful.



Fig. 30 Local agri-food chains play an important role in local economies and the socio-economic development in rural areas.

Furthermore, funding is important to support innovation processes. However, the search for the right knowledge, developing skills, expertise and competence are equally important aspects which require support. Both in the preparation phase and in the project phase. Regarding public funding for the projects itself, some claimed that innovation can only be realised if it is combined with funding from private partners although this does not need to be on a 50-50 basis. It depends on the funding capacity of the partners involved. They claimed that for co-creative innovation to be successful, all parties have to contribute in kind or in cash which reflects the necessary commitment to establish a level playing public-private playing field. However, in cases where societal issues or public goods are involved, private funding is not always adequate to incentivise the innovation process. There always

needs to be a will amongst the SMEs involved to invest in the partnership, with or without financial input. The partners involved need to look for and convince peers to join their co-creative network, to be able to combine and multiply finances. Crowd funding could also be an alternative source for funding. The co-creation process has to be supported professionally by an innovation broker such as an advisor, an association, a cluster, a technology transfer centre or a university e.g. for applied research. The broker acts as an objective supporter based on the trust of all committed parties involved. The SMEs have to be supported in:

- finding the right partners such as researchers, engineers, marketers, communication partners to co-create and valorise knowledge for innovation;
- developing skills and competence for innovation processes.

Some MSs have good experience with utilising vouchers as financial instrument to fund such innovation support.

More innovation support infrastructures such as Inovisa³⁶ and Flanders' FOOD³⁷ could be developed at regional, national and EU level.

Sharing experiences at EU level should enhance the possibilities of replicating examples and mechanisms in one region to another. The language barrier is an important aspect that needs to be taken into account when organising events.

SMEs, including start-ups, demand for support or guidance in their development process and in the different innovation phases, including the search for appropriate public and/or private funding opportunities. Support and facilitation

in funding are key needs. Costs and benefits of the potential innovation need to be calculated. In particular start-ups ask their selves what the consequences are if the company that invests in their business, wants to buy them out. Other key focus concerns are how to anticipate that the right products are being developed that solve the innovation problem, that meet the consumer/ customer's demand and that can be actually implemented or marketed, reduction of costs, safety and quality control. SMEs look for different niches and marketing strategies than the larger enterprises in their value chain. Next to existing incubator programmes, more accelerator programmes should be stimulated in agri-food chains, including mentoring from different, possibly larger companies, network activities and public-private funding opportunities.

Furthermore, networking, events and workshops that are organised to demonstrate the latest technology enable exchanging best practices, at

³⁶ www.inovisa.pt/en

³⁷ www.flandersfood.com

regional, national and EU-level. Sharing experiences at EU level should enhance the possibilities of replicating examples and mechanisms in one region to another. However, there is (still) a restraint because of language barriers. This is an important aspect that needs to be taken into account when organising events for exchange on EU level.

The enhancement of communication, demonstration and networking for exchanging knowledge and innovation experiences, could be organised in specific programmes. Depending on the context, these programmes could be part of a living lab for example, a user-centred, open-innovation ecosystem that often operates in a territorial context which integrates concurrent R&I processes within a public-private-people partnership.³⁸ However, attention should be paid to the maintenance of learning networks after the end of these projects when there is no more financial support. Last but not least, it is important to involve consumers and communities in co-innovation, when appropriate.

5.4.2 Most promising drivers for innovation in agri-food by OGs

The participants in the workshop 'Innovation in the supply chain: creating value together' identified the following, most promising drivers to enhance innovation in the agri-food supply chain:

- consumer behaviour, expectation and demand: educate and involve consumers by building better links with producers. Focus innovation on customers' needs and expectations, but make sure that strategies focus on connecting with consumers in the long term, diversifying customers and targeting products to meet those needs;
- leadership, collaboration and connecting stakeholders: build collaborations around a strong vision led by an open leader and facilitator. Start with small-scale collaborations of Multi-Actor teams built around a vision or idea, to build stakeholder skills and create the foundations for trust along the supply chain. Consider a diversity of approaches for delivery but share common ground and objectives;
- environment, climate, change and the impact of food production: develop a new mind-set on yield and income. Less is more effective and may have more impact in the market, both through a focus on quality rather than quantity and a reduced environmental impact;
- communication and transparent information: develop bottom-up, local, regional and European fora to connect people, cooperate, share experiences and learn from both best practices and mistakes;

³⁸ www.en.wikipedia.org/wiki/Living_lab

- political willingness, policy and innovation incentives: simplify farmers' administrative burdens and their access to innovation, to ensure better distribution of the value added along the supply chain;
- IT, logistics and supply chain technology: provide incentives to improve uptake of new technology to ensure that these incentives exist throughout the supply chain;
- marketing, social media and storytelling: make farming and food attractive by using farms, farmers, products and provenance to tell a contemporary, engaging story.



Fig. 31 Make farming and food attractive by using farms, farmers, products and provenance to tell a contemporary, engaging story.

Sharing experiences and bringing new perspectives to problems, encourages innovation. Successful examples inspire and motivate others. Working across borders on innovation increases the chance of finding the right partners and broader competition will enhance successful innovation, for instance cross-border marketing strategies involving consumers. Hence, to support innovation in agri-food supply chain, focus on: (1) collaborative cross-border projects, (2) common policy and clear messages, (3) events, websites and webinars to disseminate best practice, (4) developing databases of skills, knowledge and initiatives, (5) innovation meetings, (6) organising exchange visits, dialogue and (7) 'travelling farms'. Furthermore, (8) adjustments to national legislation should be taken into account as well as (9) exploring new markets for ideas and projects.

5.4.3 Exploring possibilities for collaboration on innovation in the agri-food supply chain

5.4.3.1 Finding and motivating the right partners

To find and motivate the right partners, a clear vision should be communicated and the benefits need to be identified for all partners. A skilled innovation broker should facilitate the network by bringing partners together and organising face-to-face meetings and networking events to pitch ideas and present success stories to inspire and motivate. A team of diverse partners with different experiences and skill sets, including experienced and new partners, bring in fresh ideas. Successful partners will attract others. Make use of existing databases, networks and networkers and share experiences locally, to ensure that the project is locally appropriate.

5.4.3.2 Connecting innovation groups at regional, national & European level

There should be focus on stimulating funds for cross-border OGs and also greater flexibility during the project implementation to connect to larger research projects. Build more (funded) networking time into projects, including face-to-face meetings. More funding should also become available to enable innovation groups of all sizes to work together. A standard web platform which includes all projects and effective social media could support this. Workshops/events to exchange knowledge and experience, bring groups together. Finally, more awareness of existing collaboration tools should be raised.

5.4.3.3 Successfully disseminating results

Dissemination tools need to address the right, specific target groups and results for end-users have to be practical and applicable. To address farmers best, make use of existing local and regional networks. Harmonise dissemination tools and develop shared templates to create a common platform. Communication should be both organised face-to-face such as seminars and field trips and digitally e.g. using Youtube, storytelling, social networks and AGRI-hackathons. Finally, it is not only about sharing the good practices. One might learn more from failures.

5.4.3.4 Exploring the value of creating project communities (around specific challenges)

Whether the development of project communities should be addressed at European or national level, depends on the topic the community is working on. Specific topics such as legislation for abattoirs, could best be addressed at EU level. Communities which are more oriented on general issues and in particular where language might be a barrier, are likely to function better at

national level. Good communication within and across communities is considered to be a key success factor, including the use of supporting channels like webinars and social media. Websites, newsletters, social media etc. are supportive communication means, but are not sufficient alone. Face-to-face meetings are essential to start up project communities. National Rural Networks should also play an active role in organising events to establish communities on similar issues. Furthermore, thematic networks are considered to play an important role in bridging the gap between research and practice, including OGs and participate in the creation of such communities. TNS actively reach out to OGs.

5.4.3.5 Assessing success and sustainability of innovation projects in the agri-food supply chain

Every project is established with the aim of solving a problem and is therefore logically considered successful, when the problem in question has been solved. This should be measured through key performance indicators (KPIs) or deliverables that have been defined at the beginning of the project. However, creating a cultural change or a change of practice in a given community, is also considered a success indicator but this is very difficult to measure. Success can also be achieved through unexpected positive results and the involvement of new partners. Again, learning from failures provides useful knowledge and experience for others to gain from.

The sustainability of the project, embedding the results and the fact that the dynamics which have been established continue after the end of the project, should be taken into account while assessing success, next to the contribution of the project aims to (a) global objective(s). This might be difficult to assess at project level and a programme level perspective might offer better insight. The impact of the project is often best appreciated after it has ended, so impact indicators must be clearly defined alongside result indicators. Finally, the potential of the project results to be disseminated to other geographic locations or to other sectors to support broader learning, should not be underestimated either. Despite the required adaptation of these results in other ecosystems.

5.4.4 Conclusions and recommendations

Enhancing successful collaboration on agri-food innovation requires the following aspects:

- trust, transparency and clear expectations: the partners involved in the collaboration on innovation have to trust each other and in the collaboration, otherwise there is no solid basis for commitment. Trust means transparency, clarification and understanding of each other's interests and finding (agreement on) common goals. To

create a transparent environment, information is to be exchanged openly and the expectations of the collaboration need to be clear;

- team facilitation: the collaborating network needs a facilitator, 'a spider in the web', who has the trust of all partners involved and who guides them in realising the common aim, while keeping the individual stakes into account and managing the different expectations. This also means the capability of clarifying the individual interests of the different actors involved in the process in relation to the common aim, distilling and discussing unforeseen stakes. The facilitator is able to empower the team and acts on an equal hierarchical level as the other actors involved. He/she makes sure that the partners have complementary competences and may suggest to involve other actors who can support the innovating group when required;
- win-win for impact: major drivers of innovation for companies are to stay competitive, to reduce costs, to get new customers, to live up to (new) regulation, etc. There has to be a story that serves a higher purpose to first create believers in the concept, second to gain supporters for the innovation that is being developed and finally to get customers interested in your product. Public-private innovation has to be both citizen and impact driven. Do not undersell innovation. The collaboration has to create value for all partners involved, which should be clear from the start. Innovation does not commence with focus on profit (only) but it is an important aspect which also contributes to societal socio-economic aims. The other way around, one can be passionate but without the proper funding, one does not get far. Hence the partnership has to develop a win-win framework to reach impact, including market awareness and sharing both costs and benefits.

Furthermore it is important that the partners in the collaboration process:

- are not afraid to fail and learn from their mistakes ('failing forward');
- are flexible in changing the process whenever needed;
- avoid isolation as a group and exchange with other partners or networks;
- create synergy in the agri-food chain;
- establish disruptive collaboration if disruptive innovation is envisaged.

Potential solutions for future collaboration on innovation are:

- to improve possibilities for exchange of information. There is a common need for better exchange of information and data in the agri-food chain. The topics are diverse but one interesting idea for

instance, is to develop a Google map of nutrition, related to health systems, to better inform consumers about the nutritious value of their food. Consumers need to be better informed where their food comes from and how it was made. We should develop common language and patterns in the EU which make it easier for all to communicate in a common manner. This makes it also easier to collect the knowledge and data in a European database. We should find consensus on the standardisation and governance of these data so that multiple actors are able to utilise it for different purposes, while building trust through respecting ownership of data. Sharing information and data can help establish a level playing field;

- to support the finding of funding opportunities. SMEs need support to find funding possibilities. One main challenge is the ability to engage the right funders/investors at the right phases in the innovation process. In particular, support in the crucial phase of the development process, from prototype to commercial launch. This could be started by improving the possibilities and opportunities for combining public and private financial resources, creating synergies between different funding instruments and better accessibility of funds for SMEs. There are many possibilities for funding and support on regional, national and European level. The problem is the missing overview. A European guide in the form of a website may contribute to solving this. Further-more, there should be more communication and emphasis on the attractiveness to invest in agri-food among more potential investors. This could be stimulated through cross-over collaboration with other sectors such as ICT and health. Funding should be agile and allow failures and disruption in the process. It is beneficial to invest in SME agri-food innovation because they have the capacity to implement and test innovation rapidly. However, they often do not have the financial means to do so. Lower or no contribution rates can help in such cases. Larger organisations can afford financial investment in innovation but they are hampered by decision making process and size.

One main challenge is the ability to engage the right investors at the right phases in the innovation process.

Furthermore:

- the Multi-Actor Approach (MAA, see also the previous chapters) should be enhanced when funding collaboration on innovation, to form an optimal combination of equipment and skills and to focus on end-user objectives;

- open and interregional collaboration and networking should be promoted through establishing more connections between countries, regions, municipalities, projects and people, but also rural-urban relations. H2020 thematic network projects support interregional collaboration. Language barriers should be overcome and standardised to share knowledge, experiences, good practices but also bad practices to learn from. Rural EIP networks can support this sharing and have means to translate knowledge material in local languages;
- focus in agri-food innovation should be on sustainable production and consumption of agri-food products of good quality and finding solutions for societal problems like food waste;
- there is a need to come up with better or new distribution channels from seed to fork which are cost effective, reliable, convenient and distribute the products efficiently and fast.

The following types of support stimulate collaboration for innovation in the agri-food supply chain:

- towards innovation ecosystems. A mature innovation ecosystem needs to be developed, in which innovation brokers, innovation support services, networks, incubators and accelerator programmes support the innovation process and which provides sufficient space and possibilities to network and experiment. Create collaborative spaces in rural areas. Vouchers could be introduced as instruments to support SMEs in co-funding schemes for co-innovation in innovation eco-systems. Innovation support services also stimulate new collaborations and should make cross-connections, for example with other industrial sectors. Furthermore, innovation ecosystems should encourage demand driven science and better access to knowledge, where it is needed;
- policy support and regulation. Many SMEs in the food sector are insecure about the relevant legislation, e.g. labelling. Governments can play a bigger role in fostering innovation amongst others by stimulating more connections. Continue developing a relationship between DGs AGRI and RTD, the EU MSs and the relevant stakeholders. It is a good thing they are working more together on agri-food chains. Adopt a legal framework in food legislation: regulation can stimulate a better level playing field in sharing benefits along the food supply chain and focus on accelerating the time to

Open and interregional collaboration and networking should be promoted through establishing more connections between countries, regions, municipalities, projects and people, but also rural-urban relations. **H2020 thematic network projects support inter-regional collaboration.**

market. Politicians need to be open minded with regard to innovation which is driven by societal challenges. Change state procurement practices and tendering that limit innovation. Finally, there were and are a lot of relevant projects which are funded by the EU and the Member States. The networks and knowledge which were generated should be further supported and communicated to speed up things and create synergy with new projects and networks



6 The enabling factors that make AKIS work



6.1 Lessons learned on possible funding synergies for AKIS

Text from a study by Stefan Kah and Markus Gruber, European Policies Research Centre

Objective: The aim of this study was to better understand the potential of synergies among EU funds for research and innovation in agriculture. The study explored the procedures of stimulating synergies by authorities responsible for EU funds at all relevant levels (EU, national, regional). It looked both at success stories and at lessons learned from challenges. Identifying pioneering approaches helped to build a virtual case study demonstrating the added value of synergies.

Method and structure: Research for this study analysed case studies to identify success factors barriers and approaches to overcome. The study covered all relevant EU policies, but focused on Horizon 2020, EAFRD (incl. EIP-AGRI) and ERDF both at the European and the Member State levels. Section 1 is a brief introduction to the topic. Section 6.1.2 presents the challenges of creating synergies, looking at the rationale and preconditions for synergies. Section 3 illustrates the policy environment for agricultural innovation and presents examples of AKIS and related projects. Section 4 and 5 presents the key findings related to the support environment, the identified success factors and ways to improve synergies with collaborative approaches. Section 6 finishes with some conclusions.

Conclusions and recommendations: There is a broad variety of support instruments available, covering all stages of the agricultural innovation process. However, they operate independently, making the creation of synergies challenging. Four success factors which can create synergies, found in the best practices are:

- Enablers that can provide guidance and coordination in agricultural innovation systems
- Strategies that define objectives and priorities
- Incentives that make synergies worth the additional effort and associated risk
- Harmonisation of rules between different instruments and associated simplification

In addition to these, transparency, trust and culture play the role of supporting factors.

6.1.1 Aim and methodology

The aim of this study³⁹ was to provide a better understanding of the potential and the use of synergies among EU funds in the fields of research and innovation in agriculture. The study explored the procedures with regard to stimulating synergies (including funding arrangements) of authorities responsible for EU funds at all relevant levels (EU, national, regional). It looked both at success stories and at lessons learned from encountered challenges, identifying pioneering approaches in stimulating synergies. The study is intended to provide inspiration through cases that demonstrate added value and impact of synergies.

Research for this study:

- analysed case studies in order to identify good practices, including their success factors;
- identified barriers and approaches to overcome these;
- covered all relevant EU policies, but focused on Horizon 2020, EAFRD (incl. EIP-AGRI) and ERDF;
- looked at both the European and the Member State levels.

At EU-level, interviews were carried out with policy-makers at the European Commission (DG AGRI, DG RTD, DG REGIO, DG ENV, ENRD, JRC). At Member State level, the research focused on five case study countries or regions: Lower Austria (AT), North-East Romania (RO), Scotland (UK), Slovenia and Tuscany (IT). In these, managers of funds, programmes or instrument, as well as other policy-makers and researchers have been interviewed. However, in the research process, evidence and examples from other countries were included, too.

In 6.1.2 you will read about the challenges of creating synergies, looking at the rationale and preconditions for synergies. 5.1.3 illustrates the policy environment for agricultural innovation and presents examples of AKIS and related projects. 5.1.4 presents the key findings related to the support environment, the identified success factors and ways to improve synergies with collaborative approaches. 5.1.5 finishes with some conclusions.

6.1.2 The challenges of creating synergies

6.1.2.1 The rationale for synergies

The pursuit of synergies is increasingly prominent in public policy, particularly in complex policy fields where a range of objectives, instruments and stakeholders are involved. Given this, definitional clarity is important to

³⁹ Study assigned by SWG SCAR AKIS in 2018 and funded by H2020 Agreement 727486 (CASA project)

understand what synergies can achieve, how they can be realised, and what the challenges are. In this respect, it is useful to compare 'synergy' with other related terms (see) to emphasise that, ideally, synergies should go beyond mere coherence, coordination or complementarity and achieve a product that is worth greater than the sum of the component parts.

Table 3 Synergy and related terms (Adapted from Graves et al., 2008⁴⁰)

Term	Summary definition
Synergy	The interaction of two or more agents, resources or activities such that the product is worth greater than the sum of the component parts (1+1>2).
Complementarity	Activities or policy efforts that build on the strengths and account for the limitations in each other (1+1=2).
Coordination	A process by which donors share information about or identify their respective resources, goals, processes and timelines to each other in order to reduce duplication and increase complementarity.
Coherence	Where two or more distinct policies or programmes are logically consistent and do not counteract each other.

In recent years, EU institutions and the practitioners implementing EU funding are increasingly recognising the need and to a more limited extent, the potentials for greater synergies in the use of EU funds, including the area of research and innovation in agriculture. The need to harness synergies and complementarities between EU policies and instruments, is an objective of the Council, European Parliament and European Commission (EC) both in the 2014-2020 period and post-2020. The Common Provisions Regulation (CPR), which covers all five ESI Funds in 2014-20, specifically mentions synergies between individual ESI Funds as well as of ESI Funds with Horizon 2020: *"In order to optimise the added value from investments funded wholly or in part through the budget of the Union in the field of research and innovation, synergies should be sought in particular between the operation of ESIF and H2020, as set up in Regulation (EU) No 1291/2013 of the European Parliament and of the Council, whilst respecting their distinct objectives."*⁴¹

⁴⁰ http://um.dk/en/danida-en/results/eval/Eval_reports/evaluation-studies/publicationdisplaypage/?publicationID=685C5796-030A-4105-A370-62899E53AD03

⁴¹ REGULATION (EU) No 1303/2013 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 17 December 2013 laying down common provisions on the European

In order to encourage synergies in 2014-2020, the EC presented a number of guidance documents and tools for policy-makers. This includes a 2014 guidance to encourage synergies between ESIF and other EU policies, which addresses some of the regulatory issues and recommends actions for policy-makers, particularly focusing on Horizon 2020.⁴² Similarly, a 2016 EC publication provides a series of examples for synergies between ESIF and Horizon 2020, with the aim of supporting the development of similar approaches.⁴³ However, without much scope to adjust the current regulatory frameworks, the focus is increasingly shifting to post-2020, with demands for the cohesion policy of the future to be “*designed from the very beginning with synergies, coherence and complementarity in mind*”.⁴⁴

As a solution for synergies in 2014-2020, the EC launched the Seal of Excellence (SoE) in October 2015. Although it aims to facilitate synergies between ESIF and Horizon 2020, in practice it allows for unsuccessful proposals under Horizon 2020 to be funded by ESI Funds. Initially only in the Horizon 2020 SME Instrument, the SoE certificate is awarded to applicants of excellent proposals. Managing authorities of ESIF programmes can then use the certificate to award funding without carrying out a new qualitative assessment of the application. While some Member States have started to make use of it early on (e.g. Czech Republic, Italy), others remain hesitant, arguing that the rationales of the instruments are too different to allow projects to be simply transferred to a different policy area. Nevertheless, in the area of agriculture, even in the short period between the launch of the instrument and June 2016, 107 projects EU-wide have benefitted from the Seal of Excellence.⁴⁵

Regional Development Fund, the European Social Fund, the Cohesion Fund, the European Agricultural Fund for Rural Development and the European Maritime and Fisheries Fund and laying down general provisions on the European Regional Development Fund, the European Social Fund, the Cohesion Fund and the European Maritime and Fisheries Fund and repealing Council Regulation (EC) No 1083/2006 Common Provisions Regulation, <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32013R1303&from=EN>

⁴² European Commission (2014) Enabling synergies between European Structural and Investment Funds, Horizon 2020 and other research, innovation and competitiveness-related Union programmes. Guidance for policy-makers and implementing bodies, https://ec.europa.eu/regional_policy/sources/docgener/guides/synergy/synergies_en.pdf

⁴³ European Commission (2016) *EU Funds working together for jobs & growth. Synergies between the R&I Framework Programmes and the European Structural & Investment Funds*, <http://ec.europa.eu/research/pdf/publications/ki-01-16-339-en-n.pdf>

⁴⁴ Council of the EU (2017) *Synergies and simplification for cohesion policy post-2020: Council adopts conclusions*, press release 15 November 2017, <http://www.consilium.europa.eu/en/press/press-releases/2017/11/15/council-conclusions-on-synergies-and-simplification-for-cohesion-policy-post-2020/pdf>

⁴⁵ Interreg Europe (2017) *Tapping into the potential of the Horizon 2020 Seal of Excellence. A Policy Brief from the Policy Learning Platform on Research and*

While the potential is widely acknowledged, **evidence of the use of synergies** is limited, also if looking at EU policies more widely. For instance, in the area of renewable energy and rural development, a 2018 ECA report identified potential for synergies between different EU policies but concluded that more efforts are needed to make use of these.⁴⁶ In its replies to the report, the EC emphasised that it has actively promoted synergies between ESIF and other national and EU funding schemes. However, it also highlights that ultimate responsibility for implementation choices fall under the responsibility of the Member States.

Actors acknowledge that a strategic approach to the use of public money would be more efficient, but the evidence suggests that actors tend to follow a 'synergies by opportunity' approach. Yet, synergies are not easy to achieve due to the different funding objectives and frameworks, particularly between the largest sources of funding, ESIF and Horizon 2020, which relates to the difference between directly-managed instruments (Horizon 2020, LIFE) and those under shared management (ESIF). Both types of instruments operate under different sets of rules, for instance with regard to State aid, instruments

Although its potential is widely acknowledged, the use of synergies is limited due to different sets of rules between instruments and different objectives and rationales. Domestic policies add an additional layer of complexity.

managed centrally at EU level not being subject to State aid regulations as opposed to those with shared management between EU bodies and Member States. This different applicability in terms of State aid compliance is a disincentive for synergies, as the combination of ESIF with funding

from directly-managed instruments can cause regulatory uncertainties. For instance, while a beneficiary can use Horizon 2020 funding without any notification requirement, the whole project must comply with State aid rules if the beneficiary combines Horizon 2020 support with ERDF support.

Another obstacle is related to **different objectives and rationales** of Horizon 2020 and ESIF. Haarich (2017) noted this in the context of support for the bioeconomy. ESI Funds are about the socio-economic development in Member States and regions, for instance reducing disparities and assisting structural change. Horizon 2020 instead is about research excellence more than anything. ESI Fund interventions are mostly territorially defined, either

Innovation, May 2017,

https://www.interregeurope.eu/fileadmin/user_upload/plp_uploads/2017-05-09_Policy_brief_Seal_of_Excellence.pdf

⁴⁶ European Court of Auditors (2018) *Renewable energy for sustainable rural development: significant potential synergies, but mostly unrealised*, Special Report No. 5, https://www.eca.europa.eu/Lists/ECADocuments/SR18_05/SR_Renewable_Energy_EN.pdf

local, regional or national, while one of the key features and requirements of Horizon 2020 is its international set-up. An exception under ESIF is ETC., which is defined by its international dimension. Of particular interest is its interregional dimension, which does not require beneficiaries to be located in a defined space, other than the countries covered by Interreg Europe (EU 28, Norway and Switzerland).

Domestic policies add an additional layer of complexity to support system for innovation. These play an important role particularly in more-developed Member States with a longer tradition of public support for economic development and larger domestic funds for research and innovation. Often, domestic support instruments are preferred by potential beneficiaries, as these do not entail additional, complex requirements imposed by the European level. However, relying on domestic frameworks are a less viable option in some Member States where research and economic development funding is almost exclusively provided by the EU level.

6.1.2.2 Assumed preconditions for synergies

A 2016 study on synergies for the European Parliament Committee on Regional Development found that the potential for synergies between ESIF and other EU instruments has been underexploited.

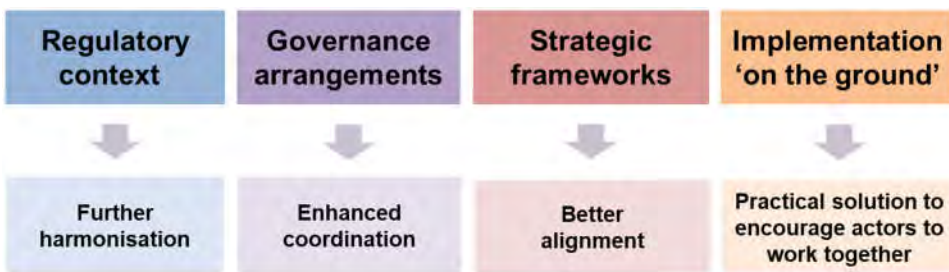


Fig. 32 Recommendations to maximise synergies between ESIF and other EU instruments (Ferry, Kah and Bachtler, 2016).

It identified a need for further harmonisation of regulatory frameworks; enhanced coordination at Member State and EC levels, including soft governance options; better alignment of strategic frameworks; and practical solutions for implementation to encourage actors to work together 'on the ground' (Ferry, Kah & Bachtler, 2016). Although these findings result from research on EU instruments more widely, it can be assumed that they are also valid in the area of agricultural innovation.

For the scope of this research, synergies are examined as features of the interactive innovation approach in a Multi-Actor environment. Previous research allowed identifying potential success factors for synergies, which have been translated into a series of potential preconditions.

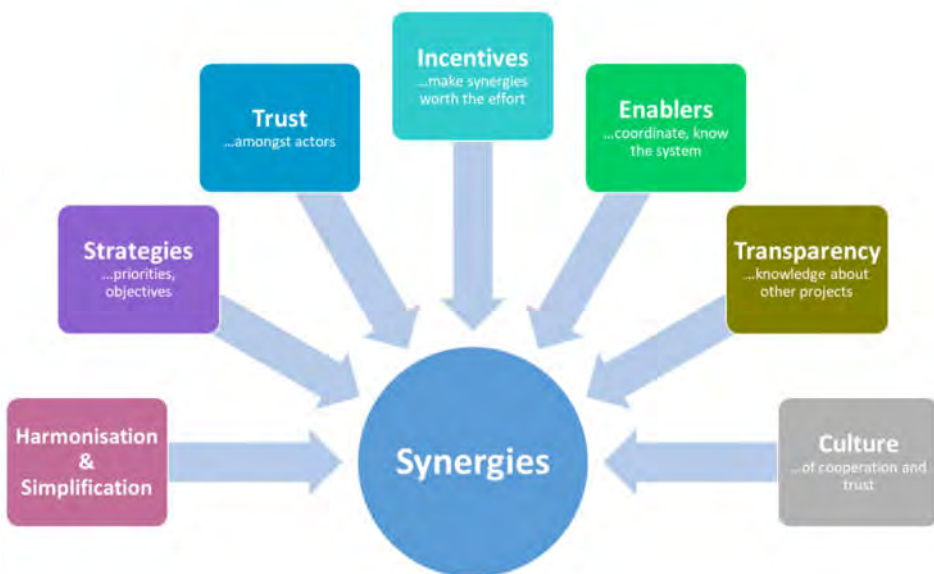


Fig. 33 Assumed preconditions for synergies.

- **harmonisation and simplification** of regulatory frameworks;
- **strategies** setting out priorities and objectives;
- **between** actors in innovation systems, both vertical (policy-makers, researchers, end-users) and horizontal (e.g. amongst policy-makers and amongst farmers);
- **incentives** to make synergies worth the effort;
- **enablers** that are able to coordinate activities of innovation actors, based on their in-depth knowledge of the system;
- **transparency** that allows flow of information and awareness of other projects;
- **cultural factors** (tradition of cooperation, demographics of innovation actors, particularly farmers).

The validity of these assumed preconditions will be examined on the basis of the evidence gathered in the course of this research, resulting in a prioritisation of selected success factors.

6.1.3 Policies for agricultural innovation

6.1.3.1 The challenge of innovation in agriculture

Innovation in agriculture faces a number of specific challenges, which has recently (2018) been defined as: (1) food and nutrition security; (2) climate change; (3) environment and biodiversity; (4) maintaining healthy lifestyles;

and (5) rural areas and territorial cohesion (Détang-Dessendre et al., 2018). Innovation can make useful contributions to all of these and particularly the fifth challenge to support rural development can benefit from synergies between innovation policies and other EU policies (e.g. ESI Fund support).⁴⁷

However, global trends in public expenditure on agricultural R&D point to a relatively flat pattern of expenditure and the source of public agricultural expenditure is shifting from traditionally richer countries to countries with strong economic growth. Also, R&D and innovation has traditionally been industry-

The innovation culture amongst farmers is varied and suffers from its demographic context (ageing farmers, missing handover to the next generation) and the small size of farms in most parts of the EU.

driven, not end-user-driven. The innovation culture amongst farmers is varied and suffers from its demographic context (ageing farmers, handover to the next generation) and the small size of farms in most parts of the EU.



Fig. 34 Innovation is very diverse amongst different countries, some develop new products for the local market...

⁴⁷ European Parliamentary Research Service (2019) *EU agricultural research and innovation*, Briefing, January 2019, p. 3, [http://www.europarl.europa.eu/RegData/etudes/BRIE/2019/630358/EPRS_BRI\(2019\)630358_EN.pdf](http://www.europarl.europa.eu/RegData/etudes/BRIE/2019/630358/EPRS_BRI(2019)630358_EN.pdf)

Traditional top-down approaches in promoting innovative approaches are not seen as appropriate anymore, not least due to a changing political context of food and farming systems that takes into account a variety of factors such as sustainability, consumer concerns, food security, food safety, environmental concerns, biodiversity and socio-economic developments in rural communities. Also, farming practices are getting more di-verse and are often combined with other activities. At the same time, new knowledge is generated not only by re-searchers, but also by farmers. Linear innovation models from science to end-users are increasingly replaced by interactive models that give end-users a more active role (Fieldsend , 2013).



Fig. 35 ... while in other countries the use of mechanisation is already innovative.

Innovation policy needs to take account of different preconditions in different Member States and regions. European AKIS are very diverse (see Fig. 36), not only in terms of their strength. They also differ in terms of their degree of integration. In fragmented AKIS, several independent knowledge networks operate in parallel (e.g. Portugal, Spain, Netherlands). In integrated systems instead, there is a coordinating structure acting on the basis on national

Traditional top-down approaches in promoting innovative approaches are not seen as appropriate anymore, not least due to a changing political context of food and farming systems.

policies on AKIS and aligned advisory services (e.g. Luxembourg, Denmark, Ireland) (Knierim & Prager, 2015). Against this background, the EU launched an AKIS-specific strategy process, which resul-

ted in the publication of an EU-level AKIS strategy in June 2016. It guides the program-ming of Horizon 2020 for the remaining part of the 2014-20 period

and for the period beyond 2020 (then Horizon Europe). The EU AKIS strategy identified five priority areas⁴⁸ and six key principles that should be followed during its implementation:⁴⁹

- strategic programme management;
- synergies with other (public) research activities;
- international cooperation;
- allow space for innovative approaches;
- synergies with the private sector (interactive innovation);
- Multi-Actor Approach.

New knowledge is generated not only by researchers, but also by farmers. Linear innovation models from science to end-users are increasingly replaced by interactive models that give end-users a more active role.

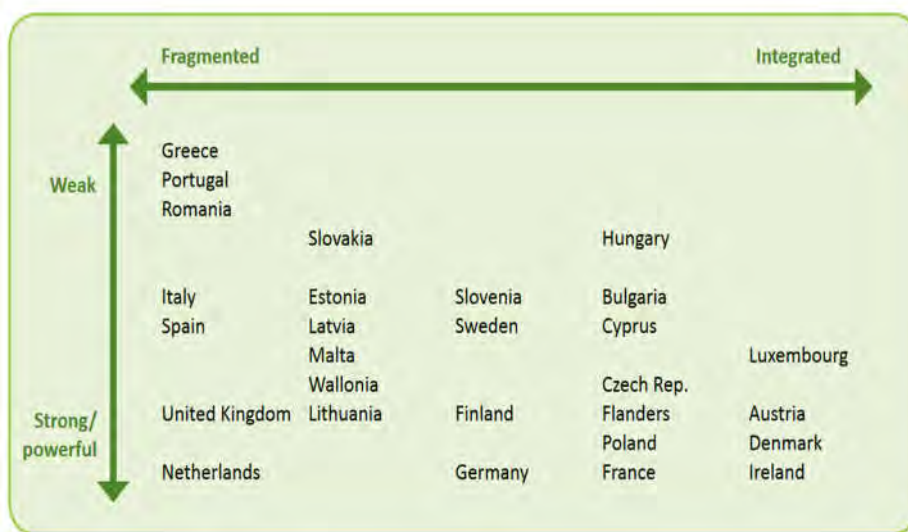


Fig. 36 Diversity of European AKIS in 2014 (Knierim and Prager, 2015).

European AKIS are very diverse, not only in terms of their strength. They also differ in terms of their degree of integration. In fragmented AKIS, several independent knowledge networks operate in parallel. In integrated systems instead, there is a coordinating structure acting on the basis on national policies on AKIS and aligned advisory services.

⁴⁸ Resource management, healthier plants and animals, integrated ecological approaches, new openings for rural growth, enhancing the human and social capital and rural areas.

⁴⁹ European Commission (2016) *A strategic approach to EU agricultural research & innovation*, Brussels, <https://ec.europa.eu/programmes/horizon2020/en/news/final-paper-strategic-approach-eu-agricultural-research-and-innovation>

6.1.3.2 European support environment for agricultural innovation

There is a wide range of EU programmes supporting innovation in agriculture in some form.

Table 4 Main funding sources for agricultural innovation.

Instrument	Aims & objectives				Spatial orientation / set-up	
	Capacity building	R&D	Innovation	Market introduction, diffusion, demonstration	Local, regional, national	International
<i>Shared management / ESIF</i>						
ERDF	X	X	X	X	X	
ESF	X		(X)		X	
ETC.	X		X			X
EAFRD	(X)		X	X	X	
incl. EIP-AGRI			X		X	(X)
incl. LEADER			X	X	X	X
<i>Direct management</i>						
Horizon 2020	X	X	X			X
COST		X				X
LIFE	X			X	X	
Erasmus+	X					X
<i>Domestic Member State policies</i>						
National & regional instruments	X	X	X	X	X	

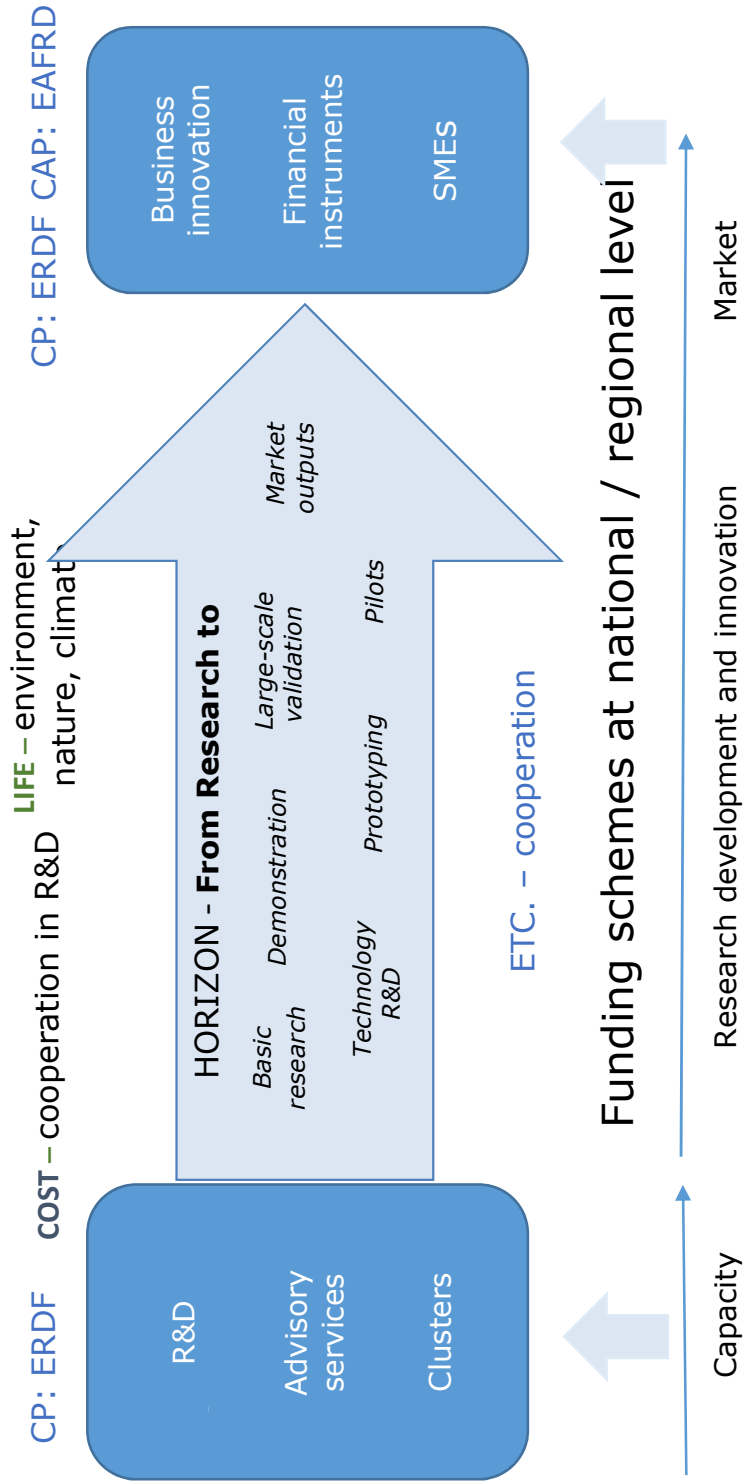


Fig. 37 The role of different EU funding sources in agricultural innovation (Kah/Gruber, 2019, adapted from Doussineau, 2016).

The main sources of funding for agricultural innovation are the EU's Framework Programmes (currently Horizon 2020) and rural development policy, including mainly the European Innovation Partnership for Agricultural Productivity and Sustainability (EIP-AGRI), but also LEADER (Liaison Entre Actions de Développement de l'Economie Rurale). Table 4 provides a comparative overview of different public funding sources for innovation in agriculture, illustrating their aims and objectives as well as their spatial orientation or set-up. EU-level instruments for agricultural innovation can broadly be divided into directly managed ones and those under shared management between EU and Member States. The table, together with xx below, illustrates how the different instruments cover the full innovation chain, from capacity building to research and then to market.

6.1.4 Instruments under direct management

The financially most important instrument under direct management is Horizon 2020 (80 billion euro in total 2014-2020), which covers the full innovation chain. Horizon 2020 addresses agricultural themes under the Societal Challenge "Food security, sustainable agriculture and forestry, marine and maritime and inland water research, and the bioeconomy", to which 5% or 3,85 billion euro of the 2014-2020 budget have been dedicated.

Horizon 2020 specifically supports Multi-Actor Approach and by the end of 2017, over 50 MAA projects had been approved. An example of a Multi-Actor Project funded under Horizon 2020 is provided in the box about LIVESEED. A special form of MAA projects are so-called Thematic Networks (TNs)⁵⁰. TNs collect existing scientific knowledge and best practices and translate this knowledge into easily understandable end-user material. By summer 2018, there were 29 thematic networks and more are expected until 2020. They are funded under Horizon 2020 and supported by EIP-AGRI. By November 2018, 29 TNs had been set up. Examples for TNs include Smart AKIS, which offers a Smart Farming Platform where smart farming technologies and best practices are collected and shared, and Hennovation, which focused on innovation led by farmers and industry in the areas of injurious pecking and the transport and use of hens that no longer lay any eggs (see Annex).⁵¹

Related to Horizon 2020 is the instrument European Cooperation in Science and Technology (COST), which stimulates research cooperation. With a budget of 300 million euro for 2014-20, COST provides international research funding for researchers and innovators to set up interdisciplinary research networks. In practice, a financial contribution is provided for organising meetings, training schools, short-term scientific missions and other net-

⁵⁰ https://ec.europa.eu/eip/agriculture/sites/agri-eip/files/eip-agri_brochure_thematic_networks_2016_en_web.pdf

⁵¹ <https://www.smart-akis.com> and <http://www.hennovation.eu>

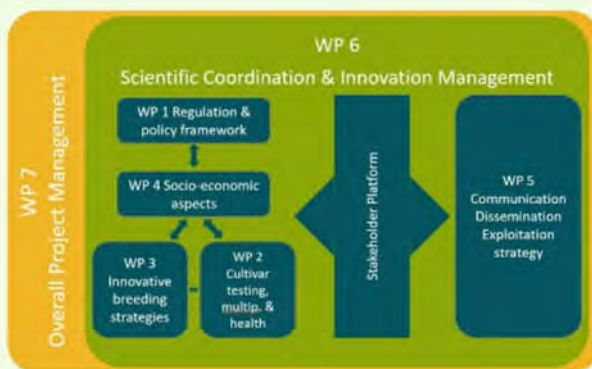
working activities. Until early 2019, COST has supported 162 actions in the area of food and agriculture alone.⁵²

LIVESEED (Horizon 2020; Source: www.liveseed.eu)

The Horizon 2020 project LIVESEED (Boosting organic seed and plant breeding across Europe) involves 49 partners in 18 countries (EU Member States and Switzerland) and runs from 2017 to 2021. It benefits from EU funding under Horizon 2020 of 7,4 million and 1,5 million euro from Switzerland. LIVESEED aims at developing cultivars adapted to organic system. It will:



- foster harmonised implementation of the EU organic regulation on organic seed and strengthen organic seed databases in the whole EU;
- widen the choice of organic cultivars meeting the demand of farmers, processors, retailers and consumers;
- investigate socio-economic aspects related to production and use of organic seed;
- improve availability and quality of organic seed and develop guidelines for organic cultivar testing and registration.



The project consortium includes research institutes, breeding companies, seed companies, organic associations (farmers, processors, retailers) and national authorities.



⁵² <https://www.cost.eu>

Also the directly-managed LIFE programme (L'Instrument Financier pour l'Environnement) plays an important role in agricultural innovation. It focuses on demonstration projects, supporting environmental, nature conservation and climate action interventions. These three Priority Areas are strongly linked to agricultural themes. The current LIFE+ has a budget of 3,5 billion euro for seven years. An example of a LIFE project linking environmental and agricultural innovation is shown in the box on Coop 2020.

The Erasmus programme (EuRopean Community Action Scheme for the Mobility of University Students), currently Erasmus+, is an EU student exchange programme established in 1987. With a budget of 14,7 billion euro for 2014-20, Erasmus+ supports cooperation for innovation and exchange of good practices under its Action 2. There are several examples for projects related to agriculture, for instance SKIFF (Skills for Future Farmers), which provides training in seven languages, including specialised apps for smart phones.⁵³

Coop 2020 (LIFE+; Source: www.coop2020.eu/en)

Coop 2020 is a LIFE+ project involving five partners in Spain and one in Greece. It ran between 2014 and 2018 and benefitted from EU funding of 1.228.535 euro under LIFE+. Coop 2020 demonstrated the viability of business models for agricultural cooperatives that integrate energy savings and renewable energy.

Coop 2020 aimed to inspire the implementation and expansion of rural smart grids. It focused on:

- the realisation of energy savings and
- the generation of energy from different renewable sources.

For instance, the participating partners faced the challenge of having to deal with organic waste in the form of olive pits. These will be used in biomass boilers in order to generate thermal power.



The project provided evidence that decentred, distributed power generation is economically feasible and desirable.



⁵³ www.future-farmer.eu

6.1.5 Instruments under shared management

ESI Funds are implemented in a shared management system. The ESI Funds are the European Agricultural Fund for Rural Development (EAFRD), the European Maritime and Fisheries Fund (EMFF), the European Regional Development Fund (ERDF), the European Social Fund (ESF) and the Cohesion Fund.

The EAFRD is part of the CAP and is the funding source for rural development programmes at national or regional level in all EU Member States. Amongst its objectives are fostering knowledge transfer and innovation in agriculture and the promotion of innovative farm technologies. A complimentary element of EAFRD OP is LEADER, to which a minimum of 5% of the funding has to be dedicated. The funding is implemented by Local Action Groups (LAGs) on the basis of bottom-up development strategies. LEADER has traditionally been *the* innovation instrument of the EAFRD, but it appears to have lost innovation capacity over the past programme periods (Dax et al., 2013). LEADER funding can be used for bottom-up driven agricultural innovation and can therefore provide 'disruptive institutional innovation' (Lukesch, 2018). It is admittedly small-scale and experimental, but LEADER's role as an innovation instrument has not been used to its full potential.

The EMFF is providing investments for Europe's maritime and fisheries areas, supporting fisheries and aquaculture as well supporting the diversification of local economies.

The three other ESI Funds (ERDF, ESF, Cohesion Fund) are the EU-level funding source for Cohesion Policy. While the Cohesion Fund is not relevant for agricultural innovation,⁵⁴ the ESF plays an important role in innovation systems by funding capacity building (training, life-long learning) and labour market measures. The ERDF is an important investment source for innovation, concentrating most funding on the 4 (out of 11) Thematic Objectives for R&D, ICT, SME competitiveness and the shift towards a low-carbon economy. It supports businesses and innovation through R&D centres, cluster structures and S3 platforms. Although agricultural themes are not covered by the Thematic Objectives of Cohesion policy, there are examples where ERDF programmes support agricultural innovation, e.g. by supporting an SME that develops applications that can be used in agriculture.

⁵⁴ The Cohesion Fund supports transport and environmental projects, but only in Member States with a gross national income per inhabitant less than 90% of the EU average.

HopfeNO3 (LEADER⁵⁵)

The LEADER project HopfeNO3 (Praxisnahe Optimierung des Stickstoffkreislaufs im Hopfenbau) is aiming at maintaining hop productivity whilst protecting groundwater resources. It was implemented by the German LAG Landkreis Kelheim (Bavaria) between 2009 and 2014 with 94.000 euro of LEADER funding from the Bavarian EAFRD programme were complemented by 129.000 euro private contributions.

It is an example of LEADER funding contributing to the development of innovative agriculture techniques, in this case hop growing strategies. The project brought together farmers, a water association and engineers providing the technical expertise.

The initiative is a result of previous LEADER projects reaching back as far as 2003 and implemented in cooperation with two other Bavarian LAGs.



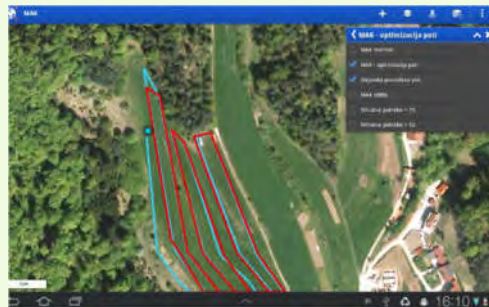
The ERDF is also the source of funding for the European Territorial Cooperation (ETC.) Objective, supporting cross-border cooperation (60 Operational Programmes) as well as transnational cooperation (15 Operational Programmes) in 15 larger cooperation areas. It also funds interregional cooperation across the EU through its Interreg Europe instrument.

⁵⁵ www.zvwv-hallertau.de/ and www.enrd.ec.europa.eu/sites/enrd/files/enrd_publications/publi-eafnd-brochure-06_2018.pdf

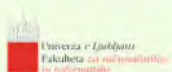
Collection of farm data using smart phones (ERDF; Slovenian Ministry of Public Administration).

The Slovenian project "Mobile Applications for the Agricultural Economy" was funded under Slovenia's 2007-13 ERDF programme. The Ministry of Public Administration as responsible intermediate body launched a series of calls for the promotion of research and development projects in the area of e-commerce and e-services. The focus of the supported project was not agriculture, but electronic commerce. Yet, in the end, farmers benefitted from the services developed. Recording events at farms and farmer's daily activities is a precondition for establishing efficient information support for the operations of farms. A comprehensive approach is required which combines the information about events (calving, fertilizing, harvesting, etc.) with financial information of the agricultural holding to be properly managed and reported on. The key problem is that after performing strenuous work the farmer should manually enter and edit this information, arising from the operational implementation of agricultural tasks.

The mobile applications relieves the farmer of these tasks as much as possible, by providing the input of data on location and at the time of the occurrence of the data or the event for which data should be entered. The entry of certain data can be completely automated by using machinery connected to the network. The combination of mobile and automatic entry relieves the farmer, enables high-quality data collection and thus helps the farmer to improve the work and comply with legal and other requirements. The project is based on the assumption that farmers have (and use) smart mobile phones and have such phones at hand during the operational implementation of agricultural activities. Project title: MAK – Mobile Applications for agricultural economy (23 October 2012 to 30 May 2014)



Consortium structure: Datalab d.d.; Sinergise d.o.o.; Faculty of Computer and Information Science, University of Ljubljana



Project funding: 347.820,54 euro

Share of ERDF funding: 85% (295.647,46 euro)

Share of national counterpart: 15% (52.173,08 euro)

In addition to EU-level instruments, there is a variety of funding schemes at national and regional level, albeit to a different degree depending on the strength of the domestic support environment for economic development and research and innovation.

A closer look needs to be taken at EIP-AGRI, which plays a crucial role in facilitating synergies between different funding sources in agriculture.⁵⁶ As set out in the 2010 EC Communication 'Innovation Union', the concept of EIPs encourages collaborative efforts in order to achieve synergies and EU value added.⁵⁷ EIP-AGRI applies the interactive innovation model using complementary types of knowledge. It supports co-creation and diffusion of solutions that are ready to be implemented in practice. Its funding comes from both rural development and Horizon 2020.

The idea is that EIP-AGRI is closely related to Horizon 2020 and the interlinked activities are based on different platforms that bring innovation actors together (see Fig. 38): a) Operational Groups (OGs) and b) Focus Groups (FGs) under EIP-AGRI, as well Thematic Networks (TNs) under Horizon 2020 (see above).

OGs are Multi-Actor innovation projects at the local level, consisting of a diverse group of partners (farmers, researchers, agri-business etc.) with a common interest in a specific, practical innovation project. Formally, OGs are projects funded by the EAFRD in the context of a rural development programmes (RDP). Participants in OGs include researchers, advisors, entrepreneurs, farmers, NGOs and others, with research institute most commonly (40% of all OGs) taking on the role of lead partner. The size of OGs varies significantly, between an average budget of 2,85 million euro in Ireland and 33.000 euro in Belgium (Van Oost, 2018).

FGs collect and summarise knowledge on best practices in a selected field.⁵⁸ In each FG, at least 20 experts work together, including researchers, farmers and consultants. FG members are selected by the EIP-AGRI Service Point and, on average, come from 12 different Member States. FGs are temporary and meet at least twice. Between 2013 and summer 2018, 33 Focus Groups had started their work, 22 of which have produced final reports and have dissolved again (Van Oost, 2018). In an ideal case, the results of FGs lead to the creation of a new OG.

⁵⁶ For more detail about the different elements of EIP-AGRI and their interaction see Cristiano & Proietti (2018)

⁵⁷ https://ec.europa.eu/eip/agriculture/sites/agri-eip/files/eip-agri_brochure_service_point_2014_en_web.pdf

⁵⁸ https://ec.europa.eu/eip/agriculture/sites/agri-eip/files/eip-agri_brochure_focus_groups_2016_en_web.pdf

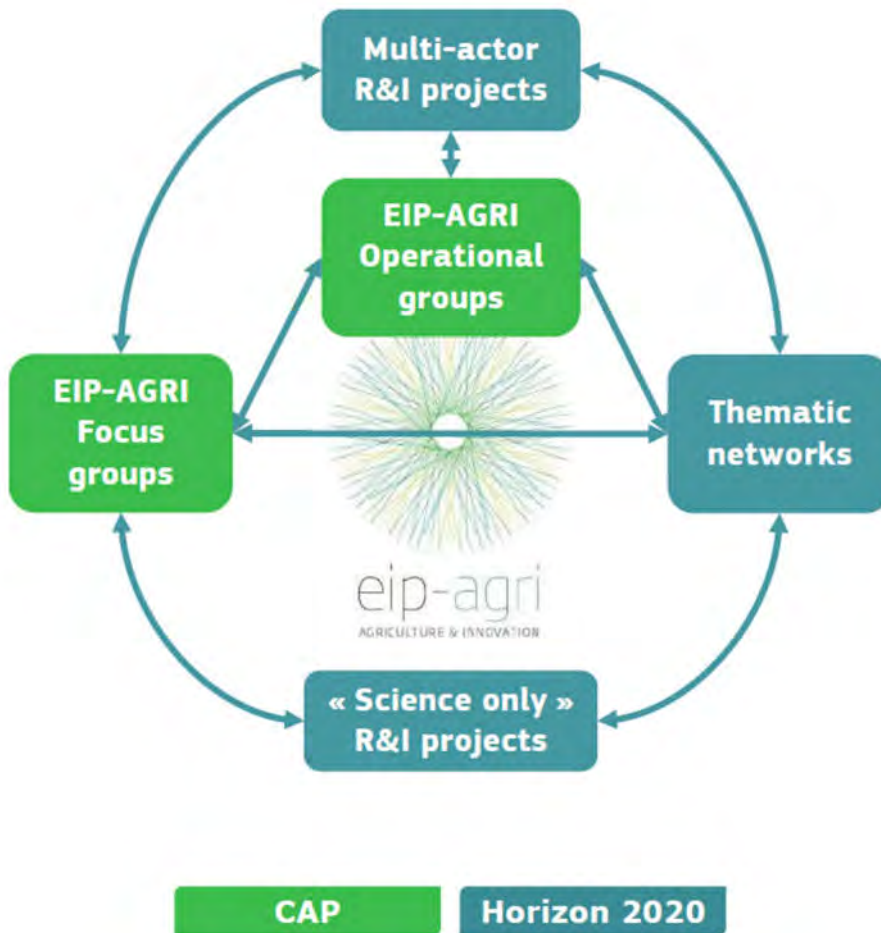


Fig. 38 CAP and Horizon 2020 working together in EIP-AGRI (Sauze-Vandevyver, 2018).

According to an evaluation from 2016 (Coffey, Edater & Speed, 2016), the potential of EIP-AGRI has not been fully exploited yet. Positive are its bottom-up approach allowing it to respond to actual needs and its flexibility, allowing it to be tailored to different circumstances. Recommendations are not to water down the distinctive bottom-up approach, to allow advance payments and to invest in innovation support services and networking opportunities.

Finally, agricultural innovation is supported indirectly through the establishment of a thematic platform on agri-food as part of the EC's efforts to support smart specialisation. So-called Smart Specialisation Strategies (S3) can play an important role in facilitating synergies. Smart specialisation is "a place-based approach, meaning that it builds on the assets and resources available to regions and Member States and on their specific socio-economic

challenges in order to identify unique opportunities for development and growth".⁵⁹ Having in place a S3 became a so-called ex-ante conditionality for all ERDF programmes in 2014-2020. In practice, this means that agreeing a regional or national (depending on the spatial implementation level of the respective programme) innovation strategy is a requirement for funding to be paid out by the European Commission.⁶⁰ The concept is particularly ERDF-oriented and has been driven by DG Regional and Urban Policy, but its principles and tools are relevant also to agricultural and rural development themes and funding. Smart specialisation is supported by the S3 Platform, which is located at the Joint Research Centre in Seville and employs 30 staff. By the end of 2018, over 180 regions have registered, including from European countries not in the EU.⁶¹

The S3 Platform has also set up three thematic smart specialisation platforms, which promote transnational learning, interregional collaboration and partnerships. One of these is the Smart Specialisation Platform for Agri-Food (S3P Agri-Food),⁶² which has been set up in 2016 to *"orchestrate and support the efforts of EU regions committed to work together for developing a pipeline of investment projects connected to specific thematic areas of smart specialisation priorities through interregional cooperation."*

The main issues are a lack of harmonisation, in particular between direct and shared management instruments, and the complexity of the individual instruments and their diversity, thus resulting in a lack of transparency.

Although several EU-level actors are involved (DG AGRI, REGIO, RTD, JRC) in the platform, its key frameworks are thematic partnerships, which are co-developed and co-led by regions themselves.

The 5 thematic partnerships involve a total of 49 regional and national authorities and are led or co-led by 7 regions. By summer 2018, these were:

- consumer involvement (Region FoodValley, NL; Ostergotland, SE);
- high-tech farming (Tuscany);
- nutritional ingredients (Wallonia and Flanders, BE);
- smart sensors for agri-food (Flanders and Wallonia, BE);
- traceability & big data (Andalucia, ES; Emilia-Romagna, IT).

The partnerships aim to ensure an active participation and commitment of industry as well as researchers and the civil society. Two of these partner-

⁵⁹ <http://s3platform.jrc.ec.europa.eu/what-is-smart-specialisation->

⁶⁰ For more information see: Polverari (2016)

⁶¹ <http://s3platform.jrc.ec.europa.eu/s3-platform>

⁶² [http://s3platform.jrc.ec.europa.eu/agri-food and Ciampi Stancova & Cavicchi \(2017\) http://s3platform.jrc.ec.europa.eu/documents/20182/221449/JRC107257_CiampiStancova_Cavicchi_EUPolicyBrief.pdf/886f31c4-fdf3-416b-a3e4-d5ee8a33dce6](http://s3platform.jrc.ec.europa.eu/agri-food-and-Ciampi-Stancova-&Cavicchi-(2017)-http://s3platform.jrc.ec.europa.eu/documents/20182/221449/JRC107257_CiampiStancova_Cavicchi_EUPolicyBrief.pdf/886f31c4-fdf3-416b-a3e4-d5ee8a33dce6)

ships, “traceability & big data” and “high tech farming” (led by Tuscany, see Section 6.1.6) have also been selected for DG REGIO’s Pilot Action on Interregional Innovation Projects, which aim to commercialise and scale-up “bankable” interregional projects that can create or reshape European value chains.⁶³



Fig. 39 One of the thematic partnerships focuses on high-tech farming.

There are many instruments available, covering all stages of the innovation process. Each instrument is established in its own community. However, they have different logics and requirements. The main issues are a lack of harmonisation, in particular between direct and shared management instruments, and the complexity of the individual instruments and their diversity, thus resulting in a lack of transparency.

6.1.6 Snapshots from regional AKISs

The selected regions are all particularly active in agricultural innovation and all have a Smart Specialisation Strategy in place in which the agri-food sector is anchored. The case studies represent a range of geographies, governance approaches and development stages in terms of innovation in the agricultural sector (see Fig. 40).

⁶³ European Commission (2017) *Call for expression of interest for thematic partnerships to pilot interregional innovation projects*, https://ec.europa.eu/regional_policy/sources/tender/pdf/expression/interregional_partnership_en.pdf

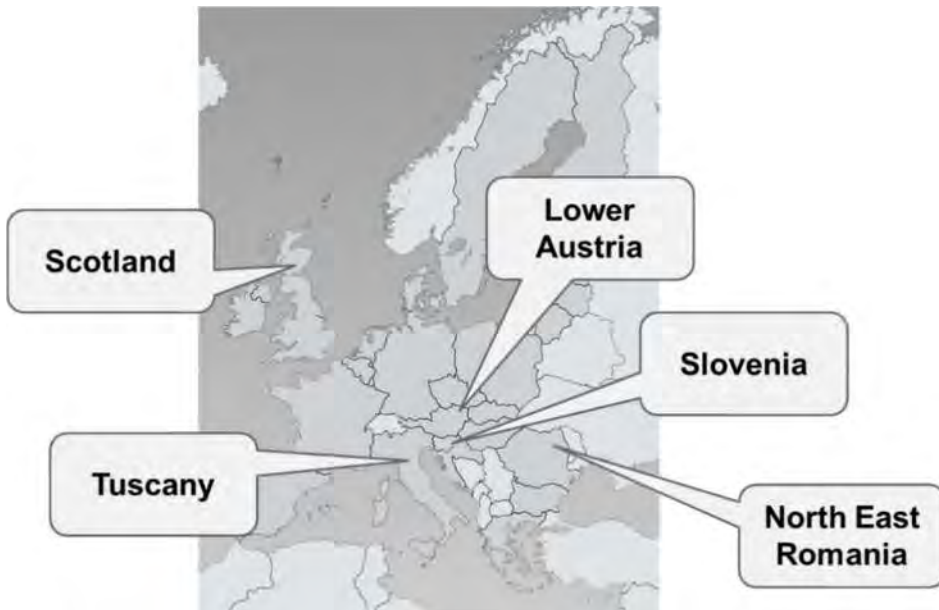


Fig. 40 Case study countries and regions.

Agriculture plays a particularly important role in **North-East Romania**⁶⁴, which has the highest share of agricultural employment in the EU (39,4%). The region is characterised by an ageing farming population and a very poor innovation culture. In addition to this, North-East Romania, as well as Romania overall, has very little domestic resources available for agricultural research, resulting in a very low national share of funding for R&D and innovation in relation to EU funding. The research showed that there is a lack of dialogue between agricultural stakeholders and research centres. More widely, there is weak cooperation between universities and the business environment. This is mirrored in weak coordination between the agricultural and rural development side of ESIF (EAFRD) and its business development side (ERDF). As one policy-maker pointed out: *“Often, the preparation phase of projects would be funded through a combination of ERDF and EAFRD. But when it comes to the main funding source for the implementation of projects, it’s just one of the two.”*

A key player in the region is the Regional Development Agency North-East, which is also the only Romanian RDA with a Brussels office. It acts as enabler in the regional AKIS and works on the basis of regional RIS3, which identified agri-food as one of six priority areas. The region is active in the S3P Agri-Food platform and has submitted a proposal for a thematic partnership on sustainable development of production field crops. The RDA is involved in

⁶⁴ The Romanian research was carried out by Neculai-Cristian Surubar

several Interreg and Horizon 2020 projects. One agricultural innovation example is RETRACE (A Systemic Approach for REgions TRansitioning towards a Circular Economy), which is an Interreg Europe involving partners from France, Italy, Romania, Slovenia and Spain. The project runs from 2016 to 2020 and benefits from 1,4 million euro of ERDF funding. In the context of the project, the agency organises roundtables with farmers and local businesses looking at potential uses of coffee waste and olive pips. However, the focus of the agency's work lies on ERDF. There is insufficient cooperation with EAFRD actors, particularly the regional and local offices of its EAFRD equivalent, the Agency for rural Finance. Hence, policy silos remain.

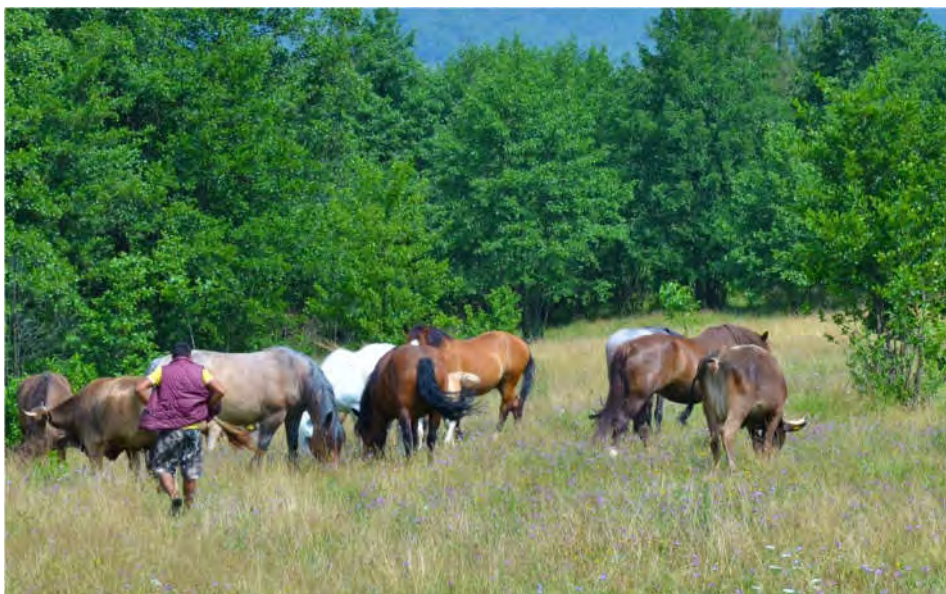


Fig. 41 Many regions in Romania are characterised by an ageing farming population and a very poor innovation culture.

In Slovenia, policy governance is characterised by national-level management of all 5 ESI Funds as well as national-level bodies in charge of directly-managed instruments such as Horizon 2020. In recent years, Slovenia has been increasingly active in Horizon 2020, particularly as lead partner. Slovenia also makes strong use of the EC's Teaming Initiative, in which research institutions are teamed up with other leading institutions in other Member States.⁶⁵ Domestic policy silos are one of the key hindering factors for synergies. These exist particularly between the Ministry of Science, which provides research funding and research infrastructure, and the Ministry of Agriculture, which is in charge of knowledge transfer and advisory services. An important mechanism for coordination across policy silos is Slovenia's

⁶⁵ <https://ec.europa.eu/programmes/horizon2020/en/h2020-section/teaming>

smart specialisation strategy, which is set up at national level. The Government Office for Development and European Cohesion Policy takes the lead on the smart specialisation process and is also responsible for the implementation of its single Cohesion Policy Operational Programme (ERDF, ESF and Cohesion Fund). The "Slovenian Smart Specialisation Strategy (S4)" was launched in 2015 and is implemented via Strategic Research and Innovation Partnerships (SRIPs), which are long-term partnerships following a quadruple helix approach. SRIPs pool investments and intellectual potential, create a comprehensive innovation ecosystem and improve Slovenia's position in global value networks. One of the 9 Priority Domains or thematic clusters of the S4 is "Sustainable food production". The SRIP in charge has a key facilitator, the Slovenian chamber of commerce, which includes agricultural and food enterprises. The SRIP's activities are based on an action Plan setting out priorities (agri-food system & value chains; new marketing models; development of HR and competences) and a target of 95 million euro investments to be achieved by 2022. The S4 forms a strong strategic basis for potential synergies and its SRIP structure could potentially act as an enabler. However, a main challenge remains the continued policy silos, in which EU-funded agricultural projects are implemented in parallel to (explicitly) agricultural interventions (see ERDF project example in). Also, so far there is insufficient involvement of rural development and agricultural actors in the smart specialisation process. Stakeholders felt that *"... S3 is really something for the ERDF, not for rural development."*

Also in Scotland it is challenging to bridge the gap between different policy areas. Scottish Enterprise, for instance, provided support for research on potatoes only because it was about seed potatoes and these are not destined for human consumption. There are two recent Scottish initiatives to strengthen agricultural innovation:

- the Rural Innovation Support Service (RISS) plays the role of an enabler. Only launched in February 2018 and co-funded by the EAFRD (£750.000, c. 850.000 euro), it focuses on bottom-up rural innovation, aiming to address land managers' real needs. It does so by getting the right people together to explore practical and sustainable solutions. By summer 2018, 9 operational groups, similar to the EIP-AGRI format, had been approved;
- the Scottish Environment, Food and Agriculture Research Institutes Gateway (SEFARI) is an information measure to increase transparency. It was launched in March 2017 and is funded by the Scottish Government. SEFARI gathers the 6 leading Scottish institutes in the field and serves as a knowledge exchange and impact hub. Its aim is to "improve the flow of research and expertise, ensuring it gets to the right people, at the right time, in the right format."

Lower Austria has a comparatively high share of national funding in R&D and innovation. In the Austrian Land, the agricultural sector is strongly anchored in the regional smart specialisation strategy. Key themes and actors are the bio-based economy (Technopol Tulln on agricultural and environmental technology), food production and safety (Food Cluster Lower Austria) and agricultural technology (Technopol Wieselburg). An important enabler is the Food Cluster Lower Austria (LMC). It was established in 2009 and emerged from the Food Initiative Lower Austria, founded in 2006. The LMC is part of the Land's cluster programme and is funded under the Austrian ERDF programme and by the economic and agricultural departments of the Land government. The LMC is organized by ecoplus, the Regional Development Agency of Lower Austria. It gathers 105 companies and organisations, which make a small financial contribution for their membership. The tasks and services of the clusters comprises:

- community Building in the area of food processing and marketing;
- recognising the needs of the sector and companies, creating awareness of development trends (such as digitalisation), organising workshops, community of practice, events;
- development of cooperative innovation projects (products and services);
- organisation of cooperative training initiatives.

LMC's projects are all Multi-Actor Projects, based on a cooperation of several commercial enterprises and research bodies, usually with the involvement of agricultural producers. Farmers are represented by associations, cooperatives or the Chamber of Agriculture. Until 2018, LMC was able to carry out 10 major innovation projects with 80 different actors as well as numerous training measures. It is also involved in two EIP-AGRI OGs.

Finally, Tuscany has a strong track record in synergies between funding streams. It is very engaged in the S3 Agri-Food Platform, leading a thematic partnership on high tech farming (S3 HTF). S3 HTF started in 2016, with the aim of accelerating the development and adoption of precision farming technologies. In 2018, it has been selected by DG REGIO as a Pilot Action on Interregional Innovation Projects. The Pilot Action is still in its starting phase, but it is expected to create leverage of cross-regional investments, as there is a limited market for high tech farming applications in individual network regions. The plan is to aggregate potentials, provide expertise and to set up demonstration farms. There will also be synergies between different Funds, not only EAFRD. While the EAFRD will support some projects, the ERDF will invest in two regional demonstration farms in Tuscany. Tuscany is also the lead region for the ERIAFF (European Regions for Innovation in Agriculture,

Food and Forestry) network.⁶⁶ Founded in 2012, ERIAFF is an informal network with over 40 members engaging in cross-border and interregional activities. It organises workshops and seminars, as well as an annual conference, and supports the development of Horizon 2020 consortia amongst its members. ERIAFF can be understood as an enabler, albeit an international one and an example in which the enabling body is in practice a very engaged individual, the coordinator of the network.

6.1.7 Findings

6.1.7.1 Complex but sufficient support environment

The above section has shown that there is a vast variety of support instruments available for innovation in agriculture. There are enough instruments to cover all types of needs and there are many successful projects dealing with different stages of agricultural innovation, covering a range of themes and funded by a diversity of policy areas. These include the more obvious sources such as the EU's R&D policy (Horizon 2020) and agricultural policy (EAFRD – including EIP-AGRI and LEADER), but also others. There is evidence that also LIFE+ and particularly ERDF – both in mainstream OPs and in ETC. – are supporting projects that contribute to agricultural innovation in a wider sense. Interestingly, the focus on R&D and innovation seems to be comparatively modest in EAFRD OPs, at least outside of EIP-AGRI and LEADER projects. However, there remain issues of harmonisation due to different rules, not only between direct and shared management instruments, high complexity of the innovation systems and their individual instruments and in a lack of transparency. Different communities are acting predominantly in their respective silos.

6.1.7.2 Focus on success factors for synergies

The factors discussed in 5.1.2.2 are not equally important and while some can actively be influenced by policy, others are more difficult to change (e.g. culture, trust). Research at EU level and the examples encountered in case studies suggest addressing the six principles of the EU AKIS strategy outlined above. Particularly, the Multi-Actor Approach provides a rationale for suggesting a focus on four key factors: (1) enablers, (2) strategies, (3) incentives and (4) harmonisation and simplification (see Fig. 42)

The following sections present these key factors and also illustrate three other, so-called supporting factors: transparency, trust and culture.

⁶⁶ <https://eriaff2018.seamk.fi/eriaff-network/about-eriaff-network/>

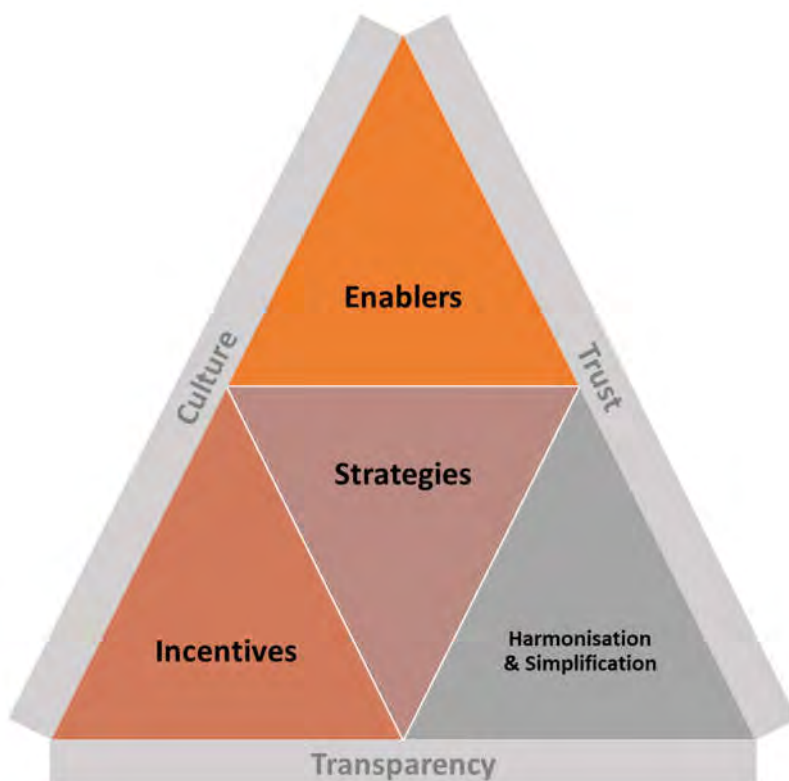


Fig. 42 Key factors for synergies (Kah and Gruber, 2019).

6.1.7.3 Enablers

The support environment for agricultural innovation is very complex and requires actors who have an overview across policy silos. These enablers of synergies need to know the system and be connected to all relevant players. This allows them to coordinate activities and bring actors together, thereby creating synergies. They stimulate cooperation, build trust and manage the complexity of the innovation system. Table 5 lists a number of examples resulting from the case study regions and beyond. Enablers can take different forms and can take the form of a cluster organisation, innovation platform, advisory service etc.

Table 5 Examples for enablers.

Country	Enabler	Description
Austria	Food Cluster Lower Austria	Community building, identifying the needs / trends, development of cooperative innovation projects, cooperative trainings; over 100 members
Belgium (Wallonia)	The Innovation Route of the Walloon rural development network ⁶⁷	Educational peer-to-peer programme for farmers that are engaged into innovative practices, facilitated through participative techniques and scientific expertise
Belgium (Flanders)	Academy on tour ⁶⁸	Organised day trips for farmers, food entrepreneurs and advisors to projects in neighbouring countries
France	USAGES - peasants' knowledge base for the Commons ⁶⁹	Digital open platform for disseminating innovative approaches, co-funded by the EAFRD
Ireland	Teagasc (Irish Agriculture and Food Development Authority) ⁷⁰	Offers knowledge programmes responding to farmers' needs, e.g. ConnectEd giving access to publications, training and support tools
Scotland	RISS (Rural Innovation Support Service) ⁷¹	Bottom-up rural innovation, addressing land managers' needs And exploring practical and sustainable solutions

Yet, bodies that could serve as enablers are hindered by silos and a lack of communication between different policy fields. In Scotland, interviewees mentioned that Scottish Enterprise as the body responsible for business

⁶⁷ https://enrd.ec.europa.eu/projects-practice/innovation-route-walloon-rural-development-network_en

⁶⁸ https://enrd.ec.europa.eu/projects-practice/academy-tour_en; <http://www.innovatiesteunpunt.be/en>

⁶⁹ https://enrd.ec.europa.eu/projects-practice/usages-peasants-knowledge-base-commons_en; <https://www.latelierpaysan.org/USAGES-2015-2018>

⁷⁰ <https://www.teagasc.ie/>

⁷¹ <https://www.innovativefarmers.org/welcometoriss>

development tends to cater for big business and does not show much interest in farmers. In Lower Austria, for instance, there seems to be a “red line” between R&D support for the primary and secondary sectors. Support is provided by policy either for one or for the other area; a combination is not foreseen. However, Lower Austria has created its own solution by regional funding instruments. Elsewhere in Austria, the red line can only be crossed via EIP-AGRI.

6.1.7.4 Strategies

It can be argued that synergies can only be created systematically if there are strategies that set out priorities and objectives. In other words, there are no systematic synergies without strategies. Most individual instruments are already operating on the basis of strategies, which serve as frameworks for aligning and focusing resources. ESI Funds, for instance, are implemented on the basis of national ESIF-wide strategies (Partnership Agreement) and national or regional Fund-specific strategies (Operational Programmes). Yet, there is no obligation for Member States to set up strategies for directly-managed instrument. Even if these would exist, there is a need for strategies that are thematically oriented, not segregated by policy instruments. These should define objectives that will be pursued by using a variety of instruments and funding sources. Smart specialisation strategies, for instance, can be a suitable approach and the implementation of the S3 approach has been viewed positively so far. According to the EC (2018), smart specialisation prepared the ground for better innovation governance interregional teaming up around S3 priorities.⁷²

While the S3 approach is suggested as a way for regional specialisation more widely, the EU launched an AKIS-specific process, which resulted in the publication of an EU-level AKIS strategy in June 2016 (see above). For 2021+, current regulatory proposals include the requirement for CAP Strategic Plans. These will need to be set up at Member State level, acting as national strategic framework for all the CAP agricultural and rural development support.⁷³ The plan will need include a strategic AKIS plan,

⁷² For instance, Stairway2Excellence, support for lagging regions by the S3 Platform, Twinning and Teaming, Vanguard Initiative, thematic platforms, interregional S3 partnerships and preparing transnational Horizon 2020 consortia. See Reppel K (2018)

⁷³ In 2014-20, rural development programmes funded by the EAFRD are covered by the current Partnership Agreement, together with all other ESI Fund. However, according to current proposals, the 2021-27 Partnership Agreement will not cover the EAFRD anymore. See also European Parliamentary Research Service (2018) *CAP strategic plans*, Briefing, December 2018, [http://www.europarl.europa.eu/RegData/etudes/BRIE/2018/630324/EPRS_BRI\(2018\)630324_EN.pdf](http://www.europarl.europa.eu/RegData/etudes/BRIE/2018/630324/EPRS_BRI(2018)630324_EN.pdf)

following the requirements resulting from the regulatory proposal.⁷⁴ These AKIS plans present an opportunity to outline objectives and pathways for potential synergies in each Member State.

6.1.7.5 Incentives

Incentives are needed to stimulate cooperative activities, as synergies do not offer a direct benefit to policy-makers focused on implementing their own instruments. Currently, pursuing synergies means additional workload and increased risks for policy-makers and particularly beneficiaries, e.g. in terms of audits. While synergies are part of the high-level and political discourse, commitment by actors at implementation level is limited. Examples for provisions specifically encouraging synergies are rare. Also, while these only require vague commitments by potential beneficiaries in funding applications, the incentive effect of these is not very high, as the potential benefits are potentially too low to outweigh the additional efforts and risks. For instance, during the appraisal phase of LIFE+ projects, extra points are given for projects that exploit synergies. This is currently not the case in Horizon 2020, as this would go against the principle of excellence and would disadvantage regions which only receive little Cohesion policy funding and therefore would have less opportunity to create synergies.

Incentives are needed to stimulate cooperative activities, as synergies do not offer a direct benefit to policy-makers focused on implementing their own instruments.

In order to create networks (Multi-Actor Projects following an interactive innovation model), incentives are needed for the individual partners, especially end-users/farmers. Ideally, there would be advisory support (e.g. enablers, see above) and / or some small-scale financial support for project development to cushion the direct costs of network building and project development (e.g. travel, external consultants etc.). This could be combined with a vouchers system, for instance innovation vouchers. At international level, the incentives could operate in similar ways to what COST is currently offering in research. A COST-like instrument for agricultural innovation could help lifting national-level projects to the international level.



⁷⁴ See Article 95: "1. Each CAP Strategic Plan shall contain the following sections: [...] (g) a description of the elements that ensure modernisation of the CAP;" in European Commission (2018)

6.1.7.6 Harmonisation & Simplification

Different policy instruments operate under different sets of rules. This does not only create unnecessary complexity that discourages synergies, but it can also sometimes mean that there are regulatory obstacles that cannot be overcome. Regulatory frameworks should be harmonised or at least simplified to reduce complexity. In the area of agricultural innovation, most issues arise from the different rules for directly-managed instruments (mainly Horizon 2020) and funding under shared management (ESI Funds). Although policy-makers in Member States tend to blame the EU level for regulatory complexity, Member States also play a role in creating a complex, multi-layered system of rules. According to some EC officials, large parts of it are homemade and there is a lot of gold-plating.⁷⁵

Significant progress in view of harmonisation and simplification has been made with the adoption of the omnibus regulation, which revises the EU's financial rules.⁷⁶ Both the omnibus regulation of the current period as well as the proposals for the regulations for the period 2021-2027 provide extended possibilities for the application of simplified cost options.⁷⁷ In addition to the standard unit costs (e.g. for staff costs), the following proposals for 2021-2027 are worth mentioning:

- flat-rate financing of up to 40% of the direct eligible staff costs to cover the remaining eligible costs ("residual costs flat rate") (Art. 51, CPR proposal);
- flat-rate financing of direct staff costs at 20% of the direct costs (Art. 50, CPR proposal).

Significant progress in view of harmonisation and simplification has been made with the adoption of the omnibus regulation, which revises the EU's financial rules.

The increased use of simplified cost options in the future is an opportunity for significant simplification. For instance, the option of 40% flat-rate financing on direct eligible staff costs can be used to cover the residual costs of staff-intensive innovation measures. Ideally, a combination of the above-mentioned

⁷⁵ For more information on gold-plating see Böhme et al. (2017)

⁷⁶ see Omnibus regulation, articles 125 and 181-184, <http://data.consilium.europa.eu/doc/document/PE-13-2018-INIT/en/pdf>

⁷⁷ Greater use of simplified cost options (or payments based on conditions) for the ERDF and the Cohesion Fund could substantially reduce total administrative costs – by 20-25% if these options are applied across the board. Implementing these types of funding is possible through a “delegated act”, which should provide both increased legal certainty and direct negotiation with the EC. If, at the same time, the EC is clearly pushing ahead with the deployment of the delegated acts, a certain pragmatism can also be expected from the drafting of the “delegated acts”.

standard unit costs for staff hours and the 40% flat-rate for "residual costs" could be pursued.

6.1.7.7 Supporting factors

Transparency

The area of agricultural innovation is very complex, with a context-specific vast diversity of actors carrying out a wide range of activities. Individual actors are not necessarily aware of other projects operating in a similar area, which could offer scope for synergies. Transparency is needed to identify opportunities for synergies. Information about regional/national activities (topics of calls, projects, OGs) in agricultural innovation needs to not only be made available but also proactively promoted. Tools can include searchable databases or events, both of which need to be facilitated, e.g. by an enabler (see above). Hence, transparency is considered to only be supporting factor, as it is of limited usefulness without the proactive promotion of these tools by an enabler.

Currently, many information initiatives exist only within their specific silos, e.g. the searchable CORDIS database of Framework Programme projects since 1990⁷⁸ and a collection of rural development projects.⁷⁹ There also databases gathering examples across policy areas, such as the "EU Budget Focused on Results" initiative⁸⁰ and the EC page "investEU".⁸¹ However, the depth of information is very limited (no information about funding sources and implementation governance) and, particularly in the latter case, the number of entries is very limited (only 17 entries under "agriculture"). Most importantly, the lists of interventions are "ex-post", i.e. they provide information about already concluded projects and best practices and are therefore of limited use.

Some areas benefit more than others from a culture of cooperation and innovation. Agricultural innovation can be particularly challenging in traditional farming contexts.

Trust

Only actors that trust each other can work constructively to create synergies. This requires conceding some control over instruments and funding to other actors. Silo mentalities and competitive attitudes in in different policy areas do not allow for trust. To some extent, these attitudes have been encountered in this research, both in Member States, at national/regional levels, and at

⁷⁸ <https://cordis.europa.eu/projects/en>

⁷⁹ https://enrd.ec.europa.eu/projects-practice_en

⁸⁰ https://ec.europa.eu/budget/euprojects/search-projects_en

⁸¹ https://europa.eu/investeu/projects_en

EU-level, between policy-makers in different ministries, DGs or other bodies. Trust is necessary for the development of Multi-Actor Projects. The partners must get to know each other and be able to build trust in each other. Since enablers play an important role here, it requires a trusting relationship between enablers and the actors involved so that projects can emerge.

Culture

Some areas benefit more than others from a culture of cooperation and innovation. Agricultural innovation can be particularly challenging in traditional farming contexts, with low pick up of innovative and an ageing farming population. Policy measures to change existing cultures are limited and long-term.

6.1.8 Improve synergies with collaborative approaches

6.1.8.1 Creating an enabling space for synergies

If innovation activities should be lifted from the domestic level, the innovation actors require a forum in which they can build contacts and develop ideas. Covering costs related to travel and other activities needed to develop networks and create synergies might be helpful.

Fig. 43 illustrates the gap between place-based support systems for innovation, which result in domestic project consortia, and internationally-oriented ones, which result in international project consortia. This gap exists at early research development stages

as well as at stages closer to the market (e.g. ERDF-funded applied research vs. Horizon 2020 projects) and is difficult to bridge. EIP-AGRI OGs operate in their respective area and their members do usually not interact in a Multi-Actor space internationally. There is the option of participating in Focus Groups, but these remain temporary structures. Hence, the aim should be to create an international synergy arena for Multi-Actors (see Fig. 44). If innovation activities should be lifted from the domestic level, funded by shared management instruments, to the international level, funded by direct management instruments or ETC., the innovation actors require a forum – or synergy arena – in which they can build contacts and develop ideas (e.g. to apply for a Thematic Network under Horizon 2020). Similarly to the existing instruments of COST, funding could be made available to Multi-Actors to meet, e.g. covering costs related to travel and other activities needed to develop networks and, in the end, create synergies. Another angle could be the provision of funding through some Erasmus-like instrument under EIP-AGRI. A practical recommendation would therefore be the creation of a transnational EIP-AGRI scheme.

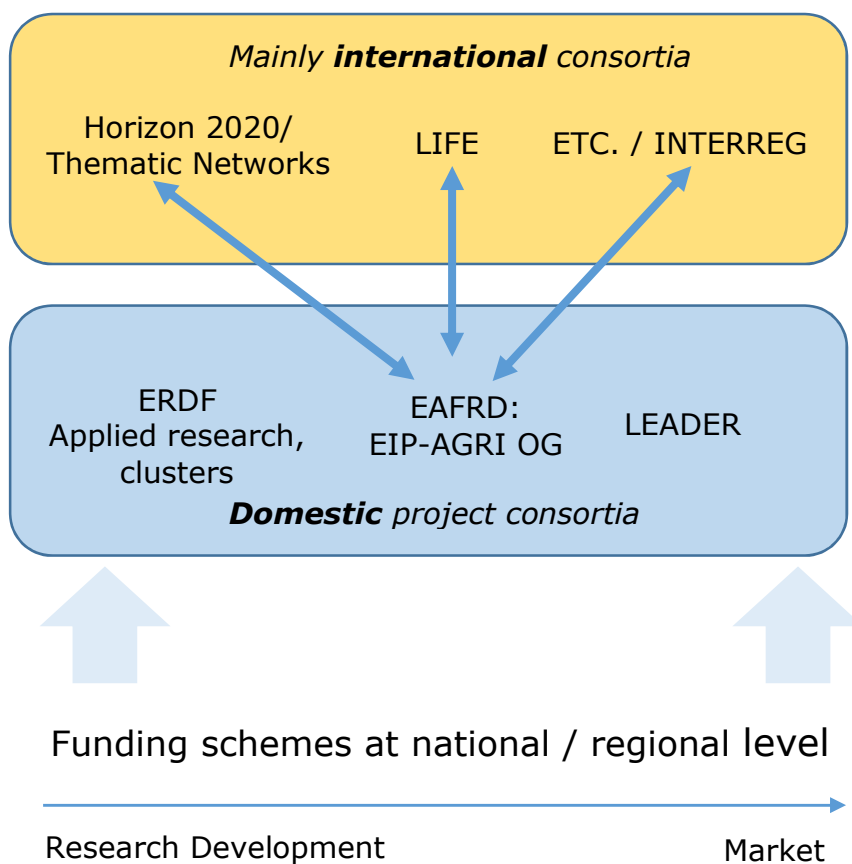


Fig. 43 The gap between internationally-oriented and place-based support systems.

However, this so-called enabling space or synergy arena requires a series of preconditions. There must already be a sufficient number of actors/OGs. The OGs must be consolidated: they need to settle and organise themselves before they can start with international cooperation. Hence, one crucial condition is that synergies need to be given sufficient time to develop.

Ideally, a transnational EIP-AGRI scheme would be under direct EC management, to avoid the complexity that transnational cooperation encountered in shared management systems (e.g. ETC. and LEADER). Some lessons can be learned from LEADER, which has been supporting transnational cooperation since its start in 1994. While transnational cooperation has been seen as providing substantial added value, its full potential could not be fulfilled due to the challenges of shared management. The funding for transnational LEADER project comes from different EAFRD OPs in different Member States, which means different rules and conditions in for each cooperation partner, different time frames, different call themes, etc.

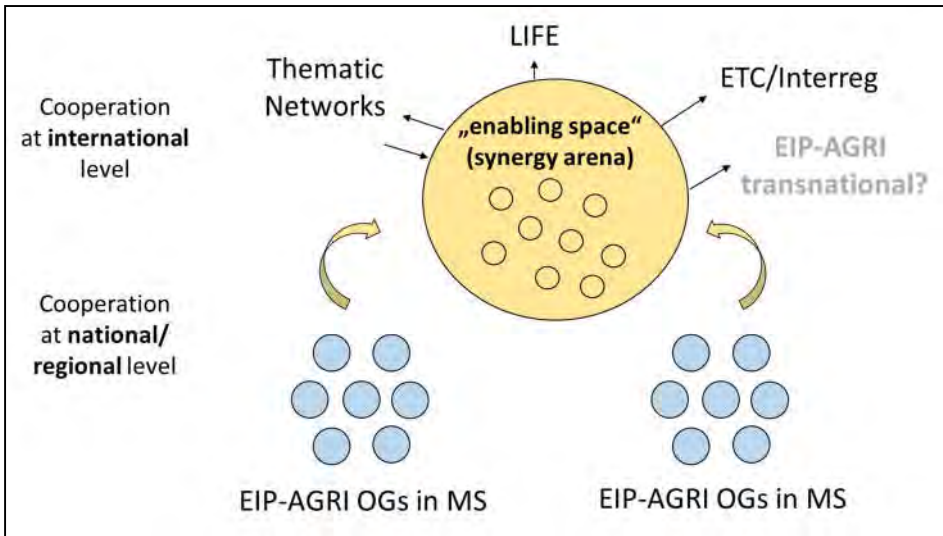


Fig. 44 Enabling space for synergies.

6.1.8.2 Virtual case of synergies in agricultural innovation

A virtual case on how synergies in innovation could work is illustrated in (see Fig. 46), using the example of hop growing and brewing.

The starting point was the challenge that the cultivation of hops for brewing also had a negative impact on the pollution of groundwater. This issue has been identified by a LEADER group and the LAG management and a project has been developed (funded by LEADER/EAFRD).

As part of the project, it was recognised that climate change had a significant impact on hop planting and hop quality (early maturation, pest infestation, etc.), which also affected the quality of the brewing process. This issue has been addressed through an innovation broker in the context of the EIP-AGRI and a trans-regional Operational Group has been formed (EIP-AGRI/EAFRD).

As the topic of climate change and the impact on crops is of major importance, parts of the OG were able to could join Thematic Network (Horizon 2020).

At the same time, the experiences gained in the LEADER project and the EIP-AGRI OG led to a demonstration project about new cultivation methods for hops pre-serving groundwater resources (LIFE+).

Through Erasmus+, a training programme for farmers has been developed and tested internationally in collaboration with research and educational institutions (Erasmus+, EAFRD).

Also, a new department for biotechnology and process technology in brewing (ERDF, national funding) was set up in a research centre.

This research centre was soon able to carry out research, funded both domestically and internationally (domestic funding, Horizon 2020).

For the preparation and coordination of the research, a COST project was successfully acquired. This also allowed establishing a large research network (COST).

Finally, farmers have invested in new hop growing methods (EAFRD) and brewers have adapted their technologies and made investments into brewing (ERDF, national funds).

A successful spin-off has emerged from the R&D centre, which focuses in the area of "process technologies for breweries (ERDF, national funds).



Fig. 45 A virtual case on how synergies in innovation could work, is illustrated using the example of hop growing and brewing.

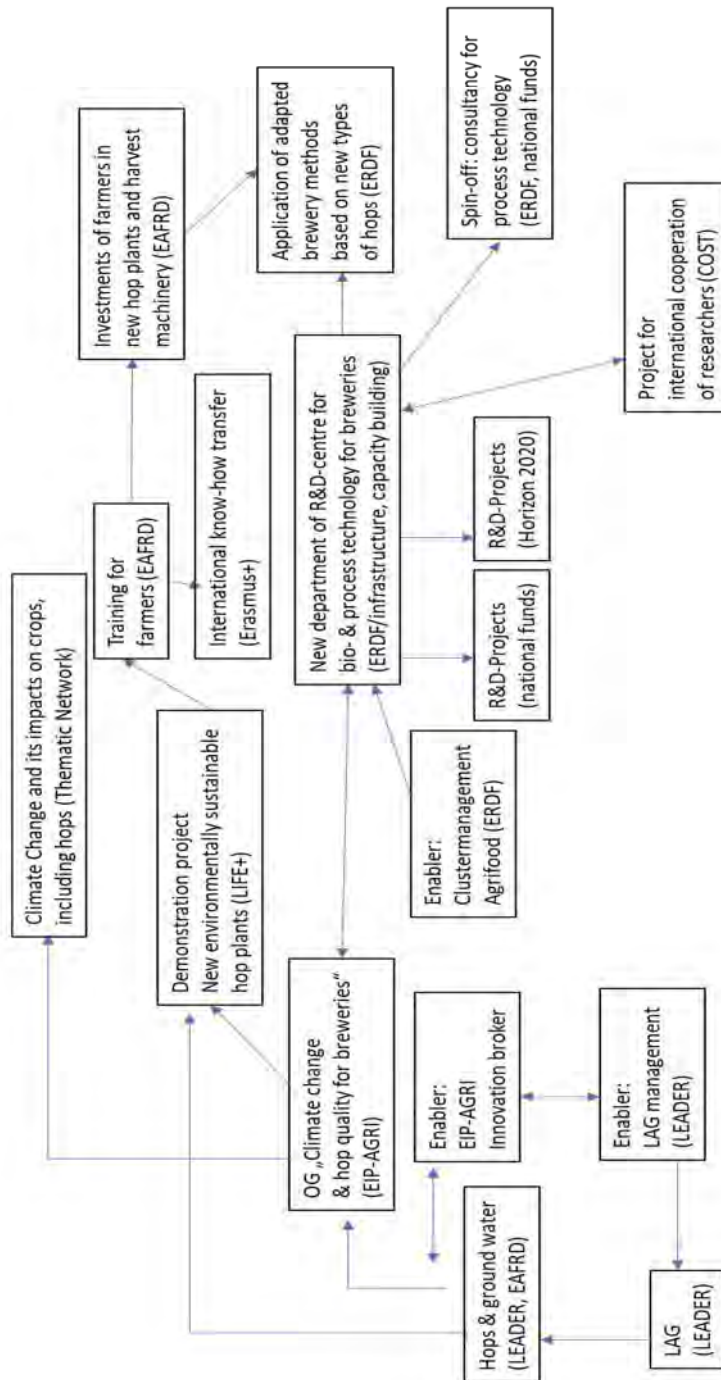


Fig. 46 Virtual case – innovation in hop growing (Kah & Gruber, 2019).

6.1.9 Conclusions and recommendations

The research showed that there is a broad variety of support instruments available for innovation in agriculture, covering all stages of the innovation process. However, they are not necessarily linked to each other and operate independently, making the creation of synergies challenging. Also, a high complexity and different sets of rules, particularly between direct and shared management instruments, deter policy-makers from pursuing synergies.

Synergies do not easily develop automatically, but have to be supported proactively. In order to identify in what policy intervention is best suited, the research started from the assumption of a series of preconditions. These were then narrowed down to four success factors:

- enablers that can provide guidance and coordination in agricultural innovation systems;
- strategies that define objectives and priorities;
- incentives that make synergies worth the additional effort and associated risk;
- harmonisation of rules between different instruments and associated simplification.

Synergies require a collaborative innovative culture built on trust, and building trust takes time.

In addition to these, transparency, trust and culture play the role of supporting factors.

In terms of recommendations to policy-makers, creating and supporting enablers appear to be the most important course of action. The main reason for this is that the activities of enablers are linked to other success factors. Enablers can, for instance, coordinate strategy development or ensure transparency by managing information flows. Another aspect that should be emphasised, but could not be discussed in detail is the importance of continuity. Synergies require a collaborative innovative culture built on trust, and building trust takes time.

It is interesting to note that the findings of this study relate in great part to the six implementation principles of the EU AKIS strategy mentioned in Section 3.1, for instance by suggesting ways to increase interactive innovation and the use of the Multi-Actor Approach, or by emphasising international cooperation and the need for strategic approaches.

Looking ahead, EC proposals indicate an increased visibility of agricultural innovation in 2021-27. There will be a dedicated 10 billion euro budget under the new Horizon Europe for research and innovation in food, agriculture, rural

development and the bioeconomy.⁸² To what extent there will also be measures to facilitate an increased use of synergies in the future remains to be seen.

6.2 Lessons learned on Research and Innovation Infrastructures for AKIS

Text from a study by Anna Augustyn, Floor Geerling-Eiff, Simona Cristiano and Patrizia Proietti

Objective: A major challenge to realise ERA is to involve EU Member States (MSs) in a way that create a real European 'market' for science and scientists without leaving any MSs behind. The aim of this study is to: (1) improve the integrated approach within the EU agricultural knowledge and innovation systems (AKIS) and the Implementation of the European Innovation Partnership (EIP), (2) help MSs identifying possible synergies between RIIs.

Method and structure: Our aim was to map existing good practices of RIIs in the EU and beyond and to highlight their strengths and weaknesses from the AKIS point of view. The international examples presented from outside the EU, are situated in the countries that are leading investors in agricultural R&I: China, India and Israel. Section 1 is a brief introduction to the topic. Section 2 presents lessons learned from earlier AKIS related studies. Section 3 and 4 gives the definition and typology of RIIs. Section 5 and 6 summarize the RIIs in 5 EU and 3 non-EU countries containing the key findings of the study. Section 7 finishes with some conclusions.

Conclusions and recommendations: The current situation is leading to different R&I agendas per country, thus various AKIS actors in different countries work apart from each other even on R&I agendas and challenges which are identical. It is visible that investments in R&I infrastructures are gaining momentum in each of the countries and that they are fostered with national and transnational coordination efforts. Most participants in RIIs are engaged in a public research setting, which is however increasingly being complemented with the engagement of a variety of industrial and other actors. Another visible tendency in the R&I set up is a strong demand for interdisciplinary focus, combining agriculture or food innovations with other industries, such as for instance the energy sector. Important drivers for setting up new R&I infrastructures are often rooted in the overall progress in Information Technologies (IT). As in most of the countries roadmaps have

⁸² At the same time, some proposals risk to reinforce existing silos. The current plans for the future MMF indicate that the EAFRD is decoupling itself from other ESI Funds. It is not covered by the CPR anymore and is not integrated into the Partnership Agreement, which will only cover the other 4 ESI Funds.

been developed, which outline the possible directions for R&I infrastructures, investments at present and in the coming years, are in many places still in a nascent phase. Further effort is also needed at EU level to support and harmonize these national roadmaps. Engagement with the non-EU countries could also be useful to learn about their experiences and enhance formal collaborations especially on private public partnerships.

6.2.1 Introduction

A specific issue regarding interactive innovation approaches, is cross-border collaboration as each country has its own science and rural development policy to address specific issues and challenges. A major challenge to realising a European Research Area (ERA) is to focus to common rules and procedures between EU MSs for R&I programmes and in that way create a real European 'market' for science and scientists as well as innovation and development. This could facilitate researchers to match proposals from different programmes by opening the market to institutes and actors from other countries. That does not mean that national or regional authorities should give up their R&I strategy and agenda-setting processes. Yet, R&I programming based on national agendas could be organised in such a way that EU added value is generated and that the best results are obtained.

This includes an optimal level of international collaboration to prevent overlap and duplication in R&I and investments in R&I infrastructures, to benefit from efficiency of scale and spill-overs and to create further specialisation in the research system. The aim should be to organise R&I in such a way that it is supported by the pooling of resources (such as in the ERA-NETs and JPIs). However, the EU AKIS are still as diverse as its 28 Member States, leading to different R&I agendas per country and diverse strategies to reach impact. Various AKIS actors in different countries work on similar broad objectives, namely sustainable agricultural production and consumption. However, they work apart from each other, even on challenges which are identical to other Member States. The EU is currently investing nearly 4 billion euro in agricultural R&I within Horizon 2020. Yet, building the ERA is still in its initial phase and a long-term process (European Commission, 2016). Research exchange between EU Member States remains limited, which may be partly due to a lack of national financial means.

The study described in this chapter (3.3) was oriented on mapping existing practices and highlighting R&I Infrastructures (RIIs) within AKISs in the EU to improve knowledge flows. The study was assigned to the SWG SCAR AKIS and. A vast number of RIIs were identified at both domestic and transnational level. This section presents an overview of inspiring examples in the EU and beyond, as well as the strengths, weaknesses and highlights of RIIs to learn from within a EU perspective. The international examples presented from outside the EU, are situated in the countries that are leading investors in agricultural R&I: China, India and Israel. The results of this study feed into:

(1) improving the integrated approach within the EU agricultural knowledge and innovation systems (AKIS) and the Implementation of the European Innovation Partnership (EIP), (2) the identification of synergies between RIIs, including facilities i.e. AKIS supportive infrastructures.

6.2.2 Lessons learned from earlier AKIS related studies as background information

While studying the role of RIIs, it is first of all important to have a better overview of knowledge flows in Multi-Actor interaction, AKIS and the impact of agricultural R&I as background information. Therefore, we reviewed the lessons from previous related EU studies. Collaboration between multiple actors in learning and innovation networks, is essential for both developing knowledge together and exchanging results and experience to valorise knowledge in practice. AKIS in EU differ and have unique characteristics. Therefore, we need to gather better insight in the structures and interconnections between the different AKIS in the Member States. Furthermore, we need to understand more about the impact of agricultural R&I projects and actions.

The 2010-2013 SOLINSA project aimed to identify barriers to the development of Learning and Innovation Networks for Sustainable Agriculture (LINSA, www.solinsa.org). SOLINSA provided recommendations on strengthening LINSAs potentials, self-awareness and capabilities, improving alliances between LINSAs and AKIS and enhancing the LINSAs scope in new networks and in the EIP context. In enhancing LINSAs, it is required to take into consideration: the process character and powerful dynamics of social learning, the various phases of the diffusion of innovations and the complexity of networking and the diversity in Multi-Actor-networks. To improve alliances between LINSAs and AKIS, dissemination of LINSA activities and results, authors recommended the recognition of LINSAs to be promoted. Support should be provided to intermediary persons who have the authority and trust of the LINSAs for further development. Transdisciplinary and participatory research projects should enable collaborations between LINSAs, researchers and other sectors. Cross-sectoral participatory trainings and conferences could be established to support LINSA. The networks need open, but protected spaces for creativity, experimentation, for trial and error to set impulses for the development of innovation. Links with EIP-AGRI can be established, e.g. because certain LINSAs could offer a long-term structure which allows to continue what was developed in projects in the EIP context.ⁱ

The PRO-AKIS project compiled an inventory of the AKIS organisations, institutions and their linkages in the 28 EU countries (www.proakisinventory.eu). Although there are similarities between AKISs, we are far from a unified EU AKIS system. Each MS has its own (based on the regulatory framework) ownership of research institutions and advisory system, structure of education, sources of financing, characteristics of farm-holding and farm-

holders, their needs and expectations as well as the necessity of the implementation of CAP and local agricultural policy. They differ, among others, in: historical conditions, the number of actors, the number of levels (national, regional or mixed level), sources of knowledge and information, sources and system of funding, ownership of advisory service organisations / companies, models of AKIS organisation, leadership and management. As a result, linkages between AKIS' actors vary from formal to informal, and from strong to weak. All, this differs per MS, therefore the PRO-AKIS project could not draw general conclusions on the overall EU AKIS. However, from the exchanges on the diversity in AKIS systems a lot can be learnt, and the results of the study also illustrate the relevance of building on existing knowledge systems rather than starting from scratch.

From the IMPRESA project⁸³ and the SCAR SWGs Policy Brief on Programming R&I for improved impact⁸⁴, we learn that the estimated internal rates of return of investment of agricultural research are between 7% and 15%, and the time lag of research effect on productivity takes many years. If we look at innovation in particular, the cycle from initial research to effects on ultimate beneficiaries is sometimes longer than the career span of the lead researcher because of institutional constraints (particularly the need to predict impacts before projects begin), stifle creativity and innovation and unplanned coincidences, along with the role of motivated individuals which is key. Innovation intermediaries play an important role in reaching impact. While private research

mostly affects improved and consolidated output (on the short term), publicly financed research in general addresses more the global strategic development goals on the longer term which makes it more difficult to monitor and evaluate effectivity.

Furthermore, there is no coherent information about the multiple actors involved, nor their involvement in agricultural research which leads to duplication risks, gaps in R&I and inefficient knowledge valorisation. To improve efficiency in impact of agricultural research, the development of a culture of impact is required. Changes into co-design and co-delivery approaches, novel procedures for selection and review of research projects are required. Greater engagement of multiple actors in the research process and improved agricultural R&D statistics and understanding of trends in research structures, topics and capacities are essential, as well as changes in ex-ante and ex-post evaluation. Public expenditure on agricultural research

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⁸³ Information about the H2020 IMPRESA Project is available at: www.cordis.europa.eu/project/rcn/110944/factsheet/en.

⁸⁴ www.scar-europe.org/index.php/akis-documents

needs to be better targeted. And to that effect, researchers should be trained in Multi-Actor and co-creative working methods. Furthermore, researchers should get improved incentives for their role in innovation processes in society, rather than the dominant current incentives limited to the scientific world.

6.2.3 Definitions of R&I Infrastructures

Defining RIIs is a challenging task. Most definitions (solely) refer to research infrastructures (RIs) and additionally, knowledge infrastructures (KIs). Since 2006, the EC has used the following working definition on RI: “facilities, resources and services that are used by the research communities to conduct research and foster innovation in their fields. Where relevant, they may be used beyond research, e.g. for education or public services. They include: major scientific equipment (or sets of instruments); knowledge-based resources such as collections, archives or scientific data; e-infrastructures, such as data and computing systems and communication networks; and any other infrastructure of a unique nature essential to achieve excellence in research and innovation. Such infrastructures may be 'single-sited', 'virtual' or 'distributed'” (European Roadmap for Research Infrastructures, 2006).

Research infrastructures may be 'single-sited', 'distributed', or 'virtual' (the service being provided electronically).

This definition covers major equipment or sets of instruments, as well as knowledge resources such as collections, archives and databases. RIs may be 'single-sited', 'distributed', or 'virtual' (the service being provided electronically). They often

require structured information systems related to data management, enabling information and communication. These include technology-based infrastructures such as grid, computing, software and middleware. The role of RIs is to offer high quality research services, thus helping the scientific community and playing a key role in the construction of an efficient R&I environment. Because of their ability to assemble a 'critical mass' of people, knowledge and investment, they contribute to national, regional and European economic development (Borgman et al., 2013). These research infrastructures can be single-sited or distributed or an e-infrastructure and can be part of a national or international network of facilities, or of interconnected scientific instrument networks.

To allow EU funding, the infrastructure should offer top quality scientific and technological performance that is recognised as being of 'more than-national relevance', offer access to scientific users from Europe and beyond through a transparent selection process based on excellence and have stable and effective management. According to DG R&I's⁸⁵ the action plan on long-term

⁸⁵ http://ec.europa.eu/research/infrastructures/pdf/ri_policy_swd-infrastructures_2017.pdf

sustainability of RIs the following elements should be included: (1) ensuring R&I at the forefront of scientific excellence; (2) configuring European RI as skills development and mobility actors; (3) unlocking RI potential and stimulating industry engagement; (4) boosting RI impact, value and benefits of RI; (5) enhancing RI as the pillar for data production and sharing; (6) ensuring effective governance and sustainable life-cycle management and (7) promoting European RI in the international arena.

In recent decades the definitions of infrastructures have flourished, expanding from physics-based machines to incorporate any centre of knowledge or facility which is the core of a particular research discipline, such as a database or a collection. In a technological view of research, RIs are identified as cyberinfrastructures and digital infrastructures. The term cyberinfrastructure is used by Unsworth (2006)ii 'to denote the layer of information, expertise, standards, policies, tools, and services that are shared broadly across communities of inquiry but developed for specific scholarly purposes. A cyberinfrastructure is something more specific than the network itself but it is something more general than a tool or a resource developed for a particular project, a range of projects, or, even more broadly, for a particular discipline. For example, digital history collections and the collaborative environments in which to explore and analyse them from multiple disciplinary perspectives, might be considered to be cyberinfrastructures. Whereas fibre-optic cables and storage area networks or basic communication protocols would fall below the line of cyberinfrastructure' (Unsworth, 2006). Digital infrastructures are defined as 'shared, unbounded, heterogeneous, open, and evolving sociotechnical systems comprising an installed base of diverse information technology capabilities and their user, operations, and design communities' (Tilson, Lyytinen & Sørensen, 2010).

In a more cultural perspective, Badenoch & Fickers (2010) define infrastructures as mediating structures within the research ecosystem. They "are the structures in between that allow things, people and signs to travel across space by means of more or less standardised paths and more or less standard protocols for conversion or translation. Thinking of infrastructures as mediating interfaces, as points of interaction and translation on material, institutional and discursive levels, allows us to get to the heart of the dynamics we seek to capture." Edmond (2013) states that "in its widest sense, an infrastructure allows us as finite individuals to achieve beyond our individual capacity to know, to do, to see". In this view, infrastructures are seen as something which allows people to go beyond their own capacity to know and to do, thus increasing their potential.

Edwards et al. (2007) focus on the knowledge creation processes. 'Infrastructures get below the level of the work, i.e. without specifying exactly how work is to be done or exactly how information is to be processed. Most systems that attempt to force conformity to a particular conception of a work process, have failed to achieve infrastructural status because they violate this principle. By contrast, email has become fully infrastructural because it can be used for virtually any work task.' Alongside the definitions of RIs, we also find various descriptions of KIs. Edwards (2010) describes knowledge infrastructures as 'robust networks of people, artefacts and institutions which generate, share, and maintain specific knowledge about the human and natural worlds.' This definition is very similar to the early definition on AKIS given by Röling (1990): the Agricultural Knowledge and Information Systems (AKIS) is 'a set of agricultural organizations and/or persons, and the links and interactions between them, engaged in such processes as the generation, transformation, transmission, storage, retrieval, integration, diffusion and utilization of knowledge and information, with the purpose of working synergistically to support decision making, problem solving and innovation in a given country's agriculture or domain thereof.'

Based on the definitions from literature, we broaden the definition of RII to the conglomerate of people, institutions, tools, facilities, which are engaged in the generation, capturing, preservation (organisation, storage, retrieval) and diffusion of different resources with the purpose of empowering and extending innovation in EU agriculture (Fig. 47).

This definition does not only focus on knowledge and innovation development as the centre of attention but looks beyond research communities by identifying flows of knowledge for co-creation, knowledge exchange, transfer and learning between multiple actors. Tools and facilities (the technological and technical elements of infrastructures) are components of a larger mechanism which include the generation, capture, preservation and diffusion of resources (knowledge management) (Weinberg, 1963). They allow to share and maintain resources, while other entities, both at an individual level and institutional level, provide the social elements necessary to capture and sustain knowledge production, through networking for both practical and theoretical collaboration (Weber, 2011).

We broaden the definition of Research and Innovation Infrastructures to the conglomerate of people, institutions, tools and facilities, which are engaged in the generation, capturing, preservation and diffusion of different resources with the purpose of empowering and extending innovation in EU agriculture.

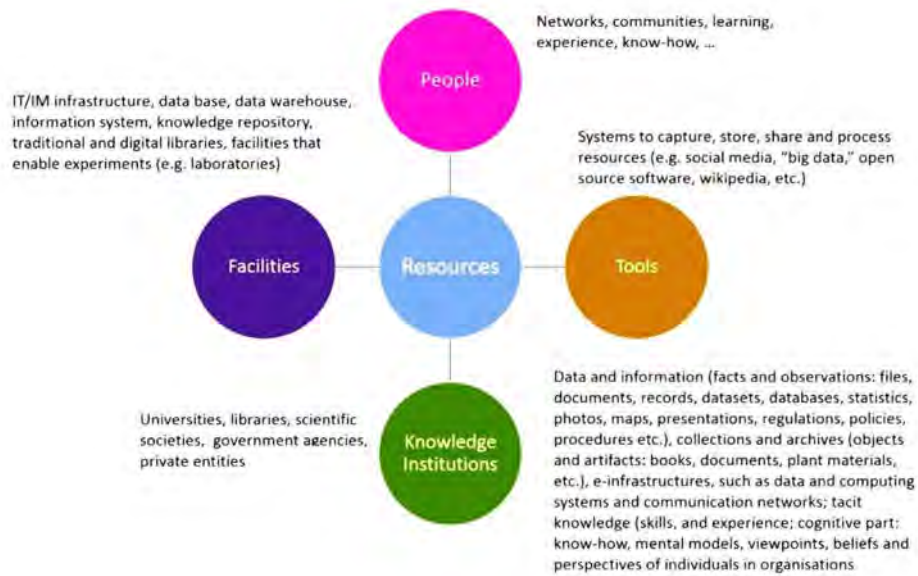


Fig. 47 In a broadened definition RII are the conglomerate of institutions, people, tools and facilities.

6.2.4 Typology of R&I Infrastructures in the EU

To enhance learning and innovation between multiple actors in networks, to improve knowledge flows in AKIS and to increase the uptake of project results for innovation, a shift is required from linear driven research for innovation to demand driven, Multi-Actor R&I. Three types of interconnected knowledge processes can be distinguished: co-creation, knowledge exchange and knowledge transfer (adapted from Lans et al., 2006⁸⁶; Geerling-Eiff et al., 2006⁸⁷). The nature of the R&I demand determines whether co-creation, knowledge exchange or transfer is dominant (see Fig. 48).

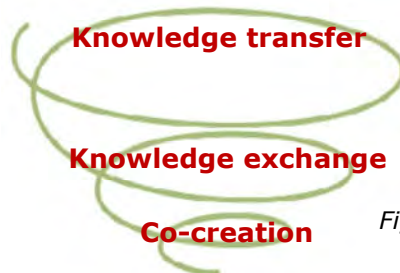


Fig. 48 The nature of the R&I which process is dominant.

⁸⁶ <https://edepot.wur.nl/29235>

⁸⁷ <http://library.wur.nl/WebQuery/wurpubs/fulltext/42190>

Research institutes have their own infrastructure to disseminate the knowledge created by their researchers, often in cooperation with other actors.

Co-creation: is the process in which multiple actors search together when there is uncertainty about the direction of development, in a co-decisive process ('Multi-Actor');

Knowledge exchange: refers to commonly seeking certainty through sharing and combining existing knowledge. The aim of the solution is (still) unknown

Knowledge transfer: occurs when the solution is decided and known but may still need to be adapted to its intended use. Transfer refers to the communication of explicit knowledge.

During the SWG SCAR AKIS meeting in Brussels on 30 and 31 October 2018, several RIIs in the MSs were identified in a participatory exercise with the participants. Based on our definition of RIIs and this inventory, different institutions, networks, enabling tools and facilities were distinguished which all support co-creation, knowledge exchange and knowledge transfer in R&I. Research institutes have their own infrastructure to disseminate the knowledge created by their researchers, often in cooperation with other actors, as well as networks create an appropriate infrastructure together with multiple actors and organisations. Enabling tools need institutions and networks to co-create, exchange and transfer knowledge and vice versa. While networks and institutions are considered as the organisation by teams of people making knowledge valorisation possible, enabling tools can be considered as the hard (physical) and soft (approaches, strategies) supportive infrastructures. Naturally most 'knowledge' cannot be 'transported' that easily. Each actor has his/her role in knowledge co-creation and valorisation. In studying different RIIs, we distilled the following six RII types, including some subcategories. Note that in practice, these types not always function in separation and that different mixed situations exist.

6.2.4.1 Applied Research Institutes (ARIs)

ARIs are organisations which focus on making research results applicable for different target groups. This work can be either based on scientific research or applied research. The output of applied research institutes depends on the demand of the end-user, which could be products, services or processes which can be implemented in practice. ARIs are not or not as restricted to scientific output, since science is not the main target field as universities. Projects are often assigned by policy makers, the industry or NGOs. R&I activities and projects are either publicly, public-privately or privately financed. Many EU countries have institutes which perform applied research for agriculture, next to agricultural universities.

6.2.4.2 Research Infrastructures

RIs are facilities, resources and services used by the science community to conduct research and foster innovation. By pooling effort and developing RIs, European countries can achieve excellence in highly-demanding scientific fields and simultaneously build the European Research Area (ERA) and Innovation Union. They include: major scientific equipment, resources such as collections, archives or scientific data, e-infrastructures such as data and computing systems, and communication networks. RIs can be single-sited (a single resource at a single location), distributed (a network of distributed resources), or virtual (the service is provided electronically).’ There is no EU research infrastructure which addresses agriculture specifically (yet).

6.2.4.3 Experimental or Research Stations

An agricultural experimental station (AES) or agricultural research station (ARS) is a centre where researchers cooperate with agricultural entrepreneurs, chain partners, advisors, extension agents and other actors on difficulties, potential improvements, competences and skills on agri-food production and agribusiness. Many agricultural experimental stations are (linked to) national or regional agricultural universities or are applied research institutes.

6.2.4.4 Innovation Hubs (digital innovation hubs, agri-business parks)

The most well-known and probably one of the oldest Innovation Hub is probably Silicon Valley which is referred to as ‘a community which fosters technological trends, innovation, and industry-specific insights’ Within the EIP-AGRI framework, Member States have invested in innovation support services or “innovation hubs” to help emergence and development of EIP-AGRI Operational Group innovative projects . In such hubs, a common feature are “innovation brokers”, who help actors with an innovative idea to connect with other actors having complementary knowledge who can help developing the solution. EIT Innovation Hubs ‘focus on developing innovative products, services and training in a specific area of their Innovation Community, taking targeted actions to help overcome key challenges in that field. Each Innovation Community operates with its own management, legal structure and business plan and has its own clear, measurable objectives to deliver value to its partners and EU citizens. EIT Innovation Hubs constitute the backbone of their Innovation Community and should have a strong management, enabling collaboration within the Hub itself and with partners from other hubs. There should be an inbuilt simplification agenda to keep overheads and management costs low.’ Innovation hubs can be both physical locations such as agri-business parks or campuses or virtual such as digital innovation hubs.

6.2.4.5 Dissemination infrastructures and Repositories

Infrastructures and repositories for knowledge dissemination are both hard and soft enabling facilities and tools or settings, to support the collection and transfer of knowledge. Types of infrastructures for knowledge transfer are: (1) Databases: a database is an organized collection of data generally stored and accessed electronically from a computer system. Where databases are more complex they are often developed using formal design and modeling techniques; (2) (Digital) libraries: a digital library, digital repository, or digital collection, is an online database of digital objects that can include text, still images, audio, video, or other digital media formats. In addition to storing content, digital libraries provide means for organizing, searching, and retrieving the content contained in the collection; (3) Knowledge reservoirs: a participative tool to host all existing knowledge developed by research or derived from practical experience. All actors involved who want to share their documented knowledge can contribute to this web archive, by uploading videos, images and documents to disseminate their insights to multiple end-users.

6.2.4.6 (Other) R&I Networks and Clusters

R&I Networks and Clusters are groups of actors, homogenous or heterogeneous, who collaborate on co-creating, circulation and/or transfer of knowledge. They can have a formal or informal character and work on various technology readiness level (TRL) R&I activities.

6.2.5 Types of RIIs in Greece

6.2.5.1 Introduction

The Greek AKIS is highly fragmented. At the national level the main actors are the Ministry of Rural Development and Food (MRDF), ELGO DIMITRA (incorporating the ex-semi-autonomous organisations NAGREF, OGEEKA, AGROCERT and ELOGAK), Higher Education Institutes (HEIs), private companies (branches of transnational companies) and PASEGES (Pan-Hellenic Confederation of Unions of Agricultural Co-operatives). At the local (municipality) level, the main actors are the Municipal Agricultural Production Offices (ex-Agricultural Extension/Rural Development Offices), local cooperatives (Coops Union branches) and, of course, individual farmers.

Such a structure, along with the breakaway of research and (farmers') training from the Ministry into semi-autonomous organisations, has led to extremely weak linkages among the main public AKIS components. Agricultural R&I in Greece is characterised by a high concentration of research and competences in universities and the underperformance of the private sector, mostly due to difficult access to finance. The public research system, as a whole, is largely insulated from the private sector. Knowledge and

service provision is largely carried out by private companies of which mainly input suppliers and consultancy firms.

In the programming period 2014-2020, RDP measures have been applied to shape up AKIS. Particularly, M01, M02, M16 have been moved under one Implementing Authority for closer planning and implementation links. New actions have been undertaken to enhance knowledge flows within the AKIS and to strengthen links between research and practice, such as the organisation of national thematic networks aimed at gathering all the AKIS actors and the setting up of systems of exchange of information. This includes the development of e-infrastructures. Among the other measures are the establishment of an advisory and monitoring group bringing together research and universities, the MRDF, ELGO-DIMITRA and chambers of commerce.

6.2.5.2 Applied Research Institutes

In Greece, applied research in agriculture is mainly performed by ELGO-DIMITRA (<http://www.elgo.gr/>) which provides scientific and technical support to the MRDF in planning and supporting the implementation of national and both Common Agricultural and Fisheries Policies. It is directly involved in research, knowledge and technology dissemination, advisory services and agricultural vocational education and training. It is also actively involved in the creation (new varieties), conservation, production and marketing of seed. Through its laboratories, facilities and technical equipment, it provides also analysis services and targeted advice. It runs six schools, which are specialized in different sectors and a number of vocational training centres, covering almost all the Regional Units of the country. ELGO-DIMITRA interacts with a relevant number of other R&I infrastructures and actors (farmers, farmers' associations, producer groups, cooperatives, municipalities, regions, input producers, food industries, universities and other private and public bodies), due to the different activities and services it provides. Because of that, ELGO-DIMITRA promotes and facilitates the exchange of knowledge among the AKIS' actors, co-produces and co-disseminates knowledge.

6.2.5.3 Experimental and/or research stations

A good number of experimental and/or research stations operate in Greece, reporting to ELGO-DIMITRA and the Ministry of Agriculture. The independent Benaki Phytopathological Institute (en.bpi.gr) is also a research station.

6.2.5.4 Innovation Hubs

The Development Agency of Karditsa (AN.KA, www.anka.gr), aims at implementing programmes and projects for the development of both rural and urban areas of the Karditsa district. It works on a regional scale. AN.KA has established a permanent cooperation with Research Centres, Universities, Technological Institutes, Development Agencies in Greece and in Europe, as well as services of both the public and private sectors. Such cooperation

ensures effectiveness, transfer of know-how and follow-up of the recent development process. AN.KA includes an incubator service (www.forum-synergies.eu/bdf_fiche-experience-178_en.html) within its activities. The incubator provides pre-start-up services, offers space for the head office, raises awareness of candidate members, provides secretarial support and inform visitors who are interested in the initiative. The incubator supports or hosts more than 15 collective schemes, among which 5 agricultural cooperatives that are part of a local network transformed into the 'ecosystem of collaboration'.

Another hub for innovation is AGROECOPOLIS (www.forum-synergies.eu/bdf_fiche-experience-151_en.html), a very young, grassroots non-profit, non-governmental organisation. It is the Hellenic Network for Agro-ecology, Food Sovereignty and Access to Land. It actively promotes different models of connecting consumers and producers, such as the Community Supported Agriculture (CSA), the safeguard agricultural land through practices of communal ownership and usage, as well as participatory action research. AGROECOPOLI acts as a hub for networking, experience sharing, training, facilitation and provision of resources for groups (formal or not) which work on similar fields. It helps existing initiatives and start-ups by providing counselling and training on ethical solidarity economy and human relations issues. Furthermore, it works for farmers' autonomy and self-sustainability by teaching farmers how to be independent in the growing practices based on the principles of agro-ecology, permaculture, biodynamics, regenerative agriculture and natural farming. So far, it has no other connections.

6.2.5.5 Dissemination infrastructures and Repositories

OPENSREEN-GR (www.openscreen.aua.gr) is an open-access infrastructure for the discovery of bioactive molecules, using molecular target-based screening technologies. It develops new technologies and provides access to the service, application and product developing sectors of the national economy, as well as spin-off companies, SMEs and larger companies interested in producing innovative products and applications. This is realised in collaboration with academic researchers by enhancing interactions and promoting collaborations between the academic and industrial communities, to which it also offers extensive training opportunities. OPENSREEN-GR facilitates the exchange of knowledge and promotes technology transfer to be used for developing innovative solutions to specific problems in both Human and animal health and agriculture.

Furthermore, the Mediterranean Agronomic Institute of Chania (CIHEAM-IAMC) (www.iamc.ciheam.org/) is the 4th constituent institute of CIHEAM, a Mediterranean intergovernmental organisation which is devoted to the sustainable development of agriculture and fisheries, food and nutrition security and rural and coastal areas. CIHEAM-IAMC provides post-graduate specialised education, networked research, facilitation of regional debate. It

offers laboratory services and manages a seed bank, holding collections of endemic, rare and threatened wild plants as well as other wild and landraces of cultivated plants. The Botanical garden holds a collection of endemic and threatened plants for demonstration and education purposes. The herbarium preserves specimen of Mediterranean plants and provides all the required facilities for taxonomic identification of plants of the Eastern Mediterranean region. CIHEAM-IAMC also hosts a broad library on agricultural knowledge.

6.2.6 Types of RIIs in Hungary

6.2.6.1 Introduction

Although some elements of the Hungarian AKIS organized and coordinated, the structure and cooperation between its different elements is still insufficient. On governmental level the main players are: the Ministry of Agriculture (MoA) and the Ministry of Innovation and Technology (MoIT). MoA is responsible for agriculture, food industry, fisheries, forestry, environment, natural resources, rural development and agricultural vocational schools. MoIT is responsible for industry, trade, climate, waste, innovation, research, higher education and vocational schools (except for agriculture). All of the operational and some of the strategic tasks of research and innovation administration are delegated to the National Research Development and Innovation Office (NRDIO).

The agri-food sectorial players are all members of the Hungarian Chamber of Agriculture (HCA) representing production, processing and trade as well. HCA provides national and international (as a member of Copa-Cogeca) lobby activities. Co-financed by MoA it operates farm advisory and information services and also have a farmers' education services. On the other hand there is a strong network of Interbranch Organisations (IBOs), representing the most important agri-food supply chains of Hungary (e.g. milk, poultry, pig, cereals, fruit & vegetable) also being involved in the HCA structure. The education sector includes mainly agricultural, horticultural and veterinary universities in Gödöllő-Budapest (SZIE), Debrecen (DE), Szeged-Hódmezővásárhely (SZTE); Kaposvár (KE); Keszthely (PE), Mosonmagyaróvár (SZE). Other important players are agricultural vocational schools (46), belonging to MoA.

Hungary took a strategic approach to develop RIIs through setting up the National Research Infrastructure Committee (NRIC), established on the initiative of the President of the NRIDO.⁸⁸ A national Roadmap was developed in this framework, highlighting the key directions for the Hungarian R&I.⁸⁹

⁸⁸ Nemzeti Innovációs Hivatal (2014): Research infrastructures in Hungary. Report

⁸⁹ Hungarian National Research, Development and Innovation Office (2018): National Research Infrastructure Roadmap. Document <https://www.esfri.eu/latest-esfri-news/hungary-publishes-its-national-research-infrastructure-roadmap>

Agricultural RIIs became embedded into two distinct domains: (1) the domain of health and food sciences: the Hungarian Academy of Sciences Centre for Agricultural Research⁹⁰ – coordinating body for agriculture and food research; and (2) the domain of environment: the Hungarian Academy of Sciences Centre for Ecological Research⁹¹ – coordinating body for biosphere, ecology and agriculture.

Another strategic action initiated by MoA is BIOEAST, the main purpose is to coordinate and represent the agri-food and bioeconomy research and innovation interest of the Central-Eastern European countries, the Visegrad 4+7 countries.

6.2.6.2 Applied Research Institutes

The agricultural applied research sector is mainly concentrated in the National Agricultural and Innovation Center (NARIC) belonging to MoA. NARIC operates through a network of diverse institutions located across the country. The central objective of the infrastructure is to coordinate the efforts in a systematic way. The thematic scope comprises numerous fields of basic research such as: physiology, genetics, genomics, molecular biology etc., as well as applied research on: plant breeding, production technology, precision agriculture, the food industry, etc. The other important player in agricultural applied research is the Centre for Agricultural Research of Hungarian Academy of Sciences (now part of the Eötvös Lóránd Network of Research Institutes of the Hungarian Academy of Sciences, ELRN-ATK) and Bay Zoltán Nonprofit Ltd. for Applied Research (BZN) belonging to MoIT. The scientific institutes making up ELRN-ATK research centre are involved in research in the following fields: veterinary science, crop production, plant breeding and agronomy, plant protection, soil science and agricultural chemistry. BZN is a public company aiming to contribute to the competitiveness and efficiency of Hungarian companies by providing services in innovation and technology transfer. There is also important agri-food applied research activity at the relevant universities and some private research organisation (e.g. Research Institute for Organic Agriculture, ÖMKI; Research Institute for Food Industry, Capmden BRI).

6.2.6.3 Research Infrastructures

ELIXIR 'coordinates and develops life science resources across Europe so that researchers can more easily find, analyse and share data, exchange expertise, and implement best practices. This makes it possible for them to gain greater insights into how living organisms work'⁹². The European Strategy Forum on

⁹⁰ http://www.agrar.mta.hu/en/main_page

⁹¹ <https://www.okologia.mta.hu/en/node/2>

⁹² <https://elixir-europe.org/about-us/what-we-do>

Research and Innovation (ESFRI) identified ELIXIR in its roadmap as 'one of the few research infrastructures of global significance'⁹³. The Bioinformatics Research Infrastructure Group, ELIXIR-HU has a strong interdisciplinary focus, involving scientific domains such as human genomics, agri-genomics, proteomics, veterinary sciences (virology) and ecology (biological networks). Despite this diversity, the core objectives of participating institutions and scientists, is a harmonized handling, processing and interpreting of large datasets from biological measurements. The infrastructure is coordinated by the ELRN Institute of Enzymology and it aims to promote applications of bioinformatics across all the life sciences in Hungary, including agriculture and related domains. It participates in the international activities and networks, such as ELIXIR, an intergovernmental organisation that brings together life science resources from across Europe. These resources include databases, software tools, training materials, cloud storage and supercomputers. The goal of ELIXIR is to coordinate these resources so that they form a single infrastructure. ELIXIR includes 23 members and over 180 research organisations. It was founded in 2014, and is currently implementing its first five-year scientific programme (www.elixir-europe.org).

6.2.6.4 Dissemination infrastructures and repositories

EIP platform (<https://eip.fm.gov.hu>): At the end of 2016 MoA launched its EIP-AGRI website developed by the Research Institute of Agricultural Economics (AKI, now part of NARIC). The website offers the potential Hungarian Operational Groups (OGs) to register their innovative ideas and for the selected OGs to publish the results on the progress of the projects. Also, the website provides useful information and news on the European EIP network.

E-Knowledge Reservoir: HCA is working on building up a knowledge reservoir collecting successful innovative solutions that are suitable for use for farmers who want to modernize their production methods. This knowledge-based data system will be set up to gather relevant practical knowledge (from Thematic Network projects, but also directly from researchers, or other AKIS actors who have something to share) and introduce it in an attractive way for the use of the practitioners of the agri-food sector, in a publicly available form. The main target group would be foremost the advisors, however, since farmers do not use such online tools regularly, but interested advisors could be reached easily (FAS has an active internal communication flow) and even trained for the use of the platform. It will have 4 modules:

⁹³

http://ec.europa.eu/research/infrastructures/pdf/esfri-strategy_report_and_roadmap.pdf

- the reservoir itself: first we collect, translate and unify (shorten, put into a practice abstract form, make it understandable for our advisors/farmers) the relevant knowledge gathered by TNs. But also write practice abstracts by ourselves, with the help of our experts. On the platform these practice abstracts will be searchable thanks to labeling.
- question and answers: if the end user cannot find relevant information at module 1, it can ask his/her question, and in the background our experts will answer. If it make sense, we create also a practice abstract (in modul 1) targeting the challenge in question.
- expert introductory: in Hungary there are 1,100 registered advisors. We would like to make them available by introducing their profile on this platform. Also researchers and other knowledge-providers can introduce themselves, if they would like to.
- calendar+map: for relevant events and the related materials.

Bioeast platform (<http://www.bioeast.eu/>): The BIOEAST initiative has developed by now into a very important and active network of the Central and Eastern European macro-region for the identification of common research needs and focus areas in the bioeconomy. The initiative has its own website permitting to follow the latest developments of the collaboration, as well as publishing relevant studies and presentations which provide useful information not only for policy makers but for research institutes, companies, producers who are interested in the bioeconomy.

MTMT database (<https://www.mtmt.hu/>): The Hungarian National Scientific Bibliography (MTMT) is a database created and maintained by HAS. MTMT presents the scientific output of Hungarian researchers together with the repositories containing the full text, wherever available. The database is accessible for non-commercial use.

6.2.6.5 (Other) R&I Networks and Clusters

MoA and HCA operates an informal AKIS working group since 2017 to discuss AKIS related issues, share experiences, and strengthen the links between actors. It serves also as a national mirror working group for BIOEAST. The group consists of about 100 AKIS actors from the agri-food sector (representatives of research institutes, universities, advisors, farmers, NGOs, the Ministry and the NRN). Meetings are held on a quarterly basis. It is an effective coordinative tool which ensures the discussion of strategic research and innovation orientation, verification of regulations, motivation to participation in international calls, and knowledge transfer for farmers about the most relevant and latest research results.

There are several thematic scientific associations operating in agriculture related topic e.g. Hungarian Soil Science Society, Hungarian Hydrological

Society, Hungarian Precision Farming Association. These more or less formalized organizations have yearly conferences, journals and web platforms. All of them have an important role in providing knowledge exchange opportunities for the scientific community. There are a few agri-food related clusters in Hungary, two of them is quite active in research and innovation (Agro ICT Cluster and Bioeconomy Cluster).

6.2.7 Types of RIIs in Italy

6.2.7.1 Introduction

The Italian AKIS is characterized by a large number of entities and a high level of fragmentation. The main priorities of R&I policies and financial resources are largely determined at national level and involve different ministries. The Italian Regions oversee the promotion of applied research, innovation, and technology transfer programmes and projects.

Agricultural research in Italy is funded by European programmes, by the government and a minimal part is funded by the Regions. Higher and university education policy is determined and funded at national level, while agricultural training is under Regions' jurisdiction and is mainly carried out by private and farmer-based training organizations. Extension services are also under the Regions' jurisdiction. They are increasingly managed by private bodies and generally funded by EAFRD. In this regard, it should be noted that in the wake of the new agricultural innovation policies during the last two programming periods of the CAP the regional agricultural development agencies were relaunched (e.g. ASSAM, www.assam.marche.it). These organisations traditionally carried out research and extension services, through the delegation of functions to support the implementation of innovation policies concerned with the analysis of needs, innovation brokerage, the selection of project proposals, the administrative management and the use of demo farms. See Table 6.

Table 6 Description of national AKIS/RD and historical trajectory.

	Public → private	Centralised/ decentralised	Concentrated/ fragmented
Research	Public	Decentralized	Fragmented
Extension	Public → private	Decentralized	Fragmented
Education	Public (education), private (training)	Decentralized	Fragmented
Support systems	Private/Public	Decentralized at regional level	Concentrated for input- related services / fragmented for other services

R&I policies have been long characterised by fragmentation of strategies, with many initiatives at both national and regional levels, delays in the implementation of measures and instability regarding budget availability and allocations. The level of business R&I activities is quite low and characterized by territorial disparities. Significant typologies of public-private partnerships have emerged within the cooperation projects 2007-2013 and EIP-AGRI operational groups OGs).

6.2.7.2 Applied Research Institutes

AR in Italy is mainly performed by public institutes (such as CREA and CNR) and the universities, which are involved in applied research by participating in local/regional innovation projects funded by the Regions or by EARDF. However, several public-private organisations and private research centres are active within cooperation projects (2007-2013) and OGs. These are foundations (e.g., FIRAB – the Italian Foundation for Research in Organic and Biodynamic Agriculture: www.firab.it), university spin-offs (e.g., HORTA srl, www.horta-srl.it/sito), polyvalent analytical laboratories (e.g. ISVEA, www.isvea.it), Technological Parks and clusters (e.g., Puglia Food Technological District, www.darepuglia.it). They are in general connected or work synergistically with the main public research institutes.

CREA is the leading Italian applied research organization and it is directly involved in research, technology transfer and farm advisory service implementation. Some instruments and tools managed by CREA can be considered as R&I infrastructures by themselves (e.g., Agritranser, National Rural Network, FADN). CREA works in synergies with many other national and regional R&I organizations, due to its competences and intermediary role between different R&I organizations. CREA promotes and facilitates the exchange of knowledge among the AKIS' actors, co-produces and co-disseminates knowledge.

6.2.7.3 Experimental and/or research stations

Experimental and/or research stations in Italy are owned by both public research bodies (e.g. CREA, Universities) and private farmer-based organizations. Over 1.000 experimental farms across Italy are owned by CREA. This allows CREA to carry out research and to facilitate the implementation of results and dissemination to practitioners. At regional level, despite the cuts in public expenditure and the closure of many Regional Agencies for Agricultural development, a relevant number of regional experimental stations and demonstration farms are increasingly engaged in innovation processes financed by the EARDF, through playing functions related to dissemination and leadership. The Stuard farm (www.stuard.it) is a significant example in this typology, as it is able to foster different knowledge processes.

6.2.7.4 Innovation Hubs

Innovation Hubs are probably the most under-represented RII types in Italy. The most significant R&I hub in Italy is the Edmund Mach Foundation (www.fmach.it), which is also a unique example of an agri-food campus. Clusters and agri-food districts generally represent intermediate infrastructures with the task of fostering public/private research cooperation and building national/regional policies in areas of strategic interest. They can be considered as R&I 'boundary' infrastructures as, in many cases, their knowledge processes are limited to knowledge exchange and to a very high level. Very few clusters act as fully fledged incubators although some of them are very active in co-innovation projects at territorial level.

6.2.7.5 Dissemination infrastructures and Repositories

A number of private micro-enterprises provide information transfer and innovation brokerage at local/national level. Among them is Vinidea (www.vinidea.it) which developed a unique expertise by putting together a wide range of information about viticulture and oenology, as well as an international network of stakeholders all over the globe. As repositories, many experimental stations manage seeds and germplasm banks. Among them is the Institute of Biosciences and Bioresources (IBBR: <https://www.cnr.it/en/institute/041>) which manages the Mediterranean Germplasm Database, the reference database for the agro-food plant germplasm and the Perennial Plant Germplasm Repository (PPGR), the reference collection for the perennial plant germplasm collection.

6.2.7.6 (Other) R&I Networks and Clusters

A number of R&I partnerships emerged from cooperation projects (2007-2013) and EIP-AGRI OGs. In many cases, these partnerships developed into consolidated territorial networks, such as the Rete Semi Rurali (RSR) – Italian Farmers' Seeds Network (www.semirurali.net). It can be considered a best practice, as it is able to capitalise the competences that have been acquired within European projects at local level, by acting as innovation support service for a number of OGs.

6.2.8 Types of RIIs in the Netherlands

6.2.8.1 Introduction

Dutch agriculture is characterised as a highly innovative sector and technologically advanced, including start-ups and innovative SME's. Its AKIS is strong but fragmented⁹⁴ and operates at international level. According to

⁹⁴ PRO-AKIS study

the OECD (2015) the Dutch AKIS is a global forerunning system in production oriented technology and processes, aiming at input efficiency and sustainability⁹⁵. This strength is due to long term public-private investments in triple helix partnerships, meaning the collaboration between research, industry and governments (Etzkowitz & Leydesdorff, 2000). However, the Dutch AKIS is also facing the challenge of becoming a more and more complex system. It has to deal with dynamic roles of diverse and new actors and intertwined, cross-sectoral issues and dilemmas. Agricultural R&I in particular faces changes such as⁹⁶:

- more large-scale firms and intensification providing for more private R&I investments, but a larger gap with small and medium enterprises;
- cuts in public funding, resulting in the transition of knowledge as a public good to knowledge as a marketable product on a global scale.

On national level transdisciplinary, triple helix R&I in agriculture, is mostly stimulated by public private partnership (ppp) collaboration in projects, programmes, including cross-sectoral cooperation, coordinated by the top sectors Agri-Food, and Horticulture & Starting Materials. Top sectors are triple helix institutes which, among others, coordinate public-private partnerships in R&I for the 10 sectors which have been identified as economically leading in the Netherlands. On regional (provincial) level, Multi-Actor cooperation R&I in agriculture is stimulated by Operational Groups under EIP-AGRI, managed by the Provincial authorities. Furthermore, there are several generic and specific subsidy instruments promoting innovation, mostly targeted at SMEs. An influential actor in agricultural innovation on behalf of the agricultural sector is LTO Nederland, the farmers' organisation. Approximately 60% of all Dutch farmers are member of LTO which is financed through fees of its members.

6.2.8.2 Applied Research Institutes

Most applied academic research in agriculture in the Netherlands is performed by the Wageningen Research institutes (as part of Wageningen UR, www.wur.nl). There are 4 universities for applied sciences (also called 'higher vocational education' in Dutch) specialised in agriculture: Van Hall Larenstein (www.hvhl.nl), HAS Den Bosch (www.hashogeschool.nl), Aeres (www.aeres.nl) and Inholland (www.inholland.nl), Next to education, these schools also

⁹⁵ https://read.oecd-ilibrary.org/agriculture-and-food/innovation-agricultural-productivity-and-sustainability-in-the-netherlands_9789264238473-en#page1

⁹⁶ Presentation for the SWG AKIS, Strategic Working Group on Agricultural Knowledge and Innovation Systems: the Dutch AKIS (2018). M. Plantinga, Ministry of Agriculture, Nature and Food Quality & F. Geerling-Eiff, Wageningen Economic Research.

conduct applied research, in teams coordinated by lecturers. A variety of other organisations, including public, private and non-profit institutes, carries out research in agriculture and food production. For some, research is their main task, while for others, it supports their main task.

6.2.8.3 Research Infrastructures

The EU RICHFIELDS project (www.richfields.eu, 2015-2018) was indicated as a research infrastructure by ESFRI to contribute to a sustainable agri-food system from agricultural production to consumption⁹⁷. RICHFIELDS was one of the building blocks⁹⁸ towards a EU food, nutrition and health research infrastructure (FNH-RI), coordinated by WUR. The FNH-RI 'aims to develop a European platform for data, tools and services for research in food, nutrition and health in which the consumer acts as link between the agri-food and health sector. The platform will provide research data, tools and services on food production and sustainability, as well as consumer behaviour, nutrition and health. Unique is the integration of consumer data into the platform. The research infrastructure aims to be fully operational by 2024.⁹⁹ Furthermore, WUR is involved in ELIXIR (see also the Hungarian case).

6.2.8.4 Experimental or Research Stations

The privatisation of the former DLO institutes (agricultural applied research) and their merger with the agricultural university into Wageningen UR, led to the closure of many regional experimental stations and demonstration farms. Many experimental farms were closed or relocated and the ones which were left had to start working on a more commercial basis. They target practical research performance and demonstration which cannot be done on individual 'normal' farms that lack these research facilities. Next to the privatisation of these infrastructures, other commercial experimental stations developed, for instance with regard to cultivation in greenhouses (Hermans et al, 2011). Examples of commercial experimental or research stations in the Netherlands are: the R&I Demonstration Centres in Horticulture¹⁰⁰, knowledge transfer centres (KTCs Zegveld¹⁰¹ and De Marke¹⁰²) for demonstration on dairy

⁹⁷ <http://roadmap2018.esfri.eu/media/1054/rm2018-part2-hf-20.pdf>

⁹⁸ <https://www.wur.nl/en/Research-Results/Research-Institutes/Economic-Research/Research-topics-1/Consumer-Food/Research-infrastructure-for-health-and-nutrition.htm>

⁹⁹ <https://www.wur.nl/en/newsarticle/Building-a-research-infrastructure-for-food-nutrition-and-health-research-FNH-RI-in-Europe.htm>

¹⁰⁰ <https://www.wur.nl/en/newsarticle/IDCs-innovation-engine-for-horticulture.htm>

¹⁰¹ <http://www.ktczegveld.nl/>

¹⁰² <https://www.wur.nl/en/Research-Results/Research-Institutes/livestock-research/Innovation-centres-and-facilities/Knowledge-Transfer-Centre-De-Marke-2.htm>

farming R&I and the High Containment Unit (HCU)¹⁰³ on contagious animal diseases, the Swine Innovation Centre (VIC) in Sterksel¹⁰⁴, de Rusthoeve for arable farming (www.proefboerderij-rusthoeve.nl), Stichting Proefboerderijen Noordelijke Akkerbouw, for arable farming (www.spna.nl) and ZILT on possibilities for growing crops in salt or brackish water (www.ziltproefbedrijf.nl/zilt-proefbedrijf).

6.2.8.5 Innovation Hubs

Agro business park BTC Wageningen in the Netherlands has been set up to increase the chances of success for starting, innovative organizations. In short, organizations that want to be at the centre of new activities that benefit from a dynamic interplay (www.agro-btc.nl/). Wageningen Business and Science Park is specifically intended for companies in life sciences, food and health and it is situated in the area of Wageningen Campus (www.bspw.nl).

There are more incubator facilities focused on agri-food initiatives but Wageningen UR Campus houses StartLife is solely specialised in fostering entrepreneurship in Food and Agtech. StartLife supports entrepreneurs and their teams as they build their innovative business ideas into global enterprises with lasting impact. Their approach is to: 1) host a community of start-ups, investors, corporates and experts, 2) develop entrepreneurial competences of students and start-up teams, 3) offer mentoring trajectories within the StartLife Incubation Program, 3) provide pre-seed capital to promising start-ups and 4) providing access to follow-up capital (start-life.nl).

Dairy Campus (www.dairycampus.nl) carries out innovative projects and activities in order to generate new information and knowledge to drive innovation in the dairy chain where science and practice go hand in hand. Dairy Campus is part of Wageningen University & Research, but moreover is also linked with organisations as Van Hall Larenstein university of applied science, vocational education Nordwin College, national farmers organisation LTO Nederland, dairy coop FrieslandCampina, RUG Campus Fryslân, city of Leeuwarden and the province of Fryslân. Dairy Campus is part of the national agri-food cluster and connected also with other Dutch clusters like Food Valley Wageningen, Water Campus Leeuwarden and the Sino Dutch Dairy Development Centre in Beijing - China.

The Brightlands Campus Greenport Venlo (www.brightlands.com/brightlands-campus-greenport-venlo), which is developed to facilitate innovators from business, science and education to collaborate on innovations in healthy

¹⁰³ <https://www.wur.nl/en/Research-Results/Research-Institutes/Bioveterinary-Research/Facilities/High-Containment-Unit.htm>

¹⁰⁴ <https://www.wur.nl/en/Research-Results/Research-Institutes/livestock-research/Innovation-centres-and-facilities/Swine-Innovation-Centre-VIC-Sterksel.htm>

nutrition, plant breeding and growing, and alternative raw materials and food sources. The Campus is located in the region Venlo (Limburg, Netherlands). Primary focus is on healthy nutrition;

As an example of international interconnections, it is worthwhile mentioning that WUR coordinates the European Horizon 2020 SmartAgriHubs project which enables a broad digital transformation of the European farming and food sector. The project started end 2018. With a 20 million euro budget from the European Union, the project aims to build an extensive pan-European network of Digital Innovation Hubs (DIHs). The aim of SmartAgriHubs is to establish 140 Digital Innovation Hubs, 9 regional cluster and 28 flagship innovation experiments. The project is expected to influence the adoption of digital solutions by the farming sector, drastically. SmartAgriHubs should leverage, strengthen and connect local DIHs and 2.000 Competence Centres (CCs) throughout Europe. SmartAgriHubs put together a large network of 140 DIHs by building on existing EU projects and ecosystems such as Internet of Food and Farm (IoF2020), which was also coordinated by WUR. All DIHs are aligned with 9 regional clusters, which are led by organizations that are closely related to national or regional digitisation initiatives and funds across the EU. This multi-layer approach is supported in each MS by 28 Innovation experiments in which ideas, concepts and prototypes are further developed and introduced into the market. More than 2 million farms are expected to be involved through 4.000 experiments, bringing the process of digitisation closer to the specific needs of the farmers¹⁰⁵.

6.2.8.6 Dissemination infrastructures and Repositories

Many dissemination infrastructures and repositories exist. In this case, we describe the particular dissemination channels of WUR research. This is being supported by WUR library and in particular 'knowledge online' for applied research, assigned by the ministry of agriculture. WUR library includes search functions for (academic) publications for WUR staff and students, a web of science, pubmed, CAB abstracts, scifinder, LexisNexis, ABI Inform, ASFA, links to other recommended databases, special collections, image collections, course reserves, the WUR journal browser and a collection of websites for agri-food and other 'green' knowledge. Furthermore, WUR is connected to 'Green knowledge net' (GKN) an online library and repository platform which focuses on education as a primary target group but forms a useful infrastructure for other end-users in agriculture too. GKN contains 25 portals on diverse topics regarding animals/livestock, the environment, plants/crops food and agri-food and 'green' economy. Furthermore, 'green knowledge net' facilitates diverse teaching material among others, constructing knowledge

¹⁰⁵ <https://www.wur.nl/en/newsarticle/EU-accelerates-the-digital-transformation-of-the-European-agri-food-sector.htm>

dossiers to collect multiple information on a topic in a pedagogic structured manner. Wiki's are another example, which are being constructed by teachers and/or students to evolve information on a certain subject (groenkennisnet.nl).

6.2.8.7 (Other) R&I Networks and Clusters

Numerous other public, public-private and private R&I networks and clusters exist in the Netherlands, we describe the most remarkable example in this case description. The largest regional agri-food R&I cluster in the Netherlands can be found in the region Foodvalley, concentrated around Wageningen UR Campus. Since 2004, a cluster organisation entitled Food Valley NL is funded by the Dutch business community and government to promote the innovativeness of Dutch companies by fostering cooperative links between business, knowledge institutions and governments (Geerling-Eiff et al., 2014). Foodvalley includes many private agricultural companies with research centres. Education is organised in the informal Platform for Foodvalley Education, in which different types of schools and the university cooperate on simulating R&I and human capital. Within a 50-km radius, the Foodvalley cluster includes over 70 food enterprises and around 1.400 other companies associated with the food industry. With 15.000 scientists and engineers engaged in R&I activities, the valley is characterised by its high density of food scientists and researchers.

6.2.9 Types of RIIs in Poland

6.2.9.1 Introduction

The AKIS in Poland is composed of various actors from public organisations, private and non-governmental organisations, each of them playing different roles. The Ministry of Agriculture and Rural Development deals with information, while other parties are more engaged in education and research (i.e. universities, research institutes, NGOs). The farm advisory services form a specialist domain of the Provincial Advisory Centres (16), which also fulfil other knowledge functions within the AKIS. These centres are public, independent organisations without a central supervising body. Their government funding is decreasing gradually while farmers' fees are increasing. In addition, private advisory services are available to farmers.

The Polish Roadmap for Research Infrastructures was developed by the Ministry of Science and Higher Education in 2011 and updated in 2014. It targets various fields of science, lists investments areas and projects. In the field of agro-food, the Roadmap proposed the establishment of the (1) Centre for Research on Environment and Innovative Food Technologies for Quality of Life – National Research Centre at the Warmia and Mazury University in

Olsztyn, and (2) the European Centre for Bioinformatics and Genomics¹⁰⁶ – National Research Institute at the Institute of Biorganic Chemistry of the Polish Academy of Sciences in Poznan. Both R&I infrastructures are currently in a conceptual phase.

Financing R&I is one of the key challenges in Poland and various mechanisms have been developed to improve it. This includes legal changes in public procurement especially, the possibility of donating 1 % CIT to the best research units and shifting the responsibility for financing R&I from the ministries to the dedicated agencies. Particularly important are the National Centre for Research and Development and the National Centre for Science, which deal with financing, capacity building and facilitation of the international collaborations. Dedicated programmes and financial instruments were created such as Bridge AC¹⁰⁷, the Top 500 Innovators Programme¹⁰⁸ and the training of innovation brokers for which some attention has been specifically paid to agriculture and food innovations. However, in financial terms agricultural R&I remains rather marginal in the strategic orientations of broader R&I directions in Poland, where other fields of science and practice are preferred.

In the previous EU financial perspective (2006-2013) around 4,1 billion euro was granted for the research sector in Poland, while 1,3 billion euro was directed to the development of R&I infrastructures. With FP7, approximately 40 million euro was granted to 13 Polish institutions, which significantly contributed to strengthening their potential. A considerable proportion of this amount was designed for the purchase of world-class research equipment. Investment in research infrastructures was also supported by funds from the national budget for research. However, the scope of the direct R&I investments in agriculture is very low compared to other fields of science, especially exact sciences in which Poland is very competitive globally (i.e. mathematics, physics, informatics).¹⁰⁹

An important R&I instrument is BIOSTRATEG¹¹⁰: a strategic programme for agricultural research and innovation. Launched in 2013, BIOSTRATEG focuses on the three main areas of intervention: natural environment, agriculture and forestry. It is aligned with the Polish National Research Programme and targets several priorities through the dedicated funding instruments: (1) Food security and safety, (2) Rational management of natural resources, particularly water, (3) Mitigation and adaptation to climate change, particu-

¹⁰⁶ <https://www.put.poznan.pl/en/organizations/european-centre-bioinformatics-and-genomics>

¹⁰⁷ <http://alfa.ac>

¹⁰⁸ <http://top500innovators.org/program-top500>

¹⁰⁹ http://www.wz.uw.edu.pl/portaleFiles/6133-wydawnictwo/Polish_systems_of_innovations-Klincewicz,Marczewska_ebook.pdf

¹¹⁰ <https://www.ncbr.gov.pl/programy/programy-strategiczne/srodowisko-naturalne-rolnictwo-i-lesnictwo-biostrateg/>

larly in agriculture, (4) Protecting biodiversity and sustainable development of agricultural production area, and (5) Forestry and timber production. Within the programme calls for R&I projects are organized, which should fit into its strategic orientations. The overall budget committed to its implementation amount to approx. 87,5 million euro.

6.2.9.2 Applied Research Institutes

The agricultural R&I landscape in Poland comprises 12 research institutes under the supervision of the Minister of Agriculture and Rural Development, 7 of those with the status of a National Research Institute. At 9 universities 47 faculties are located and 9 scientific institutes are associated under the umbrella of the Polish Academy of Sciences. Some cross-cutting institutions are supervised by the Minister of Environment, Minister of Economy and Minister of Health. The main sources of R&I were previously managed by these respective ministers.

6.2.9.3 Experimental and/or research stations

An interesting example in this context is the Renewable Energy Research Infrastructure at the Białystok University of Technology¹¹¹. It was developed with the support of the European Regional Development Fund during the programming period 2007-2013. It offers a laboratory infrastructure for research into renewable energy, with a multidisciplinary approach. It supports the identification of methods for improving renewable energy efficiency, suitable for use in the wider economy, such as for instance high-performance agro-fuel. The infrastructure consists of 8 new laboratories, while 3 older laboratories were modernized with the dedicated project. In addition, an experimental biogas plant and oil pressing and refining machinery were created. Thanks to these, analysis of energy efficiency in various systems, the use of renewable energy, biogas and biofuel production became possible. Consequently, new solutions were developed to produce environmentally friendly technology and adapting this to the regional needs. The innovation potential of the host University was also boosted significantly. Businesses use the laboratory services and make use of the facilities. The facilities are located on the farms in the region, and apart from the R&I activities. Results of the research that was performed at these, helped to modernise agriculture.

6.2.9.4 (Other) R&I Networks and Clusters

Several thematic clusters have been set up in various regions of the country. For instance, in the Mazovia Region two agriculture relevant clusters were created, i.e, AgroBioCluster¹¹² and the Center for Development and Transfer

¹¹¹ https://ec.europa.eu/regional_policy/en/projects/poland/new-renewable-energy-research-infrastructure-at-biaystok-poland

¹¹² <http://agrobiocluster.pl/?lang=en>

of Technologies for Food Industry FOOD4GOOD¹¹³. They provided laboratory services, online B2B and B2C, research and facilitates on technology transfer in the Mazovia region. In addition, they offer advisory services on financing R&I for the interested entities and undertake efforts to scale up innovative products and services internationally, and participate in the relevant international networks.

6.2.10 RIIs in R&I systems in China

With the world's largest population and rapidly growing economy, China has become an important player in the agricultural R&I in recent years. It is expected that in 2019 China will become the world's leader in agricultural R&I spending. There is a visible growth in many areas in which R&I performance is measured, such as the number of patents and scientific publications. Yet, too few research results are turned into innovative and competitive products, and many Chinese enterprises depend on the foreign sources for core technologies.

The Agricultural Science and Technology Innovation Program (ASTIP)¹¹⁴ was launched in 2013 under the direct support of the Chinese central government. The core idea behind the ASTIP is to establish a new funding paradigm, dedicated to supporting four specific objectives over the next thirteen years: (1) Supporting Long-term and Interdisciplinary Research, (2) Capacity Building, (3) Expanding Research Support Facilities and Infrastructure and (4) Fostering International Cooperation.

The Chinese agricultural R&I system, has been undergoing intense transformations in the recent years. Currently, national level research centres account for 10% of the total research staff and 15% of the total budget. The structure is organized according to the territorial administration, with central, provincial and prefecture levels, responsible for the coordination tasks. Provincial research centres account for 41% of total research staff and 51% of total budget, while the prefecture level employs 32% of research staff and consumes 34% of the total budget. China also has the largest public agricultural extension system in the world.

Since 2017, China follows the strategy to establish the Modern Agricultural Industry Technology System. The main goals are to solve the problem of disconnection between research and production from the source, and to make research more focused on the needs of industry. The evaluation of scientific performance is no longer focused on paper outputs, but rather on the industry. Hence, applied research is highly encouraged.

¹¹³ <https://www.food4good.pl>

¹¹⁴ http://www.caas.cn/en/research/research_program/index.html

At the national level, an approach called the Modern Agricultural Industry Technology System was created, which involves the creation of agricultural innovation platforms bringing together various actors who are oriented on innovating within a certain agricultural specialisation. For instance, in the Yunnan Province, 8 agricultural networks of the Yunnan Modern Agricultural Industry Technology System were established at the end of 2009. Their focus include rice, corn, potato, oilseed, sugar case, sericulture, pigs and cows.

Fig. 49 represents the main actors involved in the sericulture innovation platform.

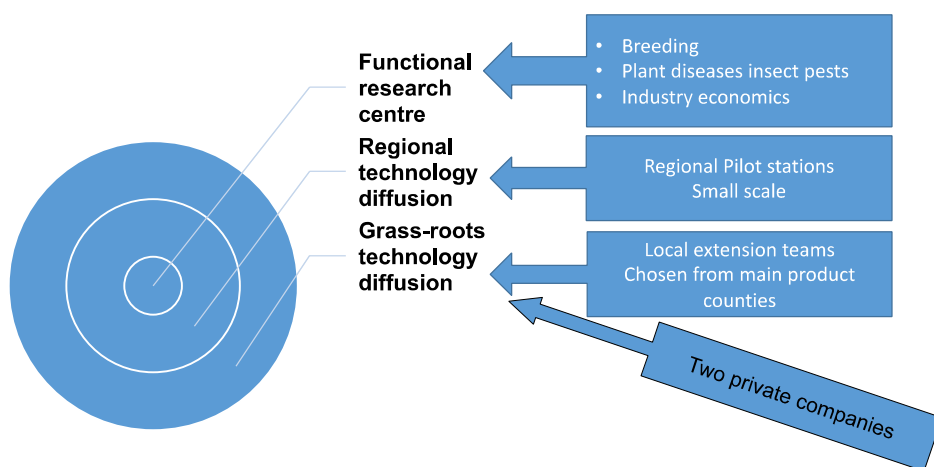


Fig. 49 Yunnan sericulture innovation platform (Hong, 2016) .

The Chinese Academy of Agricultural Sciences (CAAS) is responsible for several RIIs. As China is confronted with a huge diversity of natural and climate conditions, a dedicated network of field stations has been set up. The CAAS developed several experimental field and observation stations throughout the country, as well as introduced state-of-the-art equipment into its key laboratories. The second largest crop gene bank is also hosted within its premises. There are seven national reference laboratories at the CAAS, three of which belong to the World Organisation for Animal Health (Office International des Epizooties, OIE) network. Furthermore, the food quality and safety monitoring centres are under construction (CAAS Booklet, 2013)¹¹⁵.

Examples of dedicated RIIs at the CAAS include for instance Technological Innovation Facilities hosted by various CAAS institutes, i.e. 6 key state laboratories, 18 national centres (and sub-centres) for improvement of plant

¹¹⁵ https://www.sciencemag.org/site/products/CAAS_low.pdf

and animal varieties, 5 national engineering centres, 19 comprehensive key laboratories and 23 specialised key laboratories of the Ministry of Agriculture. Moreover, 13 ministry's laboratories are dealing with quality and safety risk assessment of agro-products.



Fig. 50 Distribution of the CAAS institutes (Chinese Agricultural Academy of Sciences).

Two national-level key Scientific Support Facilities were also created, which include 1 national long-term gene bank, 10 medium-term gene banks for storing crop germplasm, 5 national experimental field stations, and 24 experimental field stations. All of these are oriented on providing data and infrastructure support for the on-going research of the CAAS.

Over the years, CAAS invested in the development of the advanced biosafety laboratories, remote sensing application laboratories, bioreactors, modern plant factories, a microorganism culture and a collection centre, as well as environmental controlled chambers for animal nutrition. Further on-going developments concern the establishment of the national foot-and-mouth disease reference laboratory, specialized biosafety laboratory for research on animal disease prevention and control and a dioxin research laboratory.

China is also intensively investing in the development of international collaborations with the leading global agencies (e.g. FAO) and through bilateral relations and strategies (e.g. EU-China Partnership). Strong bilateral networks have been fostered particularly with Australia which resulted in the creation of several joint agricultural RIIs, i.e. (1) Australia-China Centre for Wheat Improvement (with Chinese Academy of Agricultural Sciences), (2) Australia-China Joint Centre for Postharvest Grain Biosecurity and Quality Research (with Academy State Administration of Grains), (3) Australia-China

Joint Centre for the Management and Eradication of Exotic Invasive Species (with Chinese Academy of Agricultural Sciences); (4) Joint Research Centre for Abiotic and Biotic Stress Management in Agriculture, Horticulture and Forestry (with Northwest Agriculture and Forestry University); (5) Australia-China Joint Research and Training Centre for Veterinary Epidemiology (with Huazhong Agricultural University, with support from the Chinese Ministry of Agriculture's Veterinary Bureau, the China Animal Health and Epidemiology Centre, and FAO Beijing office).

6.2.11 RIIs in R&I systems in India

Being one of the leading investors in agricultural R&I, India also has one of the largest AKIS in the world. A vast number of actors are involved in the system. The most prominent public players are the Indian Council for Agricultural Research (ICAR) and the State Agricultural Universities (SAUs). SAUs are agricultural universities located across India which were developed following the land-grant universities model of the USA. They are occupied with teaching, research and agricultural extension and have a territorial jurisdiction. In terms of RIIs, ICAR institutes are usually better equipped than the SAUs.

The ICAR is an autonomous organisation under the Department of Agricultural Research and Education (DARE) of the Ministry of Agriculture and Farmers Welfare, Government of India. With a headquarter in New Delhi, it has been operational since 1929. It serves as a body for coordinating, guiding and managing research and education in agriculture, including horticulture, fisheries and animal sciences in the entire country. It comprises 101 ICAR institutes and 71 agricultural universities, spread across the country (see

Fig. 51). It pioneered the Green Revolution and subsequent developments in Indian agriculture through its research and technology development. This enabled the country to significantly increase the production of food grains, horticultural crops, fish, milk and eggs, thus significantly impacting national food and nutritional security. It is engaged to promote higher education on agriculture and cutting edge areas of science and technology development.

In addition to ICAR and SAUs, private sector research, ICFRE, organizations such as CSIR, UGC, and BARC, IITs, IIMs, and agriculture-related faculties and departments at general universities, play important roles in agricultural R&I (Ramasamy, 2013). Private sector research is more active in the development of agribusiness. Among important investments, multi-national companies contributed to research on seed, agrochemicals and agricultural machinery. The consolidation chemical, seed and biotechnology companies is directly related with the increase of the private sector investment in agricultural R&D. The advances in biotechnology-strengthened IPRs, globa-

lization of markets, and new opportunities to collaborate with public sector institutions, are also important drivers in this process.



Fig. 51 Network of the ICAR Institutes (ICAR).¹¹⁶

Finally, India is also a location for a number of International Agricultural Research Centres (IARCs), such as the ICRISAT which advanced the knowledge base and application of innovative solutions in rain-fed farming. The CGIAR¹¹⁷ centres such as IRRI, IFPRI, CIMMYT and other international centres, are strongly connected with the Indian agricultural research system.

6.2.12 RIIs in R&I systems in Israel

The agricultural sector is of high importance in Israel, despite the natural conditions which are highly unfavourable for farming. More than half of the country is covered by desert and water resources are very scarce. Even though only 20% of the land is arable naturally, Israel is one of the major exporters of fresh produce and leaders of the high technology driven farming.

¹¹⁶ <https://icar.org.in>

¹¹⁷ <https://www.cgiar.org>

Apart from modern practices, religious traditions are playing an important role. In addition, two unique organisation systems, based on the cooperative principles, dominate the farming landscape: kibbutz and moshav, created by Jewish immigrants returning to Israel from all over the world. Overcoming natural barriers, Israel is gradually expanding its arable lands and pioneering efficient solutions in water management.

Israel is one of the world leaders in the investments devoted to its research and innovation. Israeli expertise has been especially revolving around the following main areas: (1) Agricultural biotechnology and crop protection; (2) Drip irrigation and water management; (3) Farm management; (4) Alternative protein; and (5) Food safety and traceability. Research and innovation advancements, making Israel an important global player, are particularly visible in precision agriculture, drip irrigation, seeds, breeding and plant genomics. A large number of greenhouses is also set up across the country, including the desert and many innovations are oriented around specialized plastic films, heating, ventilation and structure systems, enabling Israeli farmers to achieve superior results¹¹⁸.

An important element of the AgriFood-Tech Ecosystem is financing. 189M dollars were raised alone in 2017 to support start-ups, comparing to 102M dollars in 2016, which gives an increase of 85% within a year, a truly impressive figure. Much of the support is directed to the companies in the incubation stage. Alone, the companies operating in the area of smart farming raised 115M dollars over the last four years and 7% of global funding in 2016, which indicates a large demand on the market and strategic importance in the entrepreneurial landscape in agriculture. As of mid-2018, there were over 500 Agri-Tech and 250 AgriFood Israeli companies active on the market, that benefitted from participation in this R&I infrastructure. The Start-Up Nation Central, is another infrastructure through which this ecosystem is supported. It operates in the broader arena of building capacities of enterprises, while agriculture is one its core domains. This is a hub that collects relevant data and supports connections between the multiple actors and has a strong focus on attracting foreign investments in particular, since local investments are often insufficient.

The Agricultural Research Organisation (ARO)¹¹⁹ is located at the Volcani Center campus (Bet-Dagan, near Tel Aviv). It comprises 6 institutes responsible for the following thematic areas: Plant Sciences, Animal Science, Plant Protection, Soil, Water and Environmental Sciences, Agricultural Engineering, and Postharvest and Food Sciences. Four research stations are also operational in various parts of the country, and testing facilities provide for the agricultural production and equipment. A major infrastructure hosted

¹¹⁸ <https://www.startupnationcentral.org>

¹¹⁹ <https://www.agri.gov.il/en/home/default.aspx>

by the ARO is also Israel's Gene Bank for Agricultural Crops¹²⁰. The ARO has particular focus on arid zone agriculture and plays a key role in supporting Israel's globally leading position in R&I in this area.

Agriculture, and agricultural technology in particular, is seen as one of the leading fields for economic development of the country. Israel has thus created important research and innovation infrastructures concentrated around supporting entrepreneurship in this field: an AgriFood-Tech Ecosystem. This type of infrastructure is oriented on multiple functions serving creation of the entrepreneurial culture and consequently new companies in the field of agriculture and food technologies. It brings together various institutional players that provide know-how, financial incentives and research facilities. The ecosystem is built around 5 main types of players : (1) Academia (universities specialising in agriculture, biotech and IT); (2) Accelerators and incubators; (3) Venture capital funds; (4) Corporates; (5) Multinationals; and (6) Technology Transfer Offices.



Fig. 52 Israel's AgriFood-Tech Ecosystem (Start-Up Nation Central ¹²¹).

At the heart of this R&I infrastructure lies the creation of start-ups and technology companies operating in the fields of agriculture and food, whereby knowledge flow is enabled between the diverse actors. To date, several achievements were possible with these approaches, notably the creation of over 650 enterprises, 35% of which were founded in the last 5 years, and 50% in the last ten years. In the area of AgriTech, the efforts resulted in emergence of the new enterprises covering smart farming, crop protection, livestock, pharmaceutical crops, agribiotech, aquaculture, irrigation and water management, novel farming, machinery and robotics, post-harvest, waste-tech and market management. In the field of FoodTech, start-ups are mainly focused on e-commerce and restaurants, nutrition advice, ingredients, food

¹²⁰ <https://igb.agri.gov.il/web/?page=25&lang=en>

¹²¹ <https://www.startupnationcentral.org>

safety and traceability, kitchen apps and food as marketing, supply chain and logistics, alternative protein, packaging, production and processing.

6.2.13 Conclusions and recommendations

The development and transformation of RIIs for agriculture are currently subject to several domestic and transnational efforts. We showed just a few examples, which were facilitated by EU funding and/or national resources. A brief overview was provided for the 5 selected EU MSs: Greece, Hungary, Italy, Netherlands and Poland. Moreover, we presented a few examples of RIIs which are functioning in non-EU international countries and are leaders in the agricultural R&I investments globally: China, India and Israel.

It is visible that investments in R&I infrastructures are gaining momentum in each of the countries and that they are fostered with national and transnational coordination efforts. Several agendas emerged at EU level and arising platforms support a better collaboration between the R&I entities of the MSs.

We tried to capture the diversity of the R&I infrastructures with a dedicated typology, which was a challenging task since they are still very varied and fragmented across the countries which makes comparisons very difficult, lacking a standard approach.

Most participants in RIIs are engaged in a public research setting, which is however increasingly being complemented with the engagement of a variety of industrial and other actors. In the countries we studied in more detail, we observed a general tendency to decentralize the decision making and consult the needs of the research and industry communities for the types of infrastructure required. However, this does not necessarily translate into the scope of the public financing dedicated to developing RIIs in particular countries (e.g. Poland and Hungary). Also, several financial instruments emerged in this context (e.g. BIOSTRATEG in Poland). In the Netherlands and Italy, the system of R&I infrastructures is more advanced in terms of Multi-Actor involvement, demonstrating a strong involvement of other entities beyond the conventional research partners.

Increased interaction has been especially visible, among others in the agriculture and food clusters, which bring different types of partners in innovation processes together. For example, research stations and experimental farms are increasingly acquiring a more active role in agricultural development paths and carrying out more functions in dissemination and demonstration of results, thanks to their participation in co-innovation processes.

Some interesting examples could also be observed beyond Europe in this respect, where in general private industry plays a dominating role. For

instance, in India the technological progress has shifted emphasis to prioritise the types of investments towards the application for the industrial farming systems, to feed one of the world's biggest and growing populations. Similarly, in China R&I efforts have been more aligned with the needs of the industry and platforms bringing diverse R&I actors together. This was also created at regional level. In Israel, a complex AgriFood-Tech ecosystem was set up, which brings all interested actors to leverage their resources and capacities.

Another visible tendency in the R&I set up is a strong demand for interdisciplinary focus. Several new entities emerged which combine agriculture and / or food innovations with those relevant for other industries, such as for instance the energy sector. Important drivers for setting up new R&I infrastructures are often rooted in the overall progress in Information Technologies (IT). This is reflected in the set-up of new centres dealing with big data and making use of techniques which rely upon them, e.g. bioinformatics, genomics. DNA databanks and large catalogues of various data are structures and efforts undertaken to ensure their systematization and interoperability. The exchange and coordination is fostered at national (e.g. between different institutions in Hungary) and international levels (e.g. the ELIXIR network, the SmartAgriHub EU project).

Investments into both physical and non-physical infrastructures are needed on the long term, so as to keep the technologies up-to-date and retain institutional knowledge flows between the people engaged into the R&I infrastructures. Since many interesting developments in R&I infrastructures are being observed currently, we consider this as a field for further study and enhancement as relevant national and international agenda topics. As in most of the countries roadmaps have been developed, which outline the possible directions for R&I infrastructures, investments at present and / or in the coming years, are in many places still in a nascent phase. It would thus be recommended to monitor these efforts, share and promote relevant examples, both good and less good practices or issues encountered. Further effort is also needed at EU level, for which for instance H2020 funding could be supportive (e.g. through dedicated calls). Engagement with the non-EU countries could be useful to learn about their experiences and enhance formal collaborations. However, this could be also challenging due to the current geo-political settings, notably in the trade arena.

The study has revealed the opportunity, and the need, to define appropriate arrangements, to capture the experiences of RIIS, to facilitate benchmarking and transfer of good practices and, also, to analyse the types of knowledge flows for each type of RIIs and their effects. In this respect, the results of this initial study show that the renewal of European R&I policy and the management of innovation funds under the Common Agricultural Policy has undoubtedly contributed to the proliferation of a variety of infrastructures

devoted to facilitating knowledge flows and strengthening the functions of know-how co-creation, through their participation in partnerships for innovation (EIP-AGRI). We recommend to further analyse the impacts of European policy on the strengthening and consolidation of knowledge and innovation infrastructures, at different levels in their implementation.

6.3 Lessons learned on innovation evaluation and impact for AKIS

Text by Kevin Heanue, Simona Cristiano and Floor Geerling-Eiff based on presentations and discussions in the SWG SCAR AKIS meetings

6.3.1 Introduction

This chapter reflects on key aspects of evaluation and impact from an AKIS perspective with a particular focus on the process and outcomes of interactive innovation and/or Multi-Actor Approach (MAA) to innovation. The evaluation of such innovation processes has increased in importance in the programming period 2014-2020 because of the prominence that the innovation has achieved within the general policy agenda.

The remainder of the chapter is structured as follows. Section 2 is drawing on discussions at SWG SCAR AKIS 4th mandate meetings and the academic literature and outlines the analytical frameworks that have emerged as useful for guiding approaches to the monitoring and evaluation (M&E) of interactive innovation. Section 3 is also drawing on SWG SCAR AKIS 4th mandate meetings and the academic literature focuses on the challenges for M&E and impact assessment of interactive innovation projects and Multi-Actor Approach multi actor approaches to innovation. Section 4 examines the guidelines from the EC for evaluating innovation in Rural Development Programmes (RDPs), given the importance of RDPs in stimulating innovation in agriculture and rural areas. Section 5 uses insights from a policy brief developed following a joint SCAR SWG workshop and explores how Research and Innovation (R&I) can be programmed for improved impact. This leads to a focus on 'ex ante' evaluation in addition to 'ex post' evaluation. The final section contains a summary and recommendations drawing from the previous sections.



6.3.2 Frameworks and Pathways: Building M&E strategies for interactive innovation

6.3.2.1 Frameworks

Based on systems thinking, frameworks focusing on three main areas of analysis have emerged, which can be used to define appropriate and comprehensive strategies for monitoring and evaluating the Multi-Actor Approach 's to innovation processes (see Table 7 for an overview) (Cristiano and Proietti, 2018)

Table 7 Analytical frameworks for the AKIS. Cristiano & Proietti, 2018).

Functional - oriented analysis	Structural-oriented analysis		Transformative-oriented analysis
F1: Entrepreneurial activities F2: Knowledge development F3: Knowledge diffusion F4: Guidance of search F5: Market formation	Actors	Civil society	Micro-level failure analysis Interactions Institutions Infrastructures Capabilities Market
		Companies: start-ups, SMEs, large firms, multinational companies	
		Knowledge institutes: universities, technology institutes, research centres, schools, government	
		NGOs	
		Other parties: legal organisations, financial organisations/banks,	
	Knowledge intermediaries: consultants		
F6: Mobilization of resources F7: Creation of legitimacy	Institutions	Hard: rules, laws, regulations, instructions	
		Soft: customs, common habits, routines, established practices, traditions, ways of conduct, norms, expectations	

	Interactions	At level of networks	
		At level of individual contacts	
	Infrastructures	Physical: artifacts, instruments, machines, roads, buildings, networks, bridges, harbours	
		Knowledge: knowledge, expertise, know-how, strategic information	
		Financial: subsidies, financing programs, grants etc.	
Transformative-oriented analysis	Macro-level failure analysis Directionality Demand Articulation Policy Coordination Reflexivity		
Developmental-oriented analysis	Complexity as an interpretive framework Recognition of interconnections and dynamics between actors, the innovation system and other systems Focus on intended users of the innovation Learning framework Organizational change Adaptive capabilities Capacity Development at individual and system level Context-specific understandings that inform ongoing innovation Collective system analysis and reflection upon the relationships between activities and outcomes of the processes System capacity development pathways are implied within the research and innovation advancements Network building, social learning and negotiation processes to change		

The first analytical focus is the multiplicity of structures (actors, institutions, infrastructures) which are relevant for specific innovation processes and the effective interactions between them. Here, key issues are the extent to which relevant structures are included in Multi-Actor Approach processes, the

effectiveness of respective roles and actors' interaction with each other (Hall et al., 2006; Wieczorek and Hekkert, 2012). A structural analytical framework can be used for assessments which are instrumental to policy and AKIS strategic planning.

The second analytical focus is the functionality of the structures across different stages of innovation processes. Such functional-oriented analyses should be carried out during policy and AKIS implementation and should be oriented to assess the extent to which key functions (interaction, infrastructural, institutional, market, capabilities, directionality, policy coordination, demand articulation and reflexivity) are adequately realised by actors to achieve the goals of the specific innovation. In addition, inter-functional dynamics (virtuous and vicious cycles) and possible blocking/enabling mechanisms should be captured (Bergek et al., 2008; Hekkert et al., 2009).

Moreover, the integration of multi-level and network perspectives to functional-oriented frameworks helps identify key factors and dynamics which influence the scaling-up and scaling-out of innovations across systems over time. These include fast-changing factors at micro level; stabilising mechanisms at meso level and slow-changing factors at macro level (Lampri-nopolou et al., 2014; Hermans et al., 2013; Douthwaite et al., 2003; Klerkx et al. 2010; Wigboldus et al., 2016).

The third analytical focus is the effective development of adaptive, collaborative and innovative capacities which lead to long-term transformative change at individual, organizational, inter-organizational and system levels (Weber and Rohrer, 2012; Van Mierlo et al., 2010; Klerkx et al. 2010; TAP, 2016).

6.3.2.2 Pathways to Innovation

A central thread across the sections in this chapter is that there are three interconnected pathways that foster innovation. These are outlined in Fig. 53. Multi-Actor Approach may strengthen the process along and among these pathways. Although the stimulus to innovation identified in this figure, is implementation of Rural Development Programmes (RDP), the stimulus could clearly also be any other Research & Innovation programme or project.

The pathways are defined as:

- Pathway 1: the technology development and adoption (innovation) pathway: involving the capturing and development of new ideas (i.e. new views, approaches, products, practices, services, production processes/technology, new ways of organising or new forms of cooperation and learning);
- Pathway 2: the capacity development pathway: concerning the capacity of individuals and of the knowledge and innovation system

itself to experiment, self-organise and make use of new ideas and approaches;

- Pathway 3: the policy influence pathway: requiring the enabling of the institutional and policy environment for emerging innovative processes.

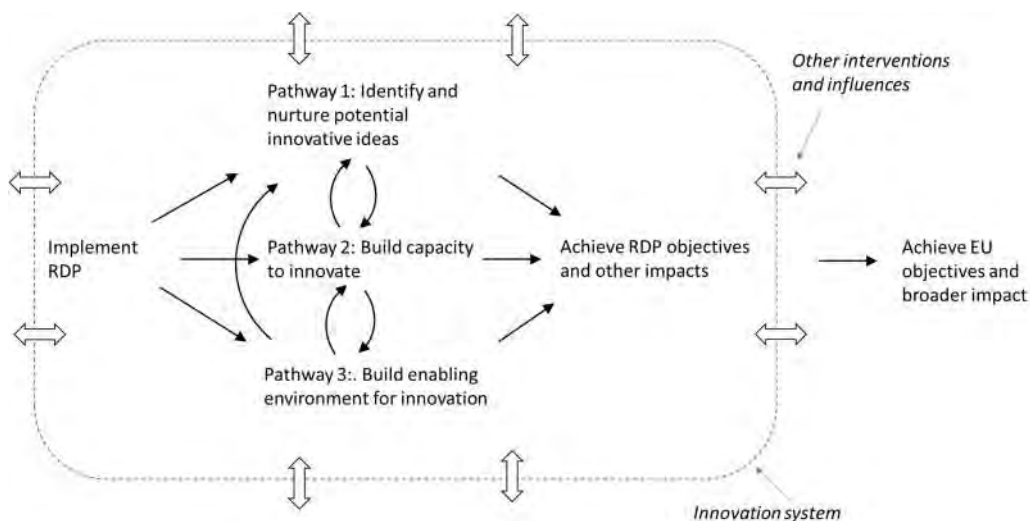


Fig. 53 Simplified picture of pathways that foster innovation (European Evaluation Helpdesk for Rural Development, 2017).

The pathways are not isolated but overlap and are mutually interlinked entry points to innovation. The self-reinforcing feedback loops are dependent on Pathway 2 - the capacity development pathway. For example, the process of innovation in Pathway 1 builds system capacity to innovate in Pathway 2 that directly feeds back to speed up the rate and quality of innovation. Innovation-friendly and stimulating policies in Pathway 3 lead to faster rates of innovation that lead to greater capacity to innovate.

6.3.3 Monitoring Interactive Innovation Policies and Benchmarking for Sustainability

The novelty and complexity of the interactive model of innovation requires a new and comprehensive analytical framework to monitor, assess and benchmark the performances of Multi-Actor processes, along with their results and long-term impacts. Five issues in particular need to be considered.

6.3.3.1 Monitoring and evaluation strategies should be applied on on-going basis

Monitoring and evaluation (M&E) can be instrumental in supporting strategic planning, continuous learning for systemic change and adjustment and to

provide lessons learned and good practices, which could favour scaling-up and scaling-out the innovation processes across agriculture. Therefore, M&E strategies should be set-up very early and applied *ex-ante*, *in itinere* and the *ex-post* stages of policy and innovation implementation. Table 8 outlines possible topics around which early, *in itinere* and *ex post* assessments might be conducted.

In principle, at a very early stage of the policy design and implementation (**ex-ante**), a pre-assessment should provide a broader diagnosis of the AKIS via a SWOT analysis. This pre-assessment should help improve policy design to foster an enabling environment for innovation by evaluating the consistency of the context and SWOT analyses, the coherence of the intervention logic and the possibility of addressing the specific needs and opportunities for development¹²².

In itinere M&E exercises should focus on policy implementation and AKIS functioning by concentrating on systematic learning loops for change and governance issues, the procedures and interventions of innovation policy along with supporting the development of individual, organizational and systemic capacities within the AKIS. *In itinere* assessments should focus on supportiveness, efficiency and effectiveness of policy delivery arrangements, performance, policy delivery, the relevance of innovations to farms and AKIS functioning.

In principle, at a very early stage of the policy design and implementation (*ex-ante*), a pre-assessment should provide a broader diagnosis of the AKIS via a SWOT analysis. **This pre-assessment should help improve policy design to foster an enabling environment for innovation.**

Finally, **ex-post** evaluation should focus on the long-term effects of policy and interactive innovation processes, explore effective changes in actors' capacities and skills, in farms' competitiveness/productivity/sustainability, in setting stable connections between research and practice; in balancing private and public funds in R&I and in system thinking within the AKIS. Lessons learned, benchmarks and good practices could be drawn from *ex-post* assessments to help scale-up and scale-out processes at policy, AKIS and farm levels.



¹²² (EC(2018)392 final)

Table 8 Topics for policy and AKIS assessments (elaborated by Cristiano).

Stages	Topics	Sub-topics
Pre-assessment	Enabling Environment for Agricultural Innovation	<ul style="list-style-type: none"> • Arrangements to ensure inclusiveness of all the relevant actors (selection criteria, incentives, ...) • Arrangements to ensure the quality of the projects/policy implementation (selection criteria of the projects, skills and capabilities to select projects) • Policy design and delivery systems (policy-mix for innovation, integration with other relevant policies, administrative burden; budgetary endowments, payment system) • Guidance to potential beneficiaries, information on opportunities, consistency with the context and SWOT analysis and with the needs' assessment ... • M&E arrangements for the AKIS (adequate analytical frameworks, set of specific indicators, adequateness of the evaluators, evaluation plan, ...)
	State of play of the AKIS	<ul style="list-style-type: none"> • AKIS structures (actors, infrastructures including facilities, interactions) • AKIS governance (coordination bodies, system approach, multi-level dialogue, ...) • SWOT of the AKIS • Skills and capabilities of AKIS' actors • Availability of advisory capacity • Potential of the education • Disconnections/connections in the knowledge and innovation flows • Common vision on the AKIS • Drivers and the barriers affecting the linkages between research and practice
In itinere	Policy/Project implementation	<ul style="list-style-type: none"> • Efficiency and effectiveness of policy delivery system • Policy failures (including directionality, policy coordination, market, ...) • Synergies and complementarities between funds and EIP-AGRI tools

	AKIS Functioning	<ul style="list-style-type: none"> • AKIS functioning • Effective integration of advisory services within the AKIS • AKIS failures (micro and macro level), including directionality, reflexivity, policy coordination, demand articulation, market)
Ex post	Policy/Project effects	<ul style="list-style-type: none"> • Achievement of long-term expected contribution to a more innovative and sustainable agriculture • State of modernization/digitisation • Effectiveness of innovations at farm level
	AKIS development	<ul style="list-style-type: none"> • Capacity development • Integration • Responsiveness • Lessons learned • Good practices/failures • Benchmarks

6.3.3.2 Participatory approaches help reveal and enhance the Multi-Actor Approach at work

The way of tackling M&E of Multi-Actor innovations should be context-sensitive and tailored to the needs of policy-makers and innovation actors so as to reflect the context-dependency, multi-dimensionality and multi-level perspectives (policy makers, AKIS, innovation partners and individuals) of actors engaged in innovation processes. In addition, the novelty of the Multi-Actor Approach and the different degree of collaborative behaviours of AKIS actors call for M&E strategies to accompany the creation of common interpretative frameworks from the very early stage of policy/project implementation, to help recognise situational complexity and work through differences in perceptions, knowledge, values and expectations.

In addition, constructivist and theory-based evaluative approaches such as participatory, reflexive and developmental evaluation seem very appropriate to monitor and assess Multi-Actor innovation processes since they are utilization-focused and can be used instrumentally 'to extract useful learning from the evaluation process itself' (Torres & Preskill, 2001; Patton, 2008). These approaches are user-centred and require the engagement of all innovation actors in an exploratory process of 'innovation-reflection-evolution-innovation' towards transformational changes to support a common understanding of the processes, alongside with collective learning, on-going adaption and changes of actors' behaviours and capabilities (Patton, 2008; Gamble, 2008).

Recently, some participatory evaluations have been integrated instrumentally to innovation processes to inform both their functioning and effects: from deploying the technology adoption pathways to assessing the quality, the effectiveness and the benefits of the co-innovation process itself at different levels. These provide evidence that, in line with the Multi-Actor principles, the evaluations supported iterative processes of farmers' demand-driven developments and co-ownership over the project implementation and how impacts at farm level were achieved due to the implementation of newly knowledge (Patton and Horton; 2009; Botha et. al, 2017; Douthwaite, 2016; 2017; Klerkx et al., 2010; Horton and Mackay, 2003; Cristiano and Proietti, 2018).

Ultimately, participatory M&E approaches can be usefully integrated to capacity development frameworks to help developing "the overall capacity of the agricultural innovation system, with its various actors, incentives, norms, and processes, and to build more effective and dynamic relationships among various actors and to 'facilitate' resourcefulness" (TAP, 2016).

For example, the Common framework on Capacity Development (CD for AIS), developed by FAO and CDAIS, is based on a 5-step cycle to improve interactions, coordination, joint learning, adaptation and responsiveness of system actors and the system as a whole. This cycle should strengthen functional capacities alongside technical skills at individual, organizational and system levels towards more system adaptiveness and responsiveness to realise the potential of innovation (TAP, 2016). Here, M&E processes are inherent to CD framework implementation, to track progress, collect empirical evidence, encourage and facilitate collective knowledge building and adaptive learning which allow continuous context-sensitive adaptation of the framework.

6.3.3.3 A mix of methods is useful for addressing different timing and targets of M&E processes

A mix of methods and tools can be put in place according to the different analytical frameworks, stages of policy implementation and innovations and the multi-dimensionality of the Multi-Actor Approach. These facilitate the collection of quantitative, descriptive and qualitative information on innovation processes and outputs: expenditure analysis, surveys, network analysis, clustering, learning histories, reflexive monitoring, benchmarking, learning and networking dynamics analyses, interviews, case studies, contribution analysis.

In general, in line with participatory approaches, methods based on social learning, negotiation processes to change and network building schemes are very effective. For example, methods and tools based on the actor-network theory, (e.g. net-maps, social network analysis, actor network analysis) have

been convincingly applied during the ex-ante and on-going monitoring and assessments, to support collective strategic planning, project designs and innovation processes. In fact, they help actors visualizing, observing and assessing the evolution of the AKIS actors positioning, their influential roles and expectations, the types of linkages on which networks rely and the connections with the environment (Schiffer, E., 2007; Klerkx et al., 2010; Hermans et al., 2013). Particularly, case studies carried out by the IMPRESA project and based on the actor network theory showed that through an iterative process of 'problematization', engagement, enrolment and mobilization of actors, this method allows analysing the contributions, the interests and the interactions of actors during the innovation processes (Quiédeville et al., 2018).

In Reflexive Monitoring in Action (RMA) the monitor acts as a facilitator and knowledge manager to support collective system analysis upon the relationships between activities and results of the innovation processes, the institutional setting and the ambition to change in both short-term, long-term actions and future perspectives (van Mierlo et al., 2010; Arkesteijn et al. 2015).

During the AgriSpin project, learning histories and timeline methods were applied during cross-visits to distil lessons learned, based on success factors and barriers of the innovation processes (Ndah et al., 2016; Wielinga et al., 2017). Case studies can be used for different evaluation purposes to deepen investigations through collecting quantitative, descriptive and qualitative information which can feed both cumulative, comparative and ad hoc analyses on policy, AKIS and innovation implementation, determinants/barriers and effects.

A specific innovation capacity scoring tool based on the CD-AIS approach has been applied by FAO to systematically assess capacity development needs and progress over the time and due to collaborative innovation processes. This tool implies a set of meaningful indicators related to different domains of individual capacities (to navigate complexity, to collaborate, to reflect and learn, to engage in strategic and political processes) along with technical skills and the enabling environment (Grovermann, 2017).

The usefulness of contribution analysis was demonstrated in the ImpresS and IMPRESA projects, to allow attributing a certain observed change to the specific innovations and describing the impact pathway, through disentangling the innovation's dynamics and the multiple causalities that interacted with each other (Faure et al., 2018). This method involves desk research as well as field work (surveys, interviews, focus groups) to collect different types of information and at different levels of innovation implementation.

6.3.3.4 The need for system-oriented indicators

The identification of a set of relevant indicators is crucial to supporting M&E of the Multi-Actor Approach to innovation processes and their effects at farms level, along with scaling processes in rural areas. In addition, the indicators could be used to establish analytical tools to support decision making, through comparisons, rankings and benchmarking, at policy, partnerships and farm levels.

This implies that data for the indicators need to be collected at the different levels of implementation of the Multi-Actor Approach (see Table 9) and relevant indicators should be identified in conjunction with end-users at the very early stage of the innovation policy and process implementation.

Table 9 System-oriented indicators (Cristiano's elaboration based on Spielman and Birner (2008) and on SCAR SWG AKIS discussions).

M&E Topics	System-oriented indicators	Sources/ Methods
Enhancing knowledge flows within the AKIS and strengthen links between research and practice	Share and quality of research that are based on collaborations among innovation system actors	Government, survey, expert, or other sources
	Share of research and education expenditures that involve multiple stakeholders in (a) priority setting and strategic planning or (b) decision making and resource allocation	Government, survey, expert, or other sources
	Frequency of priority setting, strategic planning, and reform exercises in research and education institutions	Government, survey, expert, or other sources
	Extent of individual or organizational membership in regional and international research and education networks	International or government sources
	Quality of information and communications technology available to the research and education system	International or government sources
Strengthening farm advisory services within MS' AKISs	Share and quality of extension services that are based on collaborations among innovation system actors	Government, survey, expert, or other sources
	Share of extension expenditures that involve multiple stakeholders in (a) priority setting and strategic planning or (b) decision making and resource	Government, survey, expert, or other sources

	allocation	
	Frequency of priority setting, strategic planning, and reform exercises in extension services	Government, survey, expert, or other sources
	Number of different consultation methods used by extension services	Government, survey, expert, or other sources
	Frequency of training and skills upgrading for extension agents	Government, survey, expert, or other sources
	Quality of extension services with respect to enhancing agricultural production, managing natural resources, and facilitating market linkages for farmers	Government, survey, expert, or other sources
Enabling Environment for Agricultural Innovation	Quality of policies on agricultural research, education, and extension/advisory services	Expert and other sources
	Quality of legislation and enforcement of intellectual property rights	International, expert, and other sources
	Quality of legislation and enforcement of biosafety and food safety regulations	Expert and other sources
	Quality of government effectiveness and quality of agricultural regulation	International, expert, and other sources
	Quality of investment climate or competitiveness of agricultural sector	International, expert, and other sources
	Level of entrepreneurial activity or behaviour in the rural economy	Expert and other sources
	Level of openness to indigenous or foreign knowledge sources	Expert and other sources
	Quality of rural innovation system and local innovation networks and partnerships	Expert and other sources

Beyond the purpose of defining indicators to measure the extent to which some milestones and targets along the knowledge transfer and innovation

process are achieved, a set of system-oriented indicators has been defined in the literature, which are considered as key for tracking and assessing system performance, such as the demand-orientation, learning processes, interactions and relationships (Spielman & Birner et al., 2008; Rivera et al., 2005).

For measuring the performances of innovations at farm level in terms of needs addressed, the lack of qualitative and descriptive micro-data at farm level is an issue. However, the FADN has potential and despite the lack of specific information on the quality of the co-innovation processes and on capacity development, some indicators, specifically related to the investments in assets (modernization, cooperation for innovation, etc.) can be used as proxies for analysing the adoption of innovations (Van der Meulen et al., 2016; Van Galen and Poppe, 2013). On this topic, Cristiano and Proietti (2019) highlight that since the set of FADN indicators provides a good coverage of the CAP topics, the actual set of socio-economic and environmental indicators of the FADN can be used to monitor and assess the performances of the innovations on farms by correlating the innovation's effects with the most significant indicators that are assumed to vary, due to the innovation (e.g. increase of yield productivity, reduction of intermediate consumption). Of course, the indicators should be meaningful for the policy maker and farmer end-users and, therefore, should be identified in cooperation with them.

6.3.3.5 New expertise, skills and capabilities for evaluators

Evaluating Multi-Actor innovation is a new field and needs a transdisciplinary approach which implies expertise on both the process-related evaluative approaches and methods (e.g. participatory, reflexive, developmental) and the specific domain of the interactive model as applied to innovation through the Multi-Actor Approach. This is challenging because, process-related approaches are used less across CAP evaluations where, over the different programming periods, the focus has been more on how to assess outcomes which are mostly measurable and predictable as derived from linear intervention logics.

Moreover, running participatory approaches implies acquiring a set of skills and capabilities which are fundamental to ensure sounding evaluation processes: contextual knowledge, programme/project commitment, facilitation, networking for building relationships and trustiness among the innovation actors and capacity building to support their empowerment processes.

6.3.4 Evaluating innovations in RDPs

To emphasise the importance of evaluating innovation in agriculture which is supported by EU rural development policy, this paragraph contains a summary of the document GUIDELINES: EVALUATION OF INNOVATION IN RURAL DEVELOPMENT PROGRAMMES 2014-2020. The full report can be found on the website of the European Network for Rural Development (ENRD)¹²³ which was published by the Evaluation Helpdesk¹²⁴, responsible for ENRD's evaluation function. The helpdesk provides guidance on the evaluation of RDPs and policies falling under the remit and guidance of DG AGRI's Unit C.4 'Monitoring and evaluation' of the European Commission (EC).

Innovation is one of the three cross-cutting rural policy objectives and can be addressed with the interventions implemented under the measures and focus areas (FA's) in the rural development programmes (RDPs) 2014-2020¹²⁵. There are various reasons why innovation should be evaluated: (1) to provide accountability of rural development interventions, (2) to better target the

Innovation is one of the three cross-cutting rural policy objectives and can be addressed with the interventions implemented under the measures and focus areas (FA's) in the rural development programmes (RDPs). The RDP interacts with the broader innovation system by producing two types of outcomes: enabling outcomes and innovation outcomes.

EAFRD support to innovation and (3) to enhance common learning between stakeholders. The evaluation of innovation has gained in importance in the programming period 2014-2020. Capturing these effects brings several methodological challenges for evaluation. The target groups for these guidelines are: managing authorities, evaluation experts and other

parties such as the European Commission (EC) officials, European Innovation Partnership (EIP) operational groups (OGs), members of local action groups (LAGs) and national rural networks (EIP or rural networks).

The RDP interacts with the broader innovation system by producing two types of outcomes: enabling outcomes related to the three pathways in Fig. 53 and innovation outcomes resulting from the enabling outcomes. Both types of outcomes contribute to the RDP's objectives and can be assessed through the appropriate indicators.

¹²³ https://enrd.ec.europa.eu/evaluation/publications/evaluation-innovation-rural-development-programmes-2014-2020_en

¹²⁴ The Evaluation Helpdesk's 4th Thematic Working Group "Evaluation of innovation in RDPs 2014- 2020" developed non-binding guidelines for answering the innovation related common evaluation questions.

¹²⁵ 2 Art. 8(1)(c)(v) of Regulation (EU) No 1305/2013 and Annex I, Part I.5(c) of Regulation (EU) no 808/2014.

The evaluation plan (EP) included in the RDP, is the starting point for evaluations. The EP specifies the assessment of innovation among those evaluation topics and activities linked to cross-cutting issues. The reporting of these related activities and findings are included in the annual implementation reports. The Common Monitoring and Evaluation System (CMES) contain the evaluation elements for assessing innovation, namely the common evaluation questions (CEQs), judgment criteria and indicators. There are several challenges, which should be taken into consideration when evaluating innovation in RDPs:

- conceptual challenges: clear identification of the evaluation subject, mapping the knowledge and innovation system and reviewing the approach of the RDP towards innovation;
- challenges linked to the Common Monitoring and Evaluation System: developing additional and programme-specific evaluation elements and reporting results;
- methodological challenges: attributing the innovation processes to RDP interventions, attribution of effects of innovation to RDP results and impact and designing adequate evaluation approaches;
- organisational challenges: ensuring effective and efficient data management, coordinating involved stakeholders and using evaluation findings for improving the policy design and implementation.

The evaluation of innovation and the answering of the innovation-related evaluation questions are part of the RDP evaluation. The legal framework requires the answering of all relevant innovation-related evaluation questions. The reporting of evaluation findings to the European Commission is the responsibility of the managing authorities. Other reporting formats, besides those designed for the EU level, could be used by the managing authority to inform innovation actors, rural development stakeholders and the wider public on the RDP evaluation findings.

The following non-binding working steps are proposed:

- screening the innovation potential of RDP measures/sub-measures (recommended);
- complementing the common evaluation elements for innovation (recommended);
- answering the relevant common evaluation questions (CEQs, mandatory).

At focus area level, there are two innovation-related CEQs linked to the objectives of FA 1A (fostering innovation, cooperation and the development of the knowledge base in rural areas) and FA 1B (strengthening the links between agriculture, food production and forestry and research and

innovation including for the purpose of improved environmental management and performance).

These questions capture the contributions of interventions in terms of expected outputs and results:

- CEQ no 1: "To what extent have RDP interventions supported innovation, cooperation and the development of the knowledge base in rural areas?";
- CEQ no 2: "To what extent have RDP interventions supported the strengthening of links between agriculture, food production and forestry and research and innovation, including for the purpose of improved environmental management and performance?".

Related to other aspects of the RDP, notably to capture the expected outputs and results achieved by national rural networks, the following CEQ is relevant for innovation as it concerns objective (d) of Art. 54(2) to "foster innovation in agriculture, food production, forestry and rural areas":

- CEQ no. 21: "To what extent has the national rural network contributed to achieving the objectives laid down in Art. 54(2) of Regulation (EU) No 1305/2013?";

At the level of EU objectives, there are two innovation-related CEQs to capture the contribution of programmes in terms of expected impacts:

- CEQ no. 23, related to the achievement of the EU headline target: "To what extent has the RDP contributed to achieving the EU 2020 headline target of investing 3% of EU's GDP in research and development and innovation?";
- CEQ no. 30 assesses innovation as a cross-cutting objective: "To what extent has the RDP contributed to fostering innovation?"

6.3.5 Programming research and innovation (R&I) for improved impact

This section is based on the Policy Brief Programming Research and Innovation for Improved Impact¹²⁶, written by representatives of the three SCAR Strategic Working Groups AKIS, ARCH and FOOD SYSTEMS with support from the Common Agricultural and wider bioeconomy reSearch Agenda (CASA) project (H2020 Programme under Grant Agreement no. 727486).

¹²⁶ <https://scar-europe.org/index.php/programming-research-and-innovation-for-improved-impact>

It is clear that agricultural R&I systems are increasingly open, complex and changing rapidly. In recent years, the R&I community has been asked to focus on, measure, document and demonstrate ex post impacts of their activities be they economic, societal or environmental in addition to traditional scientific

Research and innovation needs to be developed with impact in mind and a **greater focus should be given to impact during proposal development, planning and the early stages of research.** Key to addressing this challenge is improving understanding of the pathways to impact.

impact. Although there are funding programmes that list the impacts required up-front, it is necessary to do more to increase the general focus on impact during proposal development and in the planning and early stages of R&I activities. There is a clear rationale for this, but relatively little attention has been paid to the likely effects of initiatives *before* activities actually start - how to foster impact and to the generation within the R&I community of a culture of impact (Hainzelin et al., 2017). Similarly, there is little understanding of how policy can support ex ante approaches.

Therefore, research and innovation needs to be developed with impact in mind and a greater focus should be given to impact during proposal development, planning and the early stages of research. There is a need to promote and support a culture at policy, institution and individual researcher level that enables and encourages greater attention to understanding, planning and assessing impact ex ante, in addition to the usual ex post assessment. Key to addressing this challenge is improving understanding of the pathways to impact, including the feedback loops between pathways that can generate both intended and unintended positive and negative impacts, often in complex non-linear systems (see Fig. 54). This means a co-designed approach to research programmes, projects and the identification of impact pathways is necessary, although the approach will likely differ depending on whether the research is basic or more applied. In terms of innovation, the need to support the type of interactive processes that underpin innovation means that a co-designed, Multi-Actor Approach¹²⁷ is also required (EU SCAR, 2012).

6.3.5.1 Why ex ante evaluation?

By definition, ex ante evaluation, which focuses on how R&I programmes might generate impact, is conducted before implementation, whereas ex post evaluation, which analyses the actual impact of a programme, is carried out after implementation. Increasing the focus on ex ante evaluation will require a

¹²⁷ See the requirements for "Multi-Actor Approach" in H2020 Work Programme 2018 page 8-9: http://ec.europa.eu/research/participants/data/ref/h2020/wp/2018-2020/main/h2020-wp1820-food_en.pdf

cultural shift, as it demands moving the framework from a purely linear approach to a multidimensional model of the R&I pathways. A better understanding of the interactions between the various elements and actors and how this can be used to generate changes in practices and behaviour will be key to programming research that will ultimately lead to better impact. Such an approach to ex ante programming, where researchers and other actors through a six stage process, construct in a participatory and strategic manner, a shared vision and identify plausible impact pathways through which research teams and their partners expect to contribute to impacts, is outlined by Blundo Canto et al. (2018), as shown in Fig. 54.

Fostering and documenting impact, both in the short and the long term, will increase impact to R&I programmes and, in addition, provide useful insights for R&I policy makers, helping them to better shape future R&I policies. Furthermore, there is an increasing demand from public and private funders, as well as from society, to measure, document and demonstrate the impact of research, requiring research institutions to improve the uptake of research outputs and the transfer of knowledge, as well as fostering innovation. From both a R&I perspective, a co-designed and co-delivered Multi-Actor Approach is most likely to deliver on these demands. An interdisciplinary approach will help underpin this through, for example, the role of social scientists in facilitating the integration of R&I outcomes in society and the evaluation of cultural impact.

A better understanding of the interactions between the various elements and actors and how this can be used to generate changes in practices and behaviour will be key to programming research that will ultimately lead to better impact.



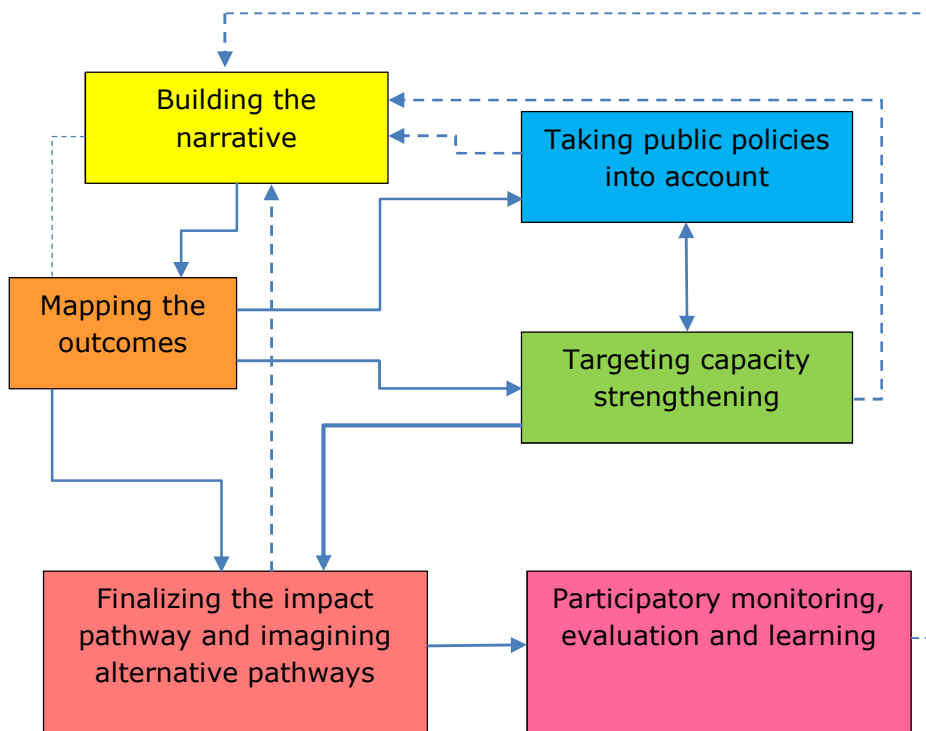


Fig. 54 CIRAD flowchart for ex ante programming (Blundo Canto et al., 2018).

6.3.5.2 Fostering impact

Better understanding of the different impact pathways (see section 2) will enable research managers and funders to influence or even take advantage of the interactions and feedback loops between the different pathways. Furthermore, to foster impact, research and innovation, actors from both the public and private sectors need to be brought into a Multi-Actor dialogue following an approach such as that outlined in Fig. 54. The Multi-Actor Approach will vary depending on the type of research being undertaken i.e. from basic to applied, as it is clear that not all research needs to integrate stakeholders to the same extent. This will require a change in the culture of research organisations as researchers can no longer define their research goals in isolation, but have to interact with other stakeholders to define the real needs of end-users of research results. Researchers must encompass “knowledge exchange activities” and consider potential applications for end-users of project results. An environment for supporting impact generation should be strengthened by including actors from knowledge transfer organisations as well as innovation support services and innovation brokering. Following recommendations from the SWG AKIS in its 2nd mandate, European Horizon 2020 work programmes started in 2014 to gradually introduce the

Multi-Actor Approach and since have improved the definition, and refined the requirements for, the MAA.

Impact must be taken into account by researchers when designing projects so that, while producing knowledge, they are able to work with others on co-designing and co-delivery of outputs and outcomes. To make all this happen, incentives to encourage researchers' engagement in interactive research and innovation processes, should be improved¹²⁸. Success in using and achieving impact indicators by researchers should be used in a novel way to provide incentives. It is also necessary to build or strengthen relevant capacities at all stakeholder levels as new competencies are required. This could be supported by fostering closer collaboration with knowledge transfer organisations as well as innovation support services and innovation brokering to create an environment for supporting impact generation.

6.3.6 Summary and recommendations

Section 2 of this chapter outlined the structural and functional aspects of innovation systems and the adaptive, collaborative and innovative capacities that form the building blocks of the analytical framework to be used to build M&E strategies for interactive and Multi-Actor Approaches to innovation. It also highlighted the three interlinked pathways to impact for such approaches to innovation that any M&E system needs to take into account. Section 3 confirms that M&E strategies should be applied on an on-going basis; that participatory research approaches which reveal and enhance the process of the Multi-Actor Approach should be used; that mixed methods are useful for addressing different timing and targets of M&E processes; the need for system-oriented indicators; and the requirement for new expertise, skills and capabilities for evaluators to engage around interactive and Multi-Actor Approach to innovation.

A number of recommendations emerge from sections 2 and 3:

- evaluation should be prior to scale-up and scale-out processes of innovations because it provides expert assessment of good and replicable practices. Thus, integrating evaluation into the planning and scaling process is crucial;
- participatory, reflexive and developmental M&E approaches should be applied to policy and innovation processes and effects to allow the collection of a variety of quantitative, qualitative and descriptive information and supporting system building;

¹²⁸ See Chapter 5 in EU SCAR (2013), *Agricultural knowledge and innovation systems towards 2020 – an orientation paper on linking innovation and research*, Brussels.

- M&E strategies should be set-up very early and applied all along the policy and innovation implementation, over the ex-ante, in itinere and the ex-post stages, to support decision making at policy, systems and farm level;
- this implies public investments on M&E arrangements to engage innovation participants in collective processes of capacity development and set the baselines needed to concurrent surveillance and assessments at the different levels of policy implementation. Specifically, the early establishment of relevant indicators would allow assessing the innovation effects all along the processes and at farm level;
- as well, major efforts are requested to monitors and evaluators to acquire the needed skills and specific expertise on participatory approaches;
- ultimately, a certain degree of uniformity in M&E tools (indicators, evaluative questions) across countries is recommended to allow knowledge exchange on lessons learned, comparative analyses and benchmarking.

Section 4, reviewing the Guidelines for the Evaluation of innovation in RDP's, identified the important Common Evaluation Questions (CEQs) related to: innovation in Focus Areas 1A and 1B; those which capture the contribution of interventions in terms of expected outputs and results; those related to other aspects of the RDP such as national rural networks; and at the EU level, those CEQs that help identify the contribution to programmes in terms of expected impact.

Section 5 argues for a renewed emphasis on ex ante evaluation and generating a culture of impact within the R&I community based on a co-designed approach to research programmes, projects and the identification of impact pathways. Several recommendations emerge from section 5 for different target groups:

Research institutions:

- develop a culture of impact at institutional level including the capacity to understand and work with impact pathways from project design to project completion, in order to strengthen the impact of R&I policies and programmes;
- widen collaboration and communication to include all relevant stakeholders in the R&I pathways, including end-users of project results, knowledge transfer organisations and innovation support services and innovation brokering;

- include use of and achievement of impact indicators as a parameter for assessing researchers.

Funding agencies:

- require a consideration of impact both ex ante and ex post and that projects and programmes are co-designed and co-delivered, where appropriate;
- examples of, and learning from, existing good practices of ex ante evaluation planning and monitoring in, for example, EIP Operational Groups and H2020 Multi-Actor Projects, should be collated and analysed with a view to translation and implementation in other programmes.

R&I Policy makers:

- foster an enabling environment for impact and provide researchers with the support needed to develop the capacity for this;
- ensure that funding regulations are flexible enough to support impact by, for instance, supporting the preparation of project proposals with a view to better planning of activities, which help non-scientists and end-users of project results to effectively co-operate all along the research project (as is done for EIP Operational Groups).

SCAR Working Groups:

- provide advice on ex ante evaluation planning and monitoring.

All:

- *ensure a co-design and co-delivery approach to research and innovation* where appropriate. At a strategic level, enable regular exchanges between researchers, funding agencies, policy makers and end-users at the national and European level including through the better use of existing mechanisms such as SCAR and its working groups.
- strengthen incentives and evaluation criteria for research organisations and individual researchers to encourage a focus on impact and a Multi-Actor Approach, in addition to purely scientific excellence and also to encourage individual researchers to take part in Multi-Actor research and innovation processes;
- strengthen the environment for supporting impact generation by including actors from knowledge transfer organisations as well as innovation support services and innovation brokering where appropriate;
- train researchers in Multi-Actor and co-creative working methods.

6.4 Lessons learned on communication for AKIS

Text by Jean-Marc Chourot and Floor Geerling-Eiff based on a questionnaire, presentations and discussions in the SWG SCAR AKIS meetings

6.4.1 Introduction

Europe's future economic growth and jobs increasingly depend on innovation in products, services and business models (European Commission, 2014). In this context, more and more agricultural professionals realize that adapting a communication strategy will maximize the impact of their work. 'While most organizations have heavily invested in agricultural research, many still need to enhance their communication to ensure that their findings reach the intended users and make sure action is taken' (FAO, 2011). In the case of Multi-Actor innovative agricultural projects, communication is about promoting the project, its themes and the challenges that it is trying to solve. Furthermore, 'the consortium partners must promote the action and its results, by providing targeted information to multiple audiences (including the media and the public), in a strategic and effective manner and possibly engage in a two-way exchange. This two-way exchange allows audiences to become more invested in the project, the consortium and the issue it is trying to tackle. Therefore, science is no longer confined to laboratories but is being integrated into society, supported by effective communication' (Sparks & Co, 2018).

Strategic communication can lead to several positive effects (direct effects and side effects), acting as a virtuous cycle on the project and its environment. It can help publicize one's work in such a way that it is profitable for the project. It can also help to increase the success rate of a project proposal by providing a good communication and dissemination plan. It can raise the attention of national governments, regional authorities and other public and private funding sources to the needs for ultimate benefits of research. It may also attract the interest of potential partners and encourage talented students and scientists to join partner institutes and enterprises. It is likely to enhance the project reputation and visibility at local, national and international level (European Commission, 2014). It may help the search for financial backers, licensees or industrial implementers to exploit results. Finally, it may generate more market demand for the products or services developed. With this in mind, communication in R&I projects regardless of its level (EU, national, regional or local), will have to enable both project participants and their communication target groups to reach higher ambitions than before. In order to meet the increasing demanding requirements, the overall communication within the project group as well as outside of the consortium, must be carefully planned and managed.

The difficulties in communicating appropriately, are often related to a lack of time from the actors involved, a lack of expertise in communication or a lack of budget dedicated to communication actions. Vigilance on these aspects is therefore required, including a thorough planning of the communication activities and a proper reservation of related resources. A dedicated communication budget must be ring-fenced and also solely used for communication purposes. The four following key factors which operate in a virtuous cycle, were identified to reassure successful communication within and outside of the consortium (see Fig. 55).

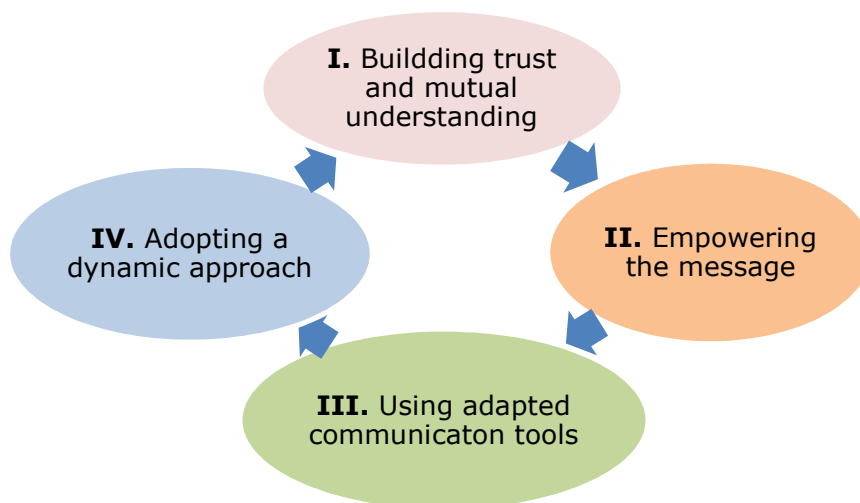


Fig. 55 Four key factors reassure successful communication for a consortium.

Because 'communication is essential for project effectiveness and sustainability' (FAO, 2012), the EU CASA H2020 project (Grant Agreement: 727486) performed a study on 'Communication of best practices in the framework of Multi-Actor innovative agricultural projects' (Chourot & Pascal, 2018). The report is based on several discussions in SWG SCAR AKIS to identify striking examples of communication practices in interactive innovation projects. SWG SCAR AKIS members provided the examples and the main ideas for drafting this report. Further discussions with some members and coordinators of the projects which were used as examples, have also been carried out. This chapter includes a summary of its main outcomes.

6.4.2 Building trust

First of all, building trust among the partners of the consortium and with the end-users of the project, is essential. In the case of R&I projects, trust has to be understood in a wide sense. It covers the quality of human relations, the accuracy and the relevance of delivered messages, as well as the subjective reliability of the chosen media to deliver the message from the end-

users/target' point of view. Trust is a key-factor for success, from the start until the end of the project. A trust-based communication strategy requires mutual understanding between all actors involved. This is even more significant in the frame of projects with a demand-driven approach, because the needs are initially expressed by the end-users. A well prepared and detailed communication plan is important to overcome the issues which are related to building trust within and outside the project. Furthermore, it allows the project partners to understand the expectations concerning their contribution to the project. A clear distribution of tasks and actions throughout the project timeline also increases trust between actors and facilitates each of them understanding their position in the consortium. Whereas the latter might be an easier achievable goal in academic-only research projects, it is more challenging in Multi-Actor Projects where the culture, the diversity and the mind-scheme of the partners varies. Therefore, the leading core group of the project has to pay specific attention to realising this aim and listen carefully to all participants, to an extent that they also might have to gently pull at some partners to express their voice. The role of the lead partner is to enable and manage a well-functioning project, including its communication process and reinforcing trust by avoiding or mitigating potential misunderstandings between the project partners. It helps the entire project team if the lead partners designates a contact person who coordinates and streamlines all information exchanges. This contact person must be someone reliable and it is also desirable to choose someone who shows charismatic traits. Last but not least, the lead partner motivates the team members by co-developing a shared vision among all partners how the project should function and in reaching the project's major and final objectives.

6.4.3 Empower the messages

The selection of the audience is the first decisive step in the transferring process of messages. This has to be analysed carefully so it includes all relevant target groups, related to the project goals and objectives. In general, regardless the project approach (research driven or demand driven), the major lessons learned are:

- consider the characteristics of your target groups and how and where you can reach them. Furthermore, it is of utmost importance to adapt to the language to the targeted audience. Messages have to be clear, understandable and easy to remember but they must not be over-simplified;
- use a channel that works well for the targeted audience in general but do not neglect other means for communication;
- whenever possible, favour face-to-face as well as peer-to-peer communication channels;
- always stay positive! It is sometimes challenging working in an international environment with people from many different cultures

and working attitudes. It takes time and flexibility to learn about each other and to find an appropriate way to communicate in an effective way.

Furthermore, it is essential to advertise upcoming events and principle news items related to the project to ensure a sufficient visibility of what is going on, to maximise the impact of communication. A very efficient way to advertise a new project release, is to communicate about it through a maximum number of **existing** channels such as technical magazines, professional newspapers, newsletters, digital media like Facebook pages, twitter post, LinkedIn, dedicated fora, etc. It is even more important to choose the right digital channels because the variety and options of online information platforms or social media are huge. However, the communicant might take into account that the time spent by the users on digital media, is often short. As a consequence, digital media should rather cast short messages like tweets, powerful headers or striking messages, when classical media such as paper, allows for longer articles.

Also, because of the behaviour of visitors on digital media, one must ease the access to the information and the messages. Project websites often do not propose a very satisfactory browsing experience. The visitor can only find the relevant information if (s)he knows what (s)he is looking for, or more in general, if (s)he knows where to look at or to click on. The internet experience of the user should often be better taken into account, meaning (s)he should be able to reach relevant information more intuitively and easily.

6.4.4 Using adapted communication tools

The types of communication channels used by interactive innovation projects form a wide range of media, such as: websites / information systems, social networks such as Facebook, Youtube depending on territories, institutional letters, technical letters, brochures, databases, videos, posters, technical leaflets, presentations, on farms demonstrations, meetings, podcasts, etc. Different channels fulfil different functions and they can complement different communication activities. It did not become clear if it is better to create specific SMART communication channels (from scratch) or to make use of existing ones. Because of transaction costs to create new communication channels and its risk of insufficient return on investment, it might seem better to make use of existing communication channels. However, it was difficult to provide a generic recommendation since each case depended on its context.

6.4.5 Adopting a dynamic approach

Because communicating is an organic and developing process, it is essential to take into account the project timeline and the project dynamics when planning communication and dissemination actions and events. Moreover, the project communication should enable to deliver accurate snapshots of the

project's state of progress. Therefore, communication has to be flexible to communicate new knowledge when delivered. Furthermore, it is important to keep all communication channels and communication support synchronised in terms of information and data. This can be summarised as a 'not to forget' item list in up-dating the:

- list of contact persons when changes occur;
- project's results as soon as new results are available;
- list of coming events, meetings, workshops, etc.;
- publications of the project and other types of output.

Finally, communication activities should incorporate the flexibility to adapt different communication channels when relevant and to reach different audiences if required.

6.4.6 Conclusions and recommendations

In short, the study on communication in interactive innovation projects, came up with the following do's and don'ts:

- do not be over-ambitious – things take time;
- use efficient support and more precise information regarding reporting;
- reduce bureaucracy to save up resources for communication within interactive innovation projects and dissemination of results;
- use a channel that works well for everyone as a general tool, but allow the use of other means for ad-hoc meetings (for internal communication);
- consider the characteristics of your target groups (i.e. where you can reach them) and try to access them through their most relevant channels, in order to avoid ineffective communication;
- always stay positive! This is sometimes challenging working in an international environment with people from many different cultures and working attitudes. It takes time and flexibility to learn about each other and to find the appropriate manner to communicate in an effective way;
- always be prepared to communicate when there is news to disseminate;
- use many different communication channels;
- in transnational projects, include and visit every partner/country to increase trust and understanding between partners.

To improve communication in interactive innovation projects, the study showed first of all that trust is vital when crossing professional cultural boundaries since people can feel vulnerable. This is important because of:

- the numerous elements of uncertainty regarding the quality and reliability of the project results;
- the communication challenges related to the potential geographical and physical distance between the project stakeholders;
- the professional, social and/or educational background diversity within the project consortium;
- the long period of the whole transfer process of the project results.

Trust should first be strongly built up within the project consortium, in order to constitute reliable relationships between partners.

Second, the role of the project coordinator and facilitator in order to fluidize communication processes and interactions, is crucial. The communication coordinator and facilitator must have very good communication skills. (S)he must manage the construction of the communication, in interaction with all partners.

Third, the dissemination management plan should be designed at early stages of the project life cycle, ideally at the same time as the communication management plan. It should be supported by all actors involved in the project (co-ownership). The more involvement of all partners, the better the impact the project is likely to have. Therefore, dissemination should not be seen as an additional task but as an integrated function to communicate about the project's results. Once trustful relationships are established between the major project actors, the easier it will be to communicate about the project's progress and results to other targeted audience(s). It is also likely to be easier then to involve policy-makers more and to obtain a more collaborative and flexible project structure. A structure which is able to adapt to fast changing regulatory policies, fast changing consumers behaviours and fast moving economic and environmental contexts, at local, national and supra-national scales. It is important to keep in mind that adaptations in communication and dissemination still have to be possible, after the initiation of the project.

Fourth, there is a strong need to gather and pool knowledge from various projects in a long term knowledge reservoir which can ensure the continuity of communication, also after each project has ended. More information on knowledge reservoirs is described in chapter 6.4.

Fifth, during the evaluation process of proposals, a supportive ex-ante assessment of the overall communication activities, could be implemented. This would enable to identify project by project what works well versus what works less with regard to allocated resources, task by task and action by

action. Such an analysis would contribute to the improvement of the project's communication. Finally, attention should be paid to the allocation of sufficient resources for communication activities which are also solely spent on communication purposes.

Finally, it is important to bear in mind that communicating interactive innovation results in agriculture, is about much more than performing individual communication actions. It should not only focus on disseminating the project's results, it should also match with the overarching AKIS strategy of the countries or regions involved. This means that the uptake of results by advisors, farmers, education and other AKIS actors, should be prepared and anticipated *ex ante*. Because of the very specific inner nature of Multi-Actor agriculture R&I projects, specific guidelines for communication could be drafted, including clear and adapted examples in order to illustrate best practices. Furthermore, some operational groups expressed the suggestion to create initiatives and/or funding calls to promote the co-relation and joint activities among OGs in similar fields. This could increase the impact of results, create better channels for knowledge exchange and enlarge the sharing of experiences on a larger scale.

6.5 AgriSpin's analysis of innovation support functions

Text by Floor Geerling-Eiff, based on the contribution from the AgriSpin consortium (Andrea Knierim, Alex Koutsouris, Sarah Audouin , Guy Faure, Syndia Mathé, Hycenth, Tim Ndah, Eelke Wielinga and Eleni Zarakosta)

6.5.1 The role of the facilitator in interactive innovation projects

From exchanges with MA projects and TNs in particular such as Winetwork and SheepNet (see Annex 1), we learned that innovation facilitators have a pivoting role in stimulating knowledge exchange between research and end-users, valuing the input and knowledge of farmers and actors and wide dissemination of relevant best practices and innovations.

In TNs, an innovation facilitator was appointed for each region of the OGs involved. They made an inventory of the practical know-how in each area and their role was also to transform existing research information to match the innovation demands by the farmer. Each facilitator worked with the same methodology. They received training within the project and further also trained each other or learned peer-to-peer, so that they all worked on innovation in their region according to a similar approach. With the know-how

from the field, facilitators produced practical communication material such as pictures and films. Researchers produced scientific output. All scientific and practical output was collected in the project's knowledge reservoir.

A facilitator needs to understand both scientific knowledge and field know-how to be able to fill in his/her intermediary role. A particular lesson from the TN Winetwork was that the facilitators wanted to organise themselves as a group, so they appointed a facilitation coordinator next to the overall project coordinator.

From the work in the TNs, farmers became to see things differently, realised that their input adds value and therefore felt more confident in OGs. In particular cross-visits for peer-to-peer exchange work well and should be stimulated. Also, there must be sufficient focus on multi-actor exchanges, including field excursions. In turn, advisors and scientists adopted better listening behaviours.

One of the barriers that may occur, are the difficulties that new actors face, when introduced in an already constituted group. It takes a relatively long time and effort to build trust and a common working ground in the groups. Specific challenges for TNs are to connect with more networks and projects and how to ensure long term communication. Connections to other TNs and projects could for instance be on common communications, on invitations to participate in each other's (international) events and on common reflections to identify innovative practices.

Efficiency between projects and networks should be stimulated and can be improved by sharing each other's solutions, approaches and tools. A platform could be implemented to identify and transfer innovations, to be rapidly 'visible', realise long term communication, involve a wider audience, mitigate language barriers and stimulate other interactions between networks and projects (see chapter on Digitisation, Knowledge reservoirs)

6.5.2 Views on innovation support from the AgriSpin project partners

The next paragraphs present insights and findings from the AgriSpin project, a Horizon 2020 project, conducted between 2014 and 2017. Project partners worked in close exchange with the SWG SCAR AKIS and partly overlapped mandate 3 and 4.

The AgriSpin project¹²⁹ aimed at creating space for innovations through, on the one hand, the identification, analysis and amplification of good examples of innovation support and, on the other hand, multi-actor learning about ways

¹²⁹ SSpace for INnovations in Agriculture, www.AgriSpin.eu

to stimulate innovation and remove obstacles. It sought to find answers pertaining the initiation, successful development and implementation of innovations by identifying best practices for innovation and support systems in European agriculture and rural development. The main focus was on 'innovation support providers' (organisations and their individual personalities), i.e. actors who connect the initiator to other actors to accomplish his/her innovative idea(s). Such actors include farmers, researchers, actors in the value chain, administrators, civil society groups, farmer-based organizations, etc. The project looked at all kinds of innovation processes, focusing on innovation support services that intervened during the process in a qualitative and quantitative way. The analysis encompassed both the innovation process and the overall environment, including local and regional AKISs. In particular, the cooperation between private actors and publicly financed knowledge providers (from research, education, advisory services) was investigated. In addition, a group of researchers conducted a targeted, quantitative analysis of Innovation Support Services (ISS) for 43 cases. AgriSpin broadens the concept of intermediaries and brokers to emphasize the role of support service providers. The latter delivers a more diversified portfolio of services, which goes beyond connecting actors. AgriSpin produced specific sets of recommendations for innovation support services providers, policy makers and scientists, on how to steer their activities and their role in supporting innovation in a more efficient way.



Fig. 56 This farmer developed an innovative pig stable with the help of a local innovation support centre, improving animal welfare, thus procuring a better price from a high-end supermarket.

6.5.3 The AgriSpin typology of Innovation Support Service functions

AgriSpin came up with a typology of the functions of Innovation Support Services (ISS), based on a literature review (Mathé et al. 2016). ISS cover seven functions and they may occur at various scales from the organisational to the territorial level and with varying importance at different stages of the innovation process. These ISS types are presented in table 1 (Faure et al. 2019).

Table 1 Innovation support service (ISS) functions

ISS functions	Brief definition of the function	Brief example
Awareness and exchange of knowledge	All activities contributing to knowledge awareness, dissemination of scientific knowledge, or technical information for farmers.	For instance information dissemination forums (website, leaflets), meetings or demonstrations and exchange visits.
Advisory, consultancy and backstopping	Advisory, consultancy and backstopping depict targeted supportive activities aimed at solving complex problems regarding for instance, a new farming system or new value chain design.	For instance a technical, legal, economic, environmental or social advice during the innovation process based on the demands of actors or the co-construction of solutions.
Demand articulation	This is targeted support to the innovator towards enhancing his /her ability to express the needs to other relevant actors.	Activities to help actors to express their interests, and clear demands to other actors (research, service providers, etc.).
Networking, facilitation and brokerage	Services to organise or strengthen networks; improve the relationships between actors and to make activities complement each other. This includes all activities aimed at strengthening collaborative and collective action.	Typically, networking and facilitation services are key measures when OGs of the EIP-AGRI are being developed and implemented.

Capacity building	Provision of services aimed at increasing innovation actors' capacities at the individual, collective and/or organisational level.	For instance, the provision of classical training and experimental learning processes.
Enhancing / supporting access to resources	Provision of services to innovators enhancing the acquisition of needed resources to support the innovation process.	This could be facilitating access to inputs (seeds, fertilizers etc.), facilities and equipment (technological platforms, labs etc.) as well as funding (credit, subsidies, grants, etc.).
Institutional support for niche innovation and stimulation of scaling mechanisms	Provision of institutional support for niche innovation (incubators, experimental infrastructures, etc.) and for outscaling and upscaling the innovation process.	This refers to support for the design and enforcement of norms, rules, funding mechanisms, taxes, subsidies, etc., that enhance the innovation process or the diffusion of innovation.

6.5.4 The seven functions during the innovation processes

While during the interactive, multi-actor-led case-studies, the ISS were only one among several study objects, their particular roles and importance were highlighted and exemplarily explained in the 'AgriSpin inspirational booklet' (AgriSpin 2017a). Moreover, a comparative analysis of the ISS across 43 out of 57 innovation cases allowed a number of systematic insights and quantified results. In particular, when quantifying references to ISS in the case study descriptions, Faure et al. (2019) showed that:

- networking and facilitation was the most frequent ISS function (approximately 25% of the total) and fairly evenly distributed across various innovation phases;
- access to knowledge (awareness and exchange) came in the second place (approximately 20% of the total);
- advisory service functions, as well as support for access to resources came third (13% each).

From these figures it also becomes obvious that among the various ISS functions, the classical advisory services such as 'providing access to knowledge' and 'providing consultancy in problem situations' still have key

places. Networking, facilitation and brokerage are observed as the most frequent ISS function. It should be noted that different forms of networking are required across different phases of the various innovation cases, involving different actors and for different purposes (Ndah et al. 2017). Clearly, this analysis shows that ISS go beyond classical advisory and brokering services in terms of contents and functions but probably also in the number of services.

6.5.5 Which actors provide different innovation support services?

Innovation support service provision is a communicative act between individuals, which nevertheless mostly occurs in professional contexts. This implies that the innovation support provider (ISP) can be addressed as a corporate actor or organisational body with explicit objectives, internal rules and institutions and codified forms of interaction with their environment. Thus, the understanding of interactive innovation processes requires also a clear view of the characteristics of the service provider such as the governance mechanisms including the mandate of the provider, funding mechanisms and technical and human capacities of the advisors (Faure et al. 2011). Based on Knierim et al. (2017), we propose a four-category typology of service providers:

- 1 **Public service providers** characterised by specific goals, specific target-groups and specific services due to their public good orientation, societal influences and long-term continuity. Here, we might distinguish between, e.g. public service providers with a broad mandate for offering a large range of ISS to the agricultural sector (e.g. Teagasc, Ireland, with a research and extension mandate, offering ISS to farmers such as 'access to knowledge', advisory, consultancy, demand articulation, networking, access to resources etc.) and public service providers with a restricted mandate for offering ISS and/or limited budget resources (examples from within AgriSpin are the Tuscany Regional Government (Italy), or the Basque Regional Government (Spain)) who, according to their mandate, focus their activities on a selection of Innovation Support Services (e.g. access to knowledge, networking).
- 2 **Farmer-based organisations** having a specific profile, internal governing structures and patterns of ISS due to their immediate relation with their members (Nagel 1997). We have to distinguish: holistic farmer-based organisations seeking to increase the range of ISS through networking with other providers in the AKIS (an AgriSpin example is the Dutch ZLTO that supports various innovation processes by initiating and coordinating ISS provided by other public or private actors) and specialised farmer based organisations, focusing on a limited range of service activities (e.g. restricted to one value chain, or to only input provision, etc.) to their members.

- 3 **Non-governmental organisations** coping with specific challenges, often operating under short-term funding conditions which, due to their value or mandate, may innovate when providing ISS (one AgriSpin example is the AIAB in Campania (Italia), who provides advisory services and networking at territorial level to promote organic agriculture).
- 4 **Private organisations** providing specialised services (mainly consultancy or advisory services possibly included in trading activities regarding inputs or machinery) based on a client relationship. Their capacity to be part of the innovation network is key for them to be able to provide relevant and articulated services.

Nevertheless, outside the formal structures, there exists as well a proliferation of **informal support providers** consisting in most cases of family members, friends, peers, large-scale farmers, local authorities, neighbours, etc. Most of these persons are often invisible or less recognised, but they play important albeit informal roles in the support for innovation processes, especially at the early phases when the innovation is still to go beyond the proof of concept stage (Ndah et al. 2017).

Across the qualitative analysis of the AgriSpin innovation cases, it became apparent that support services can be provided by any of the aforementioned service providers and, what is more, that in multi-actor innovation cases, various ISPs contribute with their services in more or less coordinated manners to the overall success. Secondly, it became obvious that some ISPs not only provide a single or a number of ISS functions, but additionally coordinate with other ISPs to provide better support to farmers (Faure et al. 2019). Thirdly, we explored the question whether patterns of ISS according to different innovation characteristics (e.g. a predominant technology or organisational change) emerge. However, a comparative analysis of 18 innovation cases with regard to the variation of ISS depending on the respective innovation characteristics, didn't reveal conclusive patterns in the ISS function combinations regarding the type of innovation (Ndah et al. 2018).



6.5.6 The spiral of innovation: how to understand innovation processes?

The Spiral of Innovation was adopted in the AgriSpin project as an important tool in the effort to understand interactive innovation processes (AgriSpin 2017b). The Spiral of Innovation was developed earlier, within the framework of the Dutch pilot programme “Networks in Livestock Farming (2004-2007)” (Wielinga et al. 2008) and further elaborated after. This experimental programme addressed networks of livestock farmers who came up with initiatives for sustainable innovations in their sector. This tool visualised the processes of such initiatives, thus making clear what different kinds of support the innovation service providers might provide to the actors, involved over a period of one year.

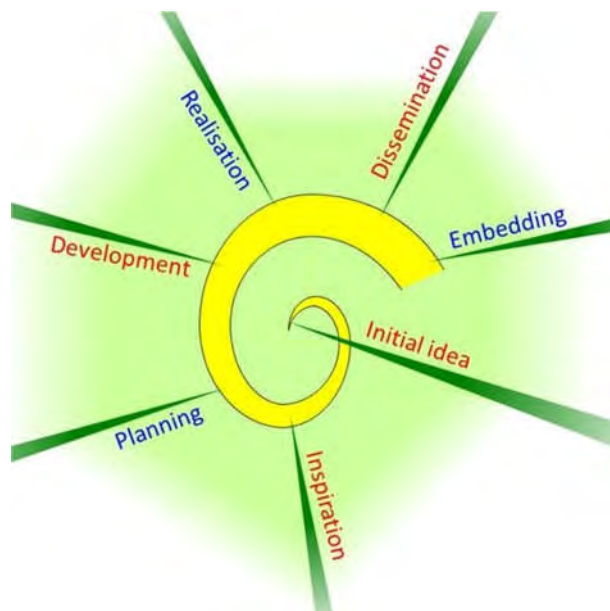


Fig. 57 The spiral of innovation.

The Spiral of Innovation is presented as a spiral because an innovation process is an iterative process rather than a linear one. During an innovation process, the process sometimes enters a dead end street and, if failures occur, actors need to step back to an earlier stage. Often some stages are repeated several times before they have generated sufficient social capital and evidence for the innovation process to continue at a next level. In the following, the seven stages' characteristics are briefly described including pitfalls adhering to the stage in question.

- 1 **Initial idea:** Good ideas can come from everywhere: farmers, advisors, researchers, policy makers, and members of civil society. What matters most is that a network (either formal or informal) of passionate people

embraces the idea and has the ambition to bring it further. Attention needs to be paid to the edges of an ecosystem as renewal most often occurs in the periphery and not in the centre where peer pressure is highest.

- 2 **Inspiration:** At this stage, a **warm network** should be formed with people who are willing to help realising a dream. There is a risk that the idea will be killed before it is born. Now is the time to build informal relations with people who can help opening doors in later stages.
- 3 **Planning:** For developing innovations, actors need a safe space where they can learn, try, fail, try again, mobilise expertise when they need it and respond to what they discover. The focus should be on questions to be answered, rather than on products to be delivered;
- 4 **Development:** This is the stage of discovery. This space should allow for trial and error, for “clever” mistakes (learning from failure), for responding to what occurs, for involving expertise when this appears to be useful. The most common pitfall is rigid plans that do not allow for surprises or creativity. Another pitfall is to stay in this stage too long.
- 5 **Realisation:** In the realisation stage, the results of the experiments become a specific practice to be implemented. Some stakeholders will embrace it; others will show resistance because their interests are at stake. Negotiation usually is a core activity here, which requires a different kind of actors such as mediators. It is helpful if they have been involved in the previous stages as well.
- 6 **Dissemination:** Good innovations spread themselves. When potential users can easily learn about the innovations, it happens more readily. A typical pitfall at this stage is that many people want change but nobody wants to be changed. The essential element of dissemination is the connection between what potential users want and the contribution of the new practice to those desires.
- 7 **Embedding:** in the embedding stage, the environment accepts the new practice and adapts its structures so that the innovation becomes mainstreamed. One difficulty to overcome is that practitioners and decision makers often live in different “bubbles” of society, each with their own rules, games, tensions and images of reality so the need perception may differ. The challenge is to amplify the good examples that are being created and to create opportunities for dialogue.

6.5.7 Reflections on AgriSpin by the SWG SCAR AKIS

The SWG SCAR AKIS provided the following reflections and additional remarks to the AgriSpin project partners:

- dividing the innovation process into stages seems useful, however this alone will not be sufficient to prevent risks of failing and other difficulties along the process;

- the spiral of innovation may be utilised by funding bodies to reflect on innovation projects;
- it is important to emphasise the relevance of analysing different cases for learning purposes so that different innovative initiatives and the actors involved can learn from each another;
- next to the changing role of advisory services, we notice a shift in knowledge and innovation processes. For example, when the outcome of a study indicates that at a current time a certain process or technology is not implementable yet, this is normally seen as research in progress.
- With the shift to the Multi-Actor Approach, there should be more acknowledgement for the entrepreneurial role of the end-user as knowledge developer, being a genuine part of the R&I system.
- In particular, if the outcome indicates that a current technology/result is not implementable yet, there should be room for further testing or improving involving end-users. This, in turn, implies the acknowledgement, in different types of instruments for R&I, of the importance of Multi-Actor Approach and synergies. The recognition of the interactive innovation process is essential in terms of supporting both knowledge development and innovation valorisation;
- regarding the responsibility of researchers for achieving practical impact from their research results, they should be incentivised differently than the current dominant focus on scientific impact through research publications. This should be seriously taken into account in the evaluation of academics/researchers;
- finally, start-up companies should be better acknowledged in the agricultural knowledge and innovation system as innovative fore-runners. The system is changing rapidly and accelerating programmes and start-ups arise from every corner. Even if few of them survive on the long term, some may come with breakthrough ideas.

6.5.8 Conclusions and recommendations

The Multi-Actor Approach in the Thematic Networks led to a better understanding between the actors involved (e.g. farmers, advisors and scientists), greater consideration of field and end-user inputs and greater efficiency in respond to practice needs. However, it takes some time and effort to get to know each other, building common working ground and trust to perform the different tasks and to provide relevant responses. Hence, dedicated facilitation training and tools to facilitate interactive innovation are needed. Sufficient attention should be spent on training the innovation broker and facilitator to enhance both technical (hard) skills and (soft) competences. An innovation broker goes beyond that and commits him or herself to the matter on a longer term. Actors who are trained as innovation brokers could obtain a

certification. We must bear in mind that national AKISs have to be adjusted to support and enable further development of innovation support services. Overall, there needs to become more awareness and comprehension in the sector about the added value of interactive innovation, by sharing best practices and demonstrating opportunities.

A vast majority still thinks about 'linear' knowledge 'transfer' services. The term "advisory services" should obtain a more interactive, reflexive connotation and the role of innovation facilitation should be enhanced. Therefore, joint implementation of the CAP 2014-2020 measure 'use of advice' (Art. 15) and 'knowledge transfer and information actions' (Art. 14) should be enabled. This would allow for implementing complex advisory programmes for a larger group of beneficiaries, linking different forms and methods of advisory work (individual advice, group advice, discussion groups, training, workshop, demonstration etc.). Such advisory programmes could be implemented by joint consortia of farmers' organisations, advisory services and research centers, and foresee adequate and ample support for this. Research facilities could be better linked to advisory services and acknowledge the time advisors spend with researchers to share ideas and needs from practice, to learn about new research results and to enhance networking. It could also be an idea to support advisors' internships and placements in experimental research centres and training facilities. Also, learning on-farm for advisors and researchers would lead to valuable insights in the world of entrepreneurial farming. Again, it is important to cover both support advisors' technological trainings, as well as strengthening their methodological and social competences.

More in detail, we learned from the AgriSpin project that when analysing the innovation support cases in the course of time as attributed to the spiral stages in the AgriSpin project, no clear-cut picture was recognisable (Faure et al. 2019); but there was a certain concentration of services provided in the development stage (24%). Differences between the other stages were less apparent with the exception of the last one, 'embedding' (which however was less in the focus of the AgriSpin project). However, there was a certain tendency for more informal service interventions in the first stages, with the aim of provoking exchanges and creating space for interaction, while in the latter stages the formalised services were more dominant (Faure et al. 2019). Furthermore, it was observed that especially in formal structures, **too little attention is often given to the early stages of the innovation process.** According to AgriSpin's findings, an initiative is often not taken seriously unless it has been framed in a fully-fledged project proposal. Many good ideas never reach that stage as the early stage activities frequently happen informally, often driven by initiators who are rowing upstream. In contrast, often most attention tends to go to the later stages, thus resulting in a gap between staged needs and the provision of relevant support. Equally, the

Member States and regions providing support in the early stage of drafting innovative project proposals, however seem to book better final results.

Furthermore, as it turns out from AgriSpin, the innovation process often sours in the early stages because of a lack of funding. Unfortunately, this often puts a stop to the innovation process, because funding does help the innovation process to move forward. Indeed, in the countries that do have organisations that assist innovative farmers with finding funding, the innovation process itself tends to be smoother and faster.

The AgriSpin project focused on uncovering the so-called blind spots in innovation projects (whether formal or not), with the objective to contribute to improved methods of innovation co-construction in European agriculture and rural development. Blind spots in an innovation project are all the important sub-processes which the participants may overlook as being critical to the project. Blind spots can, for example, occur in the collaboration between a farmer who has an innovative idea and the adviser to whom (s)he turns for advice. If they understand each other, chances are that the appropriate supportive measures will be put into play. If not, the chances of that happening are a lot lower.

Public authorities and funding bodies should explicitly recognize and endorse the fact that innovation implies taking risk and thus failures. They should accept a range of successful or not so successful outputs and outcomes insofar as they prove reliable in terms of following the processes planned in the approved project.

AgriSpin adopted and reinforced the understanding of innovation as a process evolving over time, i.e. instead of innovation as outcome/final product. In this respect, innovation should be understood as a result of multiple interactions, collective/social learning and adaptive experimentation of heterogeneous actors involved in innovation networks. In this respect, innovation evaluation should aim at the process, rather than the projects' milestones and (tangible) outcomes. This requires changed attitudes on the part of project funders and managers/administrators. Moreover, in exploring new ways of monitoring and evaluation, emphasis should be given on methods and tools addressing soft skills and learning processes.

A strong conducive element for successful innovation processes are the public authorities who act as neutral actors (instead of defending particular interest politics) and set or support the setting of the right frame conditions concerning the building of warm networks of actors. These networks will initiate and run innovation projects matching the overall innovation, agricultural and regional/local policy. Also, a need for further simplification of funding mechanisms and administrative rules was observed, so as to embrace the innovation processes and exploit the full innovation potential of such

networks. Regulation should foster innovation rather than giving a conspicuous impression.

Finally, public authorities and funding bodies should explicitly recognize and endorse the fact that innovation implies taking risk and thus failures. In other words, they should accept a range of successful or not so successful outputs and outcomes insofar as they prove reliable in terms of following the processes planned in the approved project and the collective knowledge/ learning that emerged.



7 Digitisation in support of AKIS



Text by Sylvia Burssens, Christian Rosenwirth and Mark Gibson based on presentations and discussions in the SWG SCAR AKIS meetings in Bonn (2017) and in Brussels (2018)

7.1 Introduction: agri-digitalisation in the EU, a state of the art

For most Member States participating in SWG SCAR AKIS, digitalisation of agriculture is situated in the following key areas of focus:

- more precise production (precision farming) to foster resource efficiency or to make management systems, and thus production more economically viable;
- to support a closer relationship between producers and consumers through digitisation of the agri-food chain e.g. using block chain technology to increase transparency and traceability for quality standards.

However Member States see digitalisation also opening new perspectives as a useful tool to support a better AKIS, in particular for knowledge exchange, training and supporting advisory services. For instance it can save time and resources by offering webinars or even *farminars*, or through decision support tools in advisory. Several SWG SCAR AKIS Members are already taking specific initiatives in this regard (see cases in this section).

Beyond the commercial digital tools on the market, Member States see **digitalisation also opening new perspectives as a useful tool to support a better AKIS**, in particular for knowledge exchange, training and supporting advisory services.

Since digitalisation offers many possibilities to support farmers to address the many challenges associated with sustainable agricultural production, it is explicitly mentioned in the CAP post 2020 proposals¹³⁰. The digitalisation process needs to be accompanied by a good regulatory framework for the farmer with standards for data exchange which protect data ownership and privacy, while at the same time allowing business development.



¹³⁰ Art 102 on the Strategic CAP Plans for modernisation

Two specific EIP-AGRI workshops were organised to give detailed information on data sharing and digital innovation hubs¹³¹ (2017) that addressed two main topics: 1) State of the art of digitalisation in agriculture in different MS and Europe and 2) Prospects and perspectives for digitalisation in agriculture. At the Agro-Innovation Summit in Portugal¹³² (2017) the following topics in relation to digitalisation were discussed:

- agriculture 4.0 and rural development: digital entrepreneurship in rural areas, precision farming; management tools to support farmers decision-making; robotics / mechanization;
- digitalising rural economies: digital opportunities for primary production, digital opportunities for agricultural value chains, extending digital opportunities for rural business and communities and strategies and approaches for improving connectivity in rural areas.

The following opportunities of digitalisation related to the different topics were identified:

- improving communication through the integration of data and knowledge to develop user-friendly decision support systems, to achieve greater prosperity for farmers, consumers and society;
- the transfer of data into usable information for a decision support system: these decision support modules must be adaptable to the individual needs of farmers and be very simple and user-friendly;
- decision support systems contributing to systematic monitoring and process optimization, e.g. the use of web-based technologies for the development of marketplaces;
- data availability and access to broadband;

Farmers want to identify a clear added-value when using digital technologies, tools and platforms, especially small and medium sized farms, which are not well placed to make profitable use of e.g. precision farming and other digital applications which are often designed for the bigger farms. They need to be able to trust in the business model of digital tool.

¹³¹ EIP-AGRI Workshop: "Data Sharing: ensuring a fair sharing of digitisation benefits in agriculture", 4-5 April, Bratislava (Slovakia) https://ec.europa.eu/eip/agriculture/sites/agri-eip/files/eip-agri_workshop_data_sharing_final_report_2017_en.pdf;

EIP-AGRI Seminar: "Digital Innovation Hubs: mainstreaming digital agriculture", 1-2 June, Kilkenny (Ireland) https://ec.europa.eu/eip/agriculture/sites/agri-eip/files/eip-agri_seminar_dih_short_report_2017_en.pdf.

¹³² <http://www.aislisbon2017.com/>

- the regulation of data usage with a standardized interface to focus on the innovative aspect based on the end-user needs instead of concentrating on the technology;
- genotyping (research on breeding), phenotyping (new optical sensors, in vivo sensors) in combination with database management and big data, e. g. in combination with meteorological and physiological data on plant diseases and animal health for model development and information sharing;
- the increase of data access and transparency of the data, as well as its traceability for farmers and consumers;
- the use of rural hubs (physical and virtual) for the benefit of all types of SMEs in rural areas.

Overall, farmers want to identify a clear added-value when using digital technologies, tools and platforms, especially the small and medium sized farms, which are not well placed to make profitable use of e.g. precision farming and other digital applications which are often designed for the bigger farms. They need to be able to trust in the business model of digitalisation tool. This trust can be incentivised through the use of open source tools and by the involvement of 'neutral actors', who are not commercially-driven.¹³³ Finally, of course it is the commercial or the non-commercial approach which will count. Digitalisation could have a positive impact on the AKIS if attention is paid to maintaining equity and interactivity within and between the different actors and AKISs . Under these conditions digitalisation could be a lever for the next generation of farmers. To come to this effect, starting with platforms where actors and stakeholders can exchange views with a view to come to a common agricultural digitalisation strategy - which e.g. the efforts in Austria, Hungary and Spain illustrate - are useful levers and first steps to an efficient an effective digital strategy.

7.2 Examples of digitalisation in agriculture in 8 Member States

In this section examples of initiatives to incentivise digitisation in agriculture in 8 Member States and in the EU are described which were presented during the SWG SCAR AKIS Meeting in Bonn (2017) and in Brussels (2018). Some of these projects/initiatives clearly focus on the bigger farms. Others take also medium and small farms into account.

¹³³ [http://www.europarl.europa.eu/thinktank/en/document.html?reference=EPRS_STU\(2017\)603207](http://www.europarl.europa.eu/thinktank/en/document.html?reference=EPRS_STU(2017)603207)

7.2.1 Digitalisation in Spain – Experiences from Andalucía for the development of synergies, and the involvement of farmers and value chain

The agri-food value chain requires specific data and information management systems with the need to change from 'intuitive' to 'smart' decision making models to increase the competitiveness of agri-food companies. It is necessary to know consumers demands and incorporate them in all the stages of the decision making process, to increase transparency and reach a greater balance along the whole value chain. Andalucía takes part in the H2020 MA project IOF2020¹³⁴ as coordinator of fruit & vegetable trials. These trials will show how IoT technology can improve each step in the production process making use of sensor data, cloud based systems for monitoring and early warning systems to control pests/diseases, can help to improve quality and increase yield. Andalucía is involved in the development of the S3 thematic EU partnerships on Traceability and Big Data¹³⁵. Regarding opportunities for this sub-platform, there is a need to better connect the different initiatives, projects, infra-structures, platforms, to create synergies that will allow to:

The agri-food value chain requires specific data and information management systems with the need to change from 'intuitive' to 'smart' decision making models, to strengthen competitiveness using a participatory approach. It is necessary to know consumers demands and incorporate them in all the stages of the decision making process, to increase transparency and reach a greater balance along the whole value chain.

- increase efficiency and make better use of different funding instruments;
- create better conditions for impact;
- strengthen the EU competitiveness with a participatory approach, based on the needs from local/regional levels up to EU level;
- develop pilot actions contributing to build the process beyond 2020.

7.2.2 Digitalisation in Austria – Introducing a platform of digitalisation and first projects

The Austrian Ministry of Sustainability and Tourism (including Agriculture) has installed a platform for digitalisation in agriculture which includes all relevant stakeholders of this topic to describe the development, the challenges and the

¹³⁴ <https://www.iof2020.eu/>

¹³⁵ <http://s3platform.jrc.ec.europa.eu/traceability-big-data>

benefits of the new technologies, particularly for the small and middle sized farms. This platform has the following purposes¹³⁶: (1) work on priorities and the need for action, (2) realize possibilities and work on solutions, (3) advise the ministry, (4) develop a survey of activities and projects, (5) link actors, (6) raise awareness for the value of farmer data and their digital identity and (7) disseminate knowledge through education and training.

The RDP in Hungary supports different projects that make digitalization accessible to small farms in practice.

The RDP supports some projects that make digitalization accessible to small farms in practice:

- "GIS-ELA 1 and 2", on the use of geographical information systems for site specific cultivation in order to improve efficiency and ecology in Austrian agriculture (EIP-AGRI OG);
- "Education Campaign for digitisation in agriculture and forestry", to raise awareness and transfer knowledge, net-working and enhancing competences (training project);
- "Smart farming for energy and nutrition efficiency and ground water protection" (cooperation cluster project).

7.2.3 Digitalisation in Hungary – Digital Knowledge Centres and Education

The programmes of the Digital Agricultural Strategy contain the development of policy and research and innovation to work on 1) digital skills (raising awareness, education, training and extension services) and the digital state (regulation, public systems and e-government). The proposed strategy and programs are in line with the Digital Wellbeing Program and the National Information Strategy. This should increase the turnover with 300 million euro until 2020. The following four focus areas are developed:

- precision agriculture;
- education and training for the next generation;
- reduction of bureaucracy with digital data use and solutions;
- foster international cooperation (BioEast).

For example, Hungary is working on a programme 'Smart farmers for smart farming' to change the negative image of farming with the help of digitalisation, for secondary and higher level education.

¹³⁶ <https://www.bmnt.gv.at/service/publikationen/land/digitalisierung-in-der-landwirtschaft.html>

7.2.4 Digitalisation in the Netherlands – What's keeping the Dutch busy on digitalisation knowledge for agriculture?

In the Netherlands, digitalisation of the primary sector is seen as an important accelerator to reach sustainable, circular agriculture, with particular focus on smart farming (or precision farming) based on data-driven smart decision making, robotics/mechanisation and IoT-solutions. In addition, the ambition of the Dutch regions (Provinces) is the transition of the agricultural sector into cross-connected parties and cross sectoral product chains, in which agricultural entrepreneurs transform from experts in single production towards experts in supply managing cooperatives (SMART food chains and food systems).

There are also regional initiatives to establish platforms bringing farmers and other actors from different sectors together in an open innovation approach. An example is the **JoinData¹³⁷, a non-profit cooperative that is a data platform for companies, knowledge institutions, and agricultural entrepreneurs** to work together in order to stimulate sustainable entrepreneurship and innovation. Data are exchanged and distributed in a safe and transparent way in the agriculture and food sector. Farmers remain in possession of their data and have insight into their distribution.

7.2.5 Digitalisation in France – Shared traceability systems and Digital flagship activities in the French Applied Research Institutes

BD Avicole¹³⁸ is a national database combined to innovative ICT tools for all poultry **sectors' traceability in France**. It is a collective, federative and professional system, aiming to identify all the holders of living poultry on the French territory (poultry farmers, producers' organizations, hatcheries), poultry production, buildings and outdoor area and movements of living poultry to establish the traceability all along the production for poultry industries. BD Avicole aims at increasing productivity, increasing quality and providing new services to the sector. Due to several crises, the sector has to regain the consumer's trust and come up with innovative adapted solutions to bridge the between consumer demands and production schemes. The objective is to have better knowledge and improve transparency, to make data reliable and improve the reactivity of the sector, answer to regulatory obligations and provide services. Thanks to accurate follow-up of the history of poultry movements, the system can reconstitute the links of traceability

¹³⁷ <https://www.join-data.nl/?lang=en>

¹³⁸ <https://www.bdavicole.fr/index.xhtml>

between the actors and thus ensure the external traceability. The result is the implementation of interfaces between the actors' systems and a fully shared system, to automate actors' data supplying and updating in the shared system and to establish a governance within each poultry industry involved in the common database. 5.818 actors and 13.789 productions areas are identified in the data base, of which 90 producers organizations and 116 independent producers. The system is available and operational for all involved in the flesh poultry chain, the foie gras palmipeds chain and the egg-laying chain in France. With regard to GDPR and the handling of personal data, BD Avicole created a governance structure by agreeing on how and which actors can handle the data, taking competitiveness into account. It is mandatory for people to agree to the terms to get connected to the platform.

A second French example is the digital group created in 2015 in synergy with all ACTA Technical Institutes¹³⁹. The major challenge for the coming years here was the ability to **integrate and interpret new data of agricultural research**. Relevant developments are:

- the "Applications Programming Interface (API-AGRO)" project, which aims to become a platform to centralize datasets and manage their visibility, access and valorisation in one place;
- the "Digifarm" project supports the development of connected agriculture (IoT), to move from concept to application by using an open research approach between R&I Institutes, farmers and private actors, inviting start-ups and companies to test new devices and sensors;
- apps for mobile application (exp. the phytosanitary ACTA index) will be developed, as a tool for the choice and the use of the plant health products that are commercialised in France.

7.2.6 Digitalisation in Portugal – Farm 2030

The Farm 2030 MA Project promotes the competitiveness and sustainability of agriculture in Portugal. The project has a focus on bigger farms and has the following objectives:

- re-engineering of production and precision farming with the use of new sensors for production monitoring, new models to represent soils, climate, and production and new algorithms for yield gap analysis;
- water use efficiency with sensors in large scale and data analysis to support irrigation management, as well as the use of new methods of big data pattern analysis and artificial intelligence;

¹³⁹ <http://www.acta.asso.fr/>

- energy use efficiency with the support of new decision support and management tools, the increased integration with renewal sources through intelligent management systems and new business models which are better adapted to demand management;
- new methods to combat crop diseases with the use of new algorithms to detect diseases, the promotion of better knowledge on propagation methods and crop dispersion patterns and the introduction of decision support systems to combat some crop diseases;
- bio-conservation of soils, using sensors and data analysis to improve fertilizer efficiency and develop new soil conservation models;
- “Farmlab 2030”, meaning the Development of a collaborative laboratory for the agriculture sector in Portugal;
- monitoring, data sharing and certification system Farm2030, which increase the recognition and credibility of farms.

Finally, the project should increase the sales turn over, the exports, the resource use efficiency (directly and indirectly), the productivity and also the margins as well the sustainability and generate new technology based products and services.

7.2.7 Digitalisation in Ireland – The digital advisory tools of Teagasc: on-farm evidence based decision making

Teagasc has developed a range of digital tools to support its advisory services across Ireland. The primary objective of these digital tools is to support evidence based decision making at farm level by combining data from different sources.

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Teagasc uses the following framework:

- Measure: sensors, weights, observations, IoT;
- Capture: getting data from sensors into a structural data-base;
- Integrate: combine the databases to add value, big data;
- Analyse: data analytics to turn data into useable information;
- Deliver: create a decision support system with added value.

Some of the examples presented in the SWG SCAR AKIS meeting included:

- “Pasturebase Ireland”¹⁴⁰ which is a web base grassland management decision support tool used by more than 3000 farms across Ireland. The system allows farmers to record and monitor grass growth and develop grass budgets in collaboration with their adviser;
- “Nutrient Management Planning Online”¹⁴¹, a web based mapping tool that allows farm advisers to develop detailed nutrient management plans for their farmer clients. The programme combines data from the Department of Agriculture’s LPIS system as well as the Teagasc soils database. The system produces colour coded maps along with infographics to support easier interpretation of data;
- “Opt-In”¹⁴², an online portal for rural dwellers that lists, in real-time, courses on offer from a range of rural based training providers. The system also allows users to express an interest and register for a course online;
- “Farm Appvice”¹⁴³ is a digital resource library for farm advisers informed by Teagasc extension research. The library contains a suite of methodologies and supporting resources to help advisers facilitate groups and engage with farmers.

Based on these experiences and as coordinator of FAIRshare, Ireland will discover further user cases to enable advisors to address challenges for embedding digital tools in different advisory and farming contexts across the EU.

7.2.8 Digitalisation in Estonia – A long-term program for knowledge transfer in digitalisation

Data sharing has added value that needs to be realised to develop the Estonian economy. A more effective use of data would save European countries one fifth of their administrative costs (OECD, 2015). It can have an additional effect on the private sector. Benefits for the public and private sector are:

- a user-friendly online access and updated datasets for creating more valuable products and services (private sector);

¹⁴⁰ <https://pasturebase.teagasc.ie/V2/login.aspx>

¹⁴¹ <https://www.teagasc.ie/about/our-organisation/connected/online-tools/teagasc-nmp-online/>

¹⁴² <https://www.opt-in.ie/>

¹⁴³ <https://www.farmappvice.com/splash>

- the possibility to reduce administrative costs and create better targeted legislation and measures by using data more efficiently (public sector).

Estonia has just introduced a long term programme (4 years) for the use of agri-cultural big data that is co-financed by the European Commission. This includes a feasibility study for the development of a big data system, introducing fertilisation and plant protection applications to the producers and gathering feedback from them on the usability and problems of these applications. It also introduces the implementation of precision agriculture through machinery and software solutions to the producers, including gathering feedback on usability and problems.

By creating a big data programme, Estonia wants to build up a platform where all these data are combined and used in a 2-way direction. Those databases can be connected to satellite services and can be regularly updated, e.g. all data regarding plant production, spreading of pests, etc. Estonia wants to have this in one open source system to enable the private sector, so they can concretely help the design of the environmental legislation for e.g. the use of fertiliser. The system should become self-supporting. Furthermore, Estonia wants to build a knowledge transfer programme to give farmers new ideas on how to use data in a more effective way, such as precision agriculture.

By creating a big data programme, **Estonia wants to build up a unique platform** where all these data are combined and used in a two-way direction. Those databases can be connected to satellite services and can be regularly updated. Estonia wants to have this in **one open source system**.

Furthermore, Estonia wants to **build a knowledge transfer programme** to help farmers give them new ideas how to **use data** in a more effective way.

7.2.9 EU projects on Digitalisation

The European Commission has already a lot invested and is still investing heavily in digitalisation for agriculture and related chain actors.

FAIRShare H2020 MA project (2018 – 2023)¹⁴⁴

Electronic data generation, analytics and communication technologies potentially enable more accurate, faster and better decision-making on farms, with huge potential to improve agricultural sustainability. There is a major focus on digitalisation by EU and national/regional policy-makers to ensure that **digital innovation in agriculture keeps pace with other sectors**

¹⁴⁴ <https://www.h2020fairshare.eu/>

and the benefits of digitalisation are available to the wider farming community. However, there is a danger that digitalisation and future innovations will be hampered unless the rural advisory community is mobilised to take ownership of digital tools and to advocate at the user interface. This Coordination and Support project will engage, enable and empower the independent farm advisor community, through sharing of tools, expertise and motivations. FAIRshare has two main programmes. Firstly, WPs 1, 2 and 3 will gather an evidence base of the digital tools and services used internationally, leveraging the social networks of partner institutions that span EU and non-EU countries. The inventory of tools will be accessible to end-users on an intuitively navigable online interface that has been co-designed using the Multi-Actor Approach. Accompanying the tools in the online inventory will be information, for instance short 'good practice' vignettes, on how the tools may be used/adapted for use. Secondly, WPs 4, 5 and 6 will generate and resource a participatory user cases, **empowering advisor peers from across the EU to** interact with the online inventory and, in a series of workshops, to **exchange, co-adapt, co-design and apply digital tools.** The FAIRshare user cases will enable advisors to address challenges to embedding digital tools in different advisory and farming contexts across the EU. Special focus will be on co-designing powerful communication and engagement approaches for advisors to advocate and inspire their peers and farmer clients, driving a social movement for the wider and better use of digital tools.

RECAP project

The RECAP project¹⁴⁵ (RE-inforcing CAP, 2016-2018) focused on digital solutions enabling the delivery of added value services mainly related to direct payments and cross-compliance. The RECAP H2020 project aimed at creating an infrastructure and developing information, making best **use of the satellite data available for the public authorities** and the whole agricultural ecosystem. **The project broke down this very complex legislation into practical everyday personalized guidance for farmers.** In that way, public authorities' procedures can be more transparent and more efficient. The project has achieved more targeted on-field inspections, a better control system based on satellite images & registry information and a reduction of costly & time-consuming procedures, for paying agencies. For farmers, the project contributed to personalised guidance, active participation, access to up-to-date information, reduction of administrative burden, a closer relationship with paying agencies and more transparent execution of controls. For advisory services and extension workers, the project helped to support farmers' compliance, data (availability, accessibility & re-use) and further possibilities for the development of digital services, under an open approach.

¹⁴⁵ <https://www.recap-h2020.eu/>, granted by DG Connect, focusing on E-public services

The SWG SCAR AKIS members asked questions to ensure whether this platform is really **open source** and how to build on it further? The coordinator replied that that is what they want to achieve. The platform has an **open license, all services provided will be opened**. The platform has been built to support the beneficiaries, the paying agencies. They will be the main users. However, farmers and advisors can use the platform. The way the platform will be used will be based on how the actors are linked to it. However, the data are provided by the public authorities. The public agencies are the main target groups for the platform and others can be stakeholders, who can take an interest but should be linked to the public authorities. It is **aiming at all beneficiaries of the CAP**: the platform can be used by anyone and the approach will be continued. There are already different approaches where services and tools will be provided: the platform can be used by anyone.

IOF2020

Another big EU-ICT H2020 MA projects is **IOF2020¹⁴⁶, an innovation action which explores the uptake of IoT technologies by food and farming industry** with 70 European partners involved. As requested by the MAA definition, IOF2020 embraces a demand-driven methodology in which public and industry consortium partners together with end-users from the agri-food sector are actively involved during the entire development process, aiming at cross-fertilisation, co-creation and co-ownership of results. The EU MAA in this project **incentivises new (ICT) projects, and** aims to create synergies between projects (e.g. the EU project SMART Agri Hubs started in February 2019). Cases in the project are actively supported by three work packages (WPs). WP3 facilitates sharing, reusing and finally integrating the IoT components. WP4 provides business support in terms of monitoring key performance indicators, **business models, market studies and governance aspects** (including security, data ownership, privacy, liability and ethical issues). WP5 facilitates the development and expansion of the various ecosystems on case and project level and beyond, amongst others by communication, dissemination, organizing workshops and events. This is realised by active **involvement** of European and national communities **from the demand- and supply-side of IoT, including associations and cooperatives from industry**, Technology Platforms, ERA-nets, etc. A mid-term open call will be used to accelerate developments. This approach establishes an wideIoF2020 collaboration space that is expected to sustain after the end of the project, for instance thanks to the industry involvement.

¹⁴⁶ www.IOF2020.eu

7.3 Data access – Vision of the farmers

The EU Code of Conduct¹⁴⁷ (CoC) of Copa-Cogeca on agricultural data sharing by contractual arrangements is about setting transparent principles, clarifying responsibilities and creating trust among partners to help release its full potential. The code is about data ownership, including a definition of what data are and how to regulate these. It is helping to provide services, to help

managing logistics in a way that they can have a better position in the value chain, not only for the farmer but for the whole family. The guidelines indicate that the farmer should have the power to control the data created on the farm. As they provide the data, farmers should be entitled to have a financial reward. Most valuable for the farmers is the trust in his product by the consumer, from farm to fork. However, some of the principles of the CoC were difficult to identify. For example, both farmer and machinery

Copa-Cogeca's views on the main principles underpinning the collection, use and exchange of agricultural data are multiple.

In order for the farming community to take full advantage of big data, it is necessary to create opportunities for farmers to **access existing data-bases** of the companies providing machines and services. The farming community must lead this process based on a vision for the sector.

manufacturer need to know how much yield was taken from a machine, in order to assess when it needs renovating or to be replaced.

All actors around the farm should be included for defining the next steps. At the moment Copa-Cogeca is in contact with several organisations and there is quite some international interest (e.g. Japan, Africa) to make this a global effort. Copa-Cogeca is also discussing a support system with DG Connect, which will cover the different sectors on ownership of data. The coming five years will be crucial: what kind of infra-structure will be put in place to implement the CoC? Which data can be made publically available?

The protection of the **ownership** of farm data is of the utmost importance, but it is even more important to ensure that farmers obtain a **fair share of the value** generated by farm data.

Data produced on the farm or during farming operations, should be owned by the farmers themselves, keeping their data private.

In short, Copa-Cogeca's views on the main principles underpinning the collection, use and exchange of agricultural data, are multiple:

¹⁴⁷ www.copa-cogeca.eu/img/user/files/EU%20CODE/EU_Code_2018_web_version.pdf

- innovation needs to provide concrete solutions and all farmers need to access latest technology in order to respond to dynamic markets and maintain high quality of agricultural production;
- the farming community believes that developing novel and sophisticated data processing systems to analyse farm data is a priority. In order for the farming community to take full advantage of big data, it is necessary to establish appropriate and robust data infrastructures, e.g. data centres, and services for data to be analysed and stored, as well as create opportunities for farmers to access existing data-bases of the companies providing machines and services;
- in order to maximise the potential benefits of the technological and digital transformation of agriculture, a coherent "EU Strategy on Technological and Digital Transformation of agriculture" is needed.
- the farming community must lead this process towards the "EU Strategy on Technological and Digital Transformation of agriculture", based on a vision for the sector;
- Copa-Cogeca is interested in contributing to the "Digital Skills and Jobs Coalition Initiative" which was launched by the Commission at the end of 2016, in order to under-score the importance of identifying the digital skills needed through training, knowledge transfer and guidance, to foster the uptake of digital transformation in rural areas;
- Copa-Cogeca welcomes the initiative "Smart Villages"¹⁴⁸ because the agri-food chain is a major driver of the EU economy and agriculture is the backbone of EU rural areas;
- the protection of the ownership of farm data is of the utmost importance, but it is even more important to ensure that farmers obtain a fair share of the value generated by farm data. This can be achieved through fair and transparent contracts, regulation, guidance, liability mechanisms and training services;
- data produced on the farm or during farming operations, should be owned by the farmers themselves and keeping their data private;
- contracts should clearly define

Contracts should not be amended without the prior consent of the farmer.

The **EU Code of Conduct of Copa-Cogeca on agricultural data sharing** indicates that the farmer should have the power to control the data created on the farm. **Providing data should be financially rewarded.**

¹⁴⁸ ec.europa.eu/agriculture/sites/agriculture/files/rural-development-2014-2020/looking-ahead/rur-dev-small-villages_en.pdf

the purposes for which the data can be used and how the relevant rights may be used, or for instance in combination with other data, how to handle derived data, and so on. Information should only be given to third parties as aggregate data. Contracts should not be amended without the prior consent of the farmer;

- personal data must be collected for a specific purpose and may not be further processed in a way that is incompatible with said purpose;
- the Commission and MS authorities should explore voluntary innovative ways to use ICT together with farmers and agri-cooperatives, in order to simplify controls and make them less costly and less bureaucratic, provided that data protection and intellectual property rights and the privacy of farmers are respected.

7.4 Knowledge reservoirs

7.4.1 Defining a knowledge reservoir

Knowledge reservoirs can be defined as a collection of different kinds of knowledge, expertise, best practices and methodologies, presented in different dissemination formats, tools and materials.

Knowledge reservoirs can be sectorial or cross-sectorial, stand-alone or connected to each other within and between the AKISs. The Multi-Actor Approach (MAA), that involves all actors of the value chain and focuses on the end-user's needs, has over the recent years transformed H2020 research projects in co-creation projects in comparison with projects from previous framework

The efficiency of the TNs can be improved by sharing standardised communication and dissemination tools and best practices with other TNs. For instance on how to make a TN rapidly 'visible' and in touch with end-users, on how to realise sustainability in particular on the long term.

For an optimal end-user's reach, a long term knowledge reservoir should be linked to existing farm channels like weather forecasts, local newspapers and familiar national websites for farmers.

programmes. As such, each TN or H2020 MA project can be considered as producing a knowledge reservoir that can connect to other MA projects, OGs and EIP or rural networks. From the experiences from H2020 TNs, Winetwork¹⁴⁹, Sheepnet¹⁵⁰, and SmartAKIS¹⁵¹ (see descriptions in Annex 1), several cross-cutting trends and

¹⁴⁹ www.winetwork.eu

¹⁵⁰ sheepnet.network

¹⁵¹ www.smart-akis.com

important aspects became clear that should be kept in mind for the elaboration of an efficient and high impact knowledge reservoir based on the Multi-Actor Approach and consequently co-creation and co-ownership principle.

One of the major challenges of TNs is how to ensure long term and easily available communication and dissemination to guarantee efficient uptake by the endusers, farmers, foresters and advisors and maximise impact. Solutions to connect the TNs to other H2020 projects lay in common communications, participation in shared events and common reflections to identify innovative practices. The efficiency of the TNs can be improved by sharing standardised

A generic website may be created with short descriptions and links to the individual project websites, which are built in a common format. Additional links should be made with EU, national and regional websites that are frequently used by farmers and advisors.

communication and dissemination tools and best practices with other TNs, e.g. approaches on how to facilitate participatory multi-actor meetings and on how to implement a web platform, on how to identify and transfer innovations, on how to make a TN rapidly 'visible' and in touch with end-users, on how to realise sustainability in particular

long term communication and dissemination, on efficient methods to involve a wider audience or specific target groups and on how to mitigate language barriers and interact with other H2020 projects, OGs and EIP networks or other rural CAP networks focusing on sharing of knowledge and innovation.

7.4.2 Major challenges to develop knowledge reservoirs and future prospects

As described in the chapter "The principles that make AKIS work", one of the major issues with TNs (as well as for other Multi-Actor Approach projects and all R&I projects) is how to enhance impact in terms of not only more efficiency, but also **wider dissemination of the results and acceleration of uptake by the end-user target groups and exploitation of end-user material produced**. Outputs should be continuously kept updated after the ending of the project. Sustainability may be provided in Multi-Actor Approach follow-up projects and in particular also through building digital knowledge reservoirs for long-term availability, maintenance of the knowledge rich infrastructure and feeding into existing channels.



7.4.3 Building and maintaining a TN website

Current TNs have different websites with different IT structures, formats and contents, depending on the actors involved in the project, the theme, the sector, the targeted audience and countries, and the outputs of the project. To be of high impact the results which should not only be of high relevance to the end-user but also **easily accessible and understandable, and this should be better facilitated**. Also the sustainability of the website is a key issue in terms of long term impact. Therefore, **a generic web-site or platform may be created with short descriptions and links to the individual project websites, which are built in a common format**. Additionally links should be made with EU, national and regional initiatives and websites that are frequently used by farmers, foresters and advisors. For long term dissemination channels, it is necessary to build up trustworthy databases and trust among its users. For an optimal end-user's reach, **a long term knowledge reservoir should be linked to traditional farm channels like weather forecasts, local newspapers and familiar national websites for farmers**. websites for farmers. This will be tested in the H2020 MA project EURAKNOS.

Further information can be read in the chapter on communication.

7.4.4 Creating an EU-wide agricultural knowledge reservoir

The state of the art up to date is that **a set of 34 H2020 TNs are producing knowledge for practitioners independent from each other and are organising a variety of knowledge data-bases on different agriculture and forestry-linked themes** that are related but not interconnected. Most

Ideally all TNs should be connected in one big EU-wide **open source** agricultural knowledge data-base or knowledge reservoir, focused to the end-users, farmers, foresters and their advisors mainly.

To be able to connect all knowledge reservoirs in a common open source infrastructure, a standardized framework should be developed. It should be a dynamic system with a self-improving feedback loop, with well overthought search options for specific farmers' needs, actions and different sectors.

existing networks are focusing on sectoral issues. Cross-sectoral issues are also tackled, although not so often. A typical example of a cross-sectoral TN bringing innovative approaches is the TN SKIN¹⁵², connecting consumers and producers in short supply chains.

Ideally all TNs and other MA H2020 projects should be connected in one

¹⁵² www.shortfoodchain.eu

big EU-wide agricultural knowledge base or knowledge reservoir, focused on the end-users, farmers, foresters and their advisors mainly. However, the implementation of such a EU wide open source system poses several challenges in terms of feasibility, user friendliness, access and sustainability.

To be able to connect all knowledge reservoirs in a common open source infrastructure, a standardized framework should be developed.

To ensure the sustainability of the content, projects should connect and build on each other.

What needs to be developed should be a dynamic system with a self-improving feedback loop with well overthought search options for specific farmers' needs, actions and different sectors. Indicators such as the number of hits for specific information or profile of the end-user, can be used for continuous monitoring, evaluation and adaptation of the system. A demo-system could be tested by e.g. farmers' schools, farmers' organisations or networks, advisors' organisations and universities of applied agricultural sciences.

EURAKNOS

The H2020 TN EURAKNOS¹⁵³ kicked off in January 2019 and will boost compiling of knowledge ready for practice by intensifying interaction between various agri-food or forestry TNs thereby maximising outputs for practitioners. The focus of this project is on widening existing TN outputs in an interactive way, both content-wise and in terms of geographical coverage, avoiding duplication with the existing networks. Cross-fertilisation will be organised between them and among countries, regions and production systems, using channels for farmers and foresters.

EURAKNOS will cross-fertilise by searching the best-fit harmonised approach for setting up future TNs in order to maximise the impact on practitioner, farmer and forester, hopefully resulting in a European agricultural knowledge and innovation open source system.

Moreover, the current TNs still insufficiently feed into the existing dissemination channels most used by end-users in countries. The standalone knowledge sources of the 34 H2020 TNs consist of knowledge, best practices and methodologies on specific agriculture and forestry themes. A number of them are already linked to some EIP OGs and H2020 MA research projects at

The H2020 TN EURAKNOS, kicked off in January 2019, will boost compiling of knowledge ready for practice by intensifying interaction between 34 existing agri-food or forestry Thematic Networks thereby maximising outputs for practitioners. The focus of this project is on widening existing TN outputs in an interactive way, both content-wise and in terms of geographical coverage, avoiding duplication with the existing networks.

regional or national level. In order to boost dissemination and at the same time conserve the practical knowledge for the long term, EURAKNOS will tackle the data management with a view to ensure sustainability of these knowledge networks and maximise their outputs for end-users. To this end, EURAKNOS will use a typical MAA approach. It will stimulate the exchange of existing approaches, methodologies and tools between the existing different TNs (and linked OGs and H2020 MA projects where relevant). EURAKNOS will cross-fertilise by searching the best-fit harmonised approach for setting up future TNs in order to maximise the impact on practitioner, farmer and forester. This project will also explore the end-users' needs and possibilities of setting-up a European agricultural knowledge and innovation open source system that may connect all TNs. It also creates the potential to link to other knowledge reservoirs in the future, e.g. from other funds or from national and regional projects. By the envisaged structured interaction, the flow of practical information across countries and regions in Europe will increase considerably, and thanks to the production of critical mass of practical information across Europe into one platform/website, the material will be more likely to serve national/regional education or vocational training purposes for farmers, foresters, advisors and any other end-user of project results.

EUREKA

As from 2020, broadening EURAKNOS is foreseen through the project EUREKA (RUR-17-2019), reinforcing the EU agricultural knowledge data base¹⁵⁴, to review activities and outputs of all MA projects, and the communication and information channels for dissemination used by Horizon 2020 MA projects other than TNs. This project will build on EURAKNOS and focus more on exploring the feasibility and added-value of developing joint tools, joint platform(s) and/or (e-) infrastructure integrating some or all of the outputs of projects into an EU wide open source system(s). It will propose options for the future of digital knowledge sharing for practice. Importantly, The project envisages that these options should connect efficiently to existing communication and dissemination channels within the national and regional AKISs.

A digital AKIS should take the approach of open source data management and make use of various digital tools to improve knowledge flows. The Horizon 2020 MA projects EURAKNOS and EUREKA are starting this process now.

¹⁵⁴ <https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/opportunities/topic-details/rur-17-2019>

7.5 Conclusions

7.5.1 Overall digital applications

On the one hand digital innovation offers unlimited and unprecedented potential for exciting **developments and interconnectivity within the digital AKIS** and rural development¹⁵⁵ through the implementation of novel digital structures and new technologies such as the Internet of Things (IoT), Artificial Intelligence (AI), robotics and big data. On the other hand, agri-digitalisation is a complex, inter-active process at multiple levels with still many challenges ahead related to smart and precision farming.

A digital AKIS should take the approach of open source data management and make use of various digital tools to improve knowledge flows. Key actors should identify and co-create new knowledge, identify best practices and connect best practice owners in order to enhance digital innovation through new business models in a co-ownership approach which benefits all actors. Although digital technologies in agriculture feature high on the European Union's agenda¹⁵⁶, much effort still needs to be done. EURAKNOS and EUREKA are starting this process now.

Through the implementation of digitalisation, **new opportunities have also arisen to connect different sectors with the agricultural value chain.** These connections are not only situated at the level of the bio-economy at large, but there are also digital linkages to cross-cutting issues that are strongly intertwined with agriculture, such as water quality, energy, climate, biodiversity, soil, animal welfare, that are also framed in the new CAP¹⁵⁷ and the sustainable development goals (SDGs).

Regarding bureaucracy, digitalisation should bring a reduction in administrative burden by simplifying and mainstreaming the fulfilment of legislative, and often environmental demands for data and information. This can be done by using sensors on farms and devices to better manage fertilization, irrigation, reduction of waste and also by providing information to answer growing societal and consumer concerns about the quality of agri-food products, production processes and environmental impacts. **The role of independent and holistic advice when handling digital tools becomes even more paramount.** Through the use of digital technologies and tools,

¹⁵⁵ https://ec.europa.eu/agriculture/sites/agriculture/files/events/2016/rural-development/cork-declaration-2-0_en.pdf

¹⁵⁶ https://ec.europa.eu/eip/agriculture/sites/agri-eip/files/eip-agri_brochure_digital_revolution_2017_en_web.pdf;
https://eige.europa.eu/resources/digital_agenda_en.pdf

¹⁵⁷ https://ec.europa.eu/agriculture/sites/agriculture/files/future-of-cap/future_of_food_and_farming_communication_en.pdf

farmers can effectively contribute to the transparency in the agri-food chain and to the production of more sustainable, safe and healthy food.

Allowing the farmer to participate in the digitalisation process, by being aware and picking the benefits, will however require concerted efforts and coordinated actions at several levels. **Farmers need an enabling environment particularly in terms of data access, data sharing and ownership with common standards and a regulatory framework.** Also, infrastructures that allow easy access, use and application for the end-users and the digital skills of the farmers, foresters and advisors, need particular attention. Several MSs have started to implement centralised digital infrastructures for the farmer e.g. data-platforms and are in the process of developing a digital agricultural strategy at national or regional level. There are substantial differences in digitalisation developments between different MS and regions linked with regional and/or local characteristics of the AKIS such as the farming sector, farm size, and farmers' and foresters' communities.

Also public-private initiatives to install data platforms or cooperative hubs to enable the collection of farmers' data (often sector bound), are being developed, in which data ownership is often an issue. An important study in this regard tackling the legal, social and ethical considerations of precision agriculture and digitalisation was made by the EU parliament¹⁵⁸.

Throughout the EU, research institutions and SMEs are developing a variety and heterogeneous set of digital tools such as decision support tools, apps, sensors, etc., in close contact with the farmer, which could make digitisation for small and medium sized farms accessible too. Huge potential, although not always appreciated by farmers, also lies in the combination of data registration with governmental systems for compliance with regulations, to correlate crop imaging data with soil data, early disease detection, use of information collected with crop sensors from crop protection and crop status documentation and the use of information from digital platforms as relevant info for markets (e.g. anonymous publication of input prices). The challenge will be to have and show the benefits of such digital applications to the farmer.

7.5.2 Digitalisation for AKIS knowledge flow purposes

In the EIP-AGRI concept, TNs and other H2020 Multi-Actor Approach projects have proven their added value in collecting relevant data, best practices and innovative solutions for farmers and foresters in different knowledge

¹⁵⁸ [http://www.europarl.europa.eu/thinktank/en/document.html?reference=EPRS_STU\(2017\)603207](http://www.europarl.europa.eu/thinktank/en/document.html?reference=EPRS_STU(2017)603207)

reservoirs, often linked respectively to individual open access platforms. To maximise impact and sustainability, there is however a strong need to interconnect to this practical knowledge in easy accessible, user-friendly and self-correcting EU wide open source system for the farmers, foresters and advisors, and to connect to similar initiatives at national level. Interoperability of the different systems is key to create an EU-wide open agricultural knowledge base, as part of the digitisation and knowledge sharing process. To maximise the impact, the selection of the kind of information and data that should be stored, is critical. With the structural implementation of such an EU wide open source system, not only technological but also social and economic aspects should be strongly taken into account, such as accessibility, language, readability, the profile of the farmer and economic impacts.

7.6 Recommendations

Based on the work and discussions performed during the 4th SWG SCAR AKIS mandate, the following recommendations can be made for digitalisation in agriculture:

- digitalisation in agriculture should be high on the EU and MS political agenda and concerted efforts are needed for the agricultural sector, not to lag behind in the digitisation era;
- the benefits for the farmers must become the core objective and be clearly demonstrated when developing, implementing and applying digital tools;
- small and medium sized farmers should be enabled to participate in the process of digitalisation through facilitating applications adapted to their needs and bringing them economic and social added value;
- innovative business models have to be developed to be able to implement digitisation in agriculture and to benefit the end-user and/or provider of data;
- infrastructural aspects should be considered such as broadband and smart phone availability and connectivity, the speed of the broadband and interoperability standards;
- a transparent and open source framework should be promoted for agricultural data, with the need of common regulations and standards for data exchange, to protect data ownership while allowing business developments bringing mutual benefits with the data owners;
- farmers should be educated and trained, to be able to use digital advisory tools, to acquire the necessary media and technical skills for the digital era. Special training courses and education modules should be developed for farmers and advisors, in particular for the major (older) segment of the farmers' communities;

- impartial, holistic and neutral advisors are key in supporting the farmers with the adequate choice and the use of digital applications. The on-going H2020 Multi-Actor project FAIR-Share is already collecting and promoting the uptake of digital tools;
- results from early adopters could help to set good examples;
- researchers have to develop a listening behaviour, taking into account the social and economic context and the needs of the farmer in the digitalisation process and problems to be solved on the field;
- smart farming needs to be a service for the farmer communities, while data stay owned by the farmer;
- involvement of all actors in early stages of the digitisation process and aspects thereof, is continuously needed to create co-ownership and to build useful, practical applications responding to the needs;
- there is a strong urge to stimulate the knowledge flows within the digital AKIS at national and EU level. Enhancing connectivity between different levels, projects and actors can be achieved in different ways, supported by funding programmes for dedicated projects, joint workshops, connecting of AKIS-related digital platforms, cross-border exchanges, etc.;
- there is a need for an overarching Multi-Actor international network for benchmarking and cooperation;
- synergies between funds and networks created at European and national level should be created, to enhance the innovation capacity for digitalisation in agriculture and forestry;
- knowledge reservoirs and/or existing digital AKIS platforms at national and European level should be interconnected to exchange knowledge and experiences to enhance sustainability, enable monitoring and valorise the implementation of knowledge;
- interoperability of digital infrastructures and co-creation in a sustainable way are key to digital connection of knowledge and actors;
- an exhaustive overview of the state of the art of the digital AKISs in the different MSs and an exchange on digitalisation elements and strategies is needed to be able to learn from each other and work towards an EU wide digital AKIS in which farmers' needs and competitiveness are the driving element.





8 Towards the 5th SWG SCAR AKIS mandate

8.1 Background and Impact of the SWG SCAR AKIS

The Strategic Working Group (SWG) of the Standing Committee for Agricultural Research (SCAR) on Agricultural Knowledge and Innovation Systems (AKIS) operates as a think tank providing insights for a better understanding and development of AKIS systems in the EU. The different mandates have allowed the SWG to develop a narrative for implementing a strategic approach to AKIS systems within the political and socio-economical context of the EU Member States and regions, and globally. The successful activities of this very participatory group, supported by external expertise, dedicated studies and specific AKIS related H2020 projects, have provided the EC, the EU Member States and all interested actors a set of ideas, tools, best practices and recommendations for reflections on their AKIS and an efficient and coherent use of the different instruments which contribute to the EIP-AGRI (Agricultural European Innovation Partnership) in the EU. The SWG SCAR AKIS has significantly incentivized agricultural and forestry innovation through linking existing policies and instruments, which is a main aim of European Innovation Partnerships as set out in the 2010 Commission Communication Innovation Union¹⁵⁹. The SWG SCAR AKIS co-created dedicated Horizon 2020 formats for incentivizing interactive innovation (Multi-actor projects and Thematic Networks). These formats are now in place, consortia have started and some already completed their work, and it has proven to be very useful and fruitful to continue exchanging and discussing outcomes for enhancing and improving interactive innovation.

The synergies between EU policies created by the EIP-AGRI¹⁶⁰, linking the H2020 Multi-Actor Projects and CAP funded innovation projects of Operational Groups, are becoming more and more visible and are planned to be further amplified in the period 2021-2027. Sharing experiences on AKIS, the Multi-Actor Approach, policy incentives and knowledge infrastructures support these further developments. In particular now that we are on the way to the post 2020 CAP Reform and a new framework for Research and Innovation (Horizon Europe). The work undertaken by the SWG SCAR AKIS in mandate 4 showed that interactive, Multi-Actor innovation is of vital importance to live up to the current and future EU and global demands for sustainable agricultural production and consumption. Therefore the group proposes to continue its

¹⁵⁹ <https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM%3A2010%3A0546%3AFIN%3AEN%3APDF>

¹⁶⁰ Commission Communication on the European Innovation Partnership 'Agricultural Productivity and Sustainability'
<https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52012DC0079&from=en>

pivoting networking and role as think tank on AKIS for both the EU Member States and the European Commission, by presenting its 5th mandate proposal.

In short, the 5th SWG SCAR AKIS mandate will consist of the following 5 themes and 1 collaboration theme. For each theme, the main objectives and **expected impact** are:

- AKIS policies at national and EU level feeding further EIP synergies: to support the European R&I community on their way towards well-functioning and effective AKISs and the implementation of EIP-AGRI;
- achieving greater impact of the Multi-Actor Approach (MAA) implementation in EU AKISs: to set-up and implement more impactful MAA projects in the field of agriculture and interrelated fields, where some of the deliverables are useful blueprints to solve national and regional challenges ;
- the role of Education in the EU Agricultural Knowledge and Innovation Systems: to raise awareness of Member States to include education at several levels in their AKIS and to highlight the importance of effective interactive education to EC DGs;
- social innovation and inclusiveness in AKIS: acknowledgement and recognition of the real need for Member States to include social innovation in their AKIS strategy and action plans, taking into account the full range of rural socio-cultural contexts in the different Member States;
- digitalisation and E-infrastructures for knowledge exchange: to improve the management of digital applications and tools enhancing effective knowledge flows in AKISs.

Collaboration theme:

Collaboration on AKIS related issues with different SCAR Working Groups, the Steering Group of the SCAR and the relevant networks/platforms in order to step up the impact of SCAR advice to the Member States and the EC on the coordination of agricultural R&I.

As the former mandates' experience has shown, the themes' challenges and impacts may evolve over the period of the mandate and further related actions may need to be taken.

8.2 SWG SCAR AKIS 4th Mandate (2016-19)

In the previous fruitful period, the 4th AKIS mandate addressed 6 main topics:

- to improve the integrated approach within the European AKIS and the Implementation of the EIP;

- learning and feedback from interactive projects approaches (in particular Multi-Actor Projects, thematic networks and operational groups);
- knowledge flows along the whole production/value/supply chain in the AKIS for the future;
- cross- fertilization with other EIPs and sectors:
- analysing the perspective of AKIS in Food and Nutrition Security and Sustainable Agriculture across developing countries;
- monitoring interactive innovation policies and benchmarking for sustainability.

This period will close with the publication of the 4th Mandate’s SWG SCAR AKIS final report. Along its mandate, the SWG SCAR AKIS 4 already published the following outputs¹⁶¹, which are all included in this final report.

Policy briefs:

- Policy Brief on the Future of Advisory Services;
- Policy Brief on New approaches in Agricultural Education Systems;
- Policy Brief on Programming Research and Innovation for Improved Impact (a joint action by SWGs ARCH, AKIS & Food Systems).

Reports:

- Summary Exchange of views on how to improve MSs' Agricultural Knowledge and Innovation Systems Strategic Working Group on AKIS;
- Agri-food SMEs collaborating for innovation along the supply chain - What, who, how? A joint action by SWGs AKIS & Food Systems, DGs RTD and AGRI¹⁶²;
- Studies funded by the CASA EU project:
 - Synergies among EU funds in the field of Research and Innovation in Agriculture ;
 - Inventory of Research and Innovation Infrastructures improving knowledge flows in the field of Agriculture.

The Member States have gained valuable insights on the Mandate’s themes through the presentations, discussions and reflection in the group meetings and through several key events to which members of SWG SCAR AKIS contributed.

¹⁶¹ <https://scar-europe.org/index.php/akis-documents>

¹⁶² <https://ec.europa.eu/research/index.cfm?pg=events&eventcode=36A76C00-99D3-52DE-5D0E57981288B8EA>

8.3 Proposal for activities in the SWG SCAR AKIS 5th Mandate

Although many subjects and issues have been touched upon in the first 4 AKIS mandates, the group's dynamics, newly emerging themes, international commitments and the further development of the EIP-AGRI seeking European AKIS structuring, advocate for a seamless continuation of this SWG under a 5th mandate. In this context the following 5 specific themes and 1 cross-cutting theme are proposed for SCAR SWG AKIS 5th mandate, to be covered over a time span of approximately 3 years. For each theme, the main challenges currently emerging are presented, as well as possible actions and related deliverables.

8.3.1 AKIS policies at national and EU level creating further EIP synergies between agriculture, research, innovation and education policies

Challenge: AKIS is the core of the SWG, and the new AKIS policy is also the core of the next mandate. It includes not only exchange of best practices on AKIS in post-2020 CAP Strategic Plans but is also an important topic for continued exploration via Horizon 2020 and Horizon Europe (e.g. various thematic networks and MMA projects LIAISON, FAIRShare, AgriLink, EUREKA, EURAKNOS, NEXTFOOD on education and NEWBIE, all currently funded under H2020). The challenge is broad, since the A in AKIS does not only refer to the narrow delimitation of agricultural sectors, but includes all fields interrelated with agriculture and forestry, from innovation in agro-ecosystem services, biodiversity and the environment, landscape and territorial elements, raw materials, agricultural co-/ by-products and circular economy, zero waste movements, carbon footprints and challenges relating to climate change, the urban-rural dimension (improving interrelations and partnerships among rural and urban areas), the bio-economy, to consumer-driven innovation in rural areas or cities, and the organisational changes needed for long term sustainability in land use and food production. How can AKIS be supportive in all these fields? How can AKIS be supportive for SMEs/start-ups: what kind of knowledge do they seek and use in their operations, what institutional support do they receive? How to tackle the growing need to improve communication with the society and to engage with people from outside the farming sector?

The synergies developing under the EIP-AGRI between the CAP and Horizon Europe are dependent on well-functioning AKISs and increasing multi-scale connectivity within Europe which needs further reflection in order to build a genuine European Research Area. A main challenge in this regard remains the too limited focus within agricultural/rural development Ministries, and a

disconnection with Ministries responsible for (higher) Education/Research and Environment to tackle farming systems' sustainability transition. There are difficulties of understanding between program coordinators and project managers and a strong need to create pathways for researchers to improve quantitative and qualitative participation in MULTI ACTOR APPROACH projects. Most researchers in the agri-food/non-food sector are integrated in public institutions that are not sensitive to agricultural policies, nor to disseminating results widely to extension/advisory activities. Advanced know-how or improved awareness does not necessarily lead to better results. So a fundamental question is how AKIS enables actors to move from a better attitude to a better conduct. Measuring innovation is complex. There are many external factors which influence the successful introduction of new products, processes and services in practice. The SWG SCAR-AKIS intends to continue its role as a think tank on knowledge and insight on AKISs in the EU and Member States.. The SWG will tackle the complexity by focusing on exchanging knowledge and analysing lessons learned (both critical success and fail factors) in enhancing innovation and AKIS' practices. A concept of pathway to measure impact at the research proposal stage is emerging, similar to what is happening in social research and innovation: how can improved preparation of Multi-Actor partnerships and projects support this?

Actions: (1) Take stock of existing knowledge on AKISs in the EU to review policy elements impacting the AKISs at MS level and at EU level and (2) explore possible settings for policy recommendations. For AKIS to be **embedded** in the 'real world' of practical agriculture, forestry and rural development, there needs to be an integration and frequent interaction between the various MULTI ACTOR APPROACH projects, the CAP networks at regional, national and EU level, as well as the research bodies, the advisory bodies, farmers'/foresters' organisations, cooperative organisations and all other actors in fields interrelated with agriculture, including the agri-food/non-food sector and forestry. It is also important to learn more about the good examples of how program owners (EU or national funding bodies) and project managers are supported in better understanding, communicating and evaluating. The capacity/role of the CAP networks at national/regional level and their interaction with the CAP network at EU level may be explored, as well as seeking enabling factors for the emerging concept of EIP-AGRI OGs at transregional or transnational level.

Deliverables: This work will result in a comprehensive report that will help the European R&I community, advisors and (CAP) networks on their way towards well-functioning and "effective" AKISs and the implementation of the EIP-AGRI. We will collect good examples and ideas of strategic actions to take, how to set up effective networking in a knowledge and innovation system, and adapt researchers and advisor's activities to their broader roles (collecting and tackling practice needs, innovation brokering, facilitation,

dissemination, communication). We will collect a variety of incentives on how to: better draw in researchers in the innovative co-creative projects and strengthen regional, national and transnational networking; make researchers more interactive with farmers, advisors, representative organisations and regional and national authorities. In short, how to improve the impact of R&I as described in the dedicated Policy Brief on impact of R&I made during the AKIS 4 mandate. We will also look for best practices on how to evaluate positive AKIS elements without decreasing their effectiveness with administrative burden (using good examples from on-going and future projects such as Liaison or already existing evaluation guidelines on innovation e.g. those found through the 2019 CASA study on AKIS). It is proposed that the results will be **broadly disseminated and communicated** with the SCAR, in side events and with other SCAR SWGs and in joint workshops with e.g. Food Systems, ARCH, the Bio Economy group and potentially other groups, to further discuss the role of AKIS and recommendations to improve their impact on sustainable agriculture.

8.3.2 Achieving greater impact of the Multi-Actor Approach (MAA) implementation in EU AKISs

Challenge: The objective of this topic is to learn from the implementation of the Multi-Actor Approach projects in a variety of AKISs at all territorial scales (regional – national – European) and to improve our understanding of the process in order to increase the quality of the genesis, the organisational setting and the activities of Multi-Actor Approach projects, eventually to achieve a greater impact on all farming related sectors and rural areas of the high value knowledge developed.

Questions related to the dynamics of Multi-Actor Projects, the emergence of place-based approaches and living lab concepts, the challenge of implementing Multi-Actor Approach projects at all territorial scales, as well as the broad availability and uptake of results will form part of the challenge to tackle. Further reflection is needed on how to move from projects to answering challenges at regional and national scale, and how to fuel a more active involvement of the grass-root farmers' community in Multi-Actor Approach projects, potentially through intensifying, improving and taking a layered approach to networking. On the other hand, how to downscale knowledge from Horizon 2020 or Horizon Europe projects to farmers, as they are big projects with many partners but possibly with only one local partner in one specific work package involved for a limited period of project time. Is a targeted follow-up of research and innovation projects towards exploitation and implementation of their results possible? How to correct the focus on funding projects to a focus on transforming the sector and increasing the impact of knowledge?

Actions: The work will focus on key areas of the Multi-Actor-Approach such as learning from a number of Flagship H2020 projects, brokering and innovation support services supporting enabling environments, interactivity and capacity building within Multi-Actor Approach projects, and scaling up and scaling out the innovations, with attention also for SMEs. We will explore the possibilities and relevance of enabling a targeted follow-up of RIA projects towards exploitation and implementation of their results. The role of advisory services / advisors in knowledge transfer in Multi-Actor Approach, namely the participation of different advisory structures and models on dissemination, communication and exploitation activities, will also be further analysed.

Deliverables: This work will result in recommendations for the European R&I community to set-up and implement more impactful Multi-Actor Approach projects in the field of agriculture and interrelated fields including rural development, through formats such as dedicated thematic workshops and related guidance, and through reports.

8.3.3 The role of education and training in the EU Agricultural Knowledge and Innovation Systems

Challenge: The objective of this topic is to learn and better understand education as an important part of building AKISs which require an effective involvement of the farmers and other linked supply chain actors. During the 4th mandate of the AKIS SWG a Policy Brief **on New approaches in Agricultural Education Systems, including** educational good practices, was written. The development process of the policy brief highlighted that this theme is crucially important for well working AKISs, especially in connection with generational renewal, digitalisation in agriculture, the transition to agricultural sustainability and farmers' lifelong learning challenges. Another challenge is identifying and deploying solutions for a broader scope for learning, experimenting, and making knowledge more accessible to ALL farmers and interconnected AKIS actors, thus creating a virtuous circle aiming also at developing new knowledge. New education models and the digitalisation of education form part of this circle (e.g. e.g. participatory education and curriculum planning, moocs, e-learning, blended learning). Furthermore, agricultural education and training are key to keep the human resources that AKIS and the agricultural sector needs for its future. Also researchers' capacity to participate in interactive innovation projects and how to work with farmers needs attention (skills, attitude, behaviour).

Actions: Find answers on how new agriculture students and farmers could acquire the skills and competences of effective learning, problem solving and interacting with society. Collecting the best practices of attracting and keeping students, professionals and farmers in agricultural lifelong education, and

exploring innovative, best tailored agricultural education practices. It is also important to collect good practices of generation renewal farmer-to-farmer learning. This includes direct and indirect transgenerational knowledge sharing, at different levels and oriented to diverse target groups such as farmers, researchers and advisors. Activities should help raising farmers' and agri-food/non-food SMEs' awareness on the benefits of the adoption of new processes, such as digitalisation and others. Reflections will also revolve around the growing importance of teaching new topics to students/farmers/SME supply chain actors, e.g. digital skills, bio-economy, consumer preferences, management skills, new business models, soft and interactive skills etc. Exchange good practices and develop approaches on how to design an efficient and attractive Erasmus exchange program for young farmers/farmers and advisors. Exploring and highlighting the importance of teaching the skills of problem solving, system thinking and interaction with society, or possibly include a focus on the education of consumers. Discuss the integration of AKIS and Multi-Actor Approach within the education system, and in particular (1) how to better integrate educational organisations (of different types and levels) in Multi-Actor Approach projects, EIP Operational Groups and Thematic Networks, and in the AKISs at large, and (2) how to promote convergence between CAP/Horizon Europe/Educational programmes of the EU.

Deliverables: Raise awareness of Member States to include educational programmes with interactively updated content in their AKIS strategies and action plans and to highlight the importance of effective interactive education to Commission DGs listening to the SCAR groups. To support this process we would dedicate a number of slots in our meetings to education, inviting relevant non SCAR AKIS stakeholders and write a detailed report showing the best Member States' practices of solving the related main challenges, and a roadmap to an efficient Erasmus programme for farmers and SME supply chain actors. The relevant presentations and report could also serve MSs' AKIS plans to improve farmers and other supply chain actors' skills for instance on digital issues, interactive innovation, system thinking etc. It will provide recommendations to communicate to young people that agriculture, including AKIS an attractive place to work.

8.3.4 Social innovation and inclusiveness in AKIS

Challenge: Social innovation involves rural communities (including communities of farmers) finding creative solutions to the complex social challenges they face. These challenges are linked to location, generational renewal, status, lack of willingness to cooperate, poor infrastructure and rural services, lack of skills for picking up new opportunities such as development of smart villages, care farming, consumer-producer short supply chains, agri-tourism, rural commons etc. Social innovation is an important aspect of

innovation under LEADER, EIP-AGRI and Smart Villages initiatives and also an important topic for continued exploration via Horizon Europe projects (e.g. SIMRA and NEWBIE projects currently funded under H2020). Challenges include social entrepreneurship and the development of new social business models, as well as consumer-driven innovation and the urban-rural dimension (urban farming/forestry and social innovations in food chains, as well as topics which engage city people such as agro-ecology).

Actions: Collecting best practices seeking elements of existing national/regional AKISs which function to foster social innovation. Analyse successful cases of replication and scaling-up of social business models, as well as the capacity to build regional and international initiatives by promoting cross-links between local agriculture / rural development actors and social entrepreneurs. Promoting social innovation with significant impact on the 'real world' of practical agriculture, forestry and rural development through identifying lessons learnt for an effective AKIS reaching this objective. Analyse the fitting of these social innovation actions on the rural development and R&I policies.

Deliverables: Acknowledgement / recognition of the real need for Member States **to include social innovation in their AKIS strategy and action plans**, taking into account the full range of rural socio-cultural contexts in the different Member States. Collection and categorisation of examples of good practices for fostering and scaling up social innovation. Recommendations for an integrated approach to strengthening the AKIS for social innovation, making sure that conditions are met for social innovation to occur through the workings of the AKIS.

8.3.5 Digitalisation and E-infrastructures for knowledge exchange

Challenge: SWG SCAR AKIS should focus on (1) how digitalisation supports AKIS and (2) how AKIS supports digitalisation. The future of agriculture and forestry will rely on digitalisation and so will AKISs. Strategic advice, planning and support on digitalisation and E-infrastructure is needed related to knowledge and data exchange, communication, dissemination and exploitation. Questions cover: data management of Findable, Accessible, Interoperable, Reusable (FAIR) data, as well as issues related to security (authorisation, etc.); to the potential of sharing of public data as a lever for the digitalisation of the sector while respecting ownership of data; the use of private data, acknowledging personal data under GDPR and the Code of Conduct for agricultural data exchange; taking into account the value of data for farmers *and* the value chain. While IT companies and large scale, multinational agri-food companies develop their businesses based on digitalisation, the question is also how family farmers and agri-related SMEs

can capture more benefit and improve efficiencies through digitalisation? Is this measurable?

Actions: Collecting best practices on how AKIS can support digitalisation, covering a broad spectrum of themes, e.g. the Smart Villages approach, Knowledge Reservoirs of use for agricultural practice (but not limited to only primary production), Smart Farming techniques, building interrelations between data from various sources (agriculture, eco-systems, food/bio-economy industries, research etc.) to make them more useful. The group should seek elements of existing national/regional AKISs which foster a sound and open data management of benefit for all (creating win-wins). Discussions may evolve around the relationship of the public with the private – what should be open/public, what should be private. Reflections on which private business models are implemented: which impact have they on the community and on the (limiting of) fluency of sharing of knowledge within the AKIS? Explore how to make the digitalisation process more inclusive using novel ways for small and medium size farmers and SMEs to adopt technologies, in this way supporting a well-functioning AKIS.

Deliverables: Report of the discussion in the SWG AKIS meetings on the best practices of management of digital applications and tools enhancing effective data use and knowledge flows in AKISs. Collecting and providing inspiration on how well-functioning E-infra structures and digitalisation can support each other.. Propose actions and policies to promote more inclusive and fair digitalisation processes in the agri-food sector in Europe.



Collaboration theme between the various SCAR WGs and networks/platforms for greater impact

The objective is to continue and extend the collaboration between different collaborative or strategic Working Groups and the Steering Group of the SCAR and the relevant networks/platforms, on cross-cutting and cross-sectoral topics for more efficiency, streamlining and impact to foster SDG EU commitments, with a view to organise joint activities on:

- Specific topics between SCAR WGs and/or networks/ platforms, such as for example exchanges on agriculture and aquaculture, agro forestry, etc....
- General topics between SCAR WGs and/or networks/ platforms, such as the impact of improved AKISs, the role of education in AKIS, the systems approach, the actors' oriented approach which recognises the role played by human behaviour and psychology, and the role of sustainable agricultural production and consumption, perception of consumers on sustainable agriculture and consumption, biodiversity, and the environment.

This should lead to further cross-fertilisation between SCAR SG, SCAR CWGs/SWGs and various networks/platforms, lessons learned from these exchanges and recommendations to enhance further collaboration in order to step up **the impact of the different SWGs in giving advice to the Member States and the EC on the coordination of agricultural research and innovation.**



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Annex : Overview of SWG SCAR AKIS 4 Meetings Presentations (2016-2018)

Introduction

This annex includes presentations addressing the topics of SWG SCAR AKIS Mandate 4, which have been provided and discussed during the SWG SCAR AKIS plenary meetings and contributed to this report. Some presentations have been left out if these topics are comprehensively described in the main chapters of this report, as well as the detailed presentations by SWG members on SCAR AKIS related topics in their member states. Almost all presentations can be made available if useful and the reports of most meetings are available on the SCAR website¹⁶³, for more information. All these presentations and discussions contributed to the work of SCAR AKIS' Mandate 4, summarised in this main final report 'Enhancing Interactive Innovation in Agricultural Knowledge and Innovation Systems.'

The presentations are shortly described per Plenary Meeting in chronological order.

1st Meeting, 6-8 April 2016, Barcelona (ES)

Topic: AKIS in Food and Nutrition Security and Sustainable Agriculture across developing countries

Mediterranean Innovation Partnership (MIP) for youth entrepreneurship and technological transfer in the agro-food sector

Claudio Bogliotti, CIHEAM (IT)

The Mediterranean Innovation Partnership (MIP) for youth entrepreneurship and technological transfer in the agro-food sector, is a partnership among institutions committed to the innovation and technological transfer of knowledge, experience, know-how and good practices in the agro-food sector in their countries. The vision is to create a continuous growing environment for sharing and for the development of knowledge and skills, to support the future of new generations of innovative agro-food entrepreneurs in the Mediterranean. The mission is to connect the Mediterranean actors of the innovation ecosystem in order to favour:

- the growth of an entrepreneurship culture among young people, entrepreneurship creation and innovation;
- the development and search of methods, tools and practices for sharing, transfer and cogeneration of knowledge;

¹⁶³ <https://scar-europe.org/index.php/akis-reports-meetings>

- the enhancement and the reinforcement of institutions and innovation support organisations (ISO) involved in the innovation processes and their collaboration in the Mediterranean area.

The MIP addresses the need of a regional approach to increase opportunities for innovation. The aim is to activate the multiple actors in a quadruple helix approach and to encourage participative and collaborative approaches. MIP will foster access processes, mobilization and knowledge sharing based on local and regional operator's needs and create an open and collaborative technological ecosystem.

Topic: Synergies for enhancing interactive innovation

Smart Specialisation and synergies in Agro-Food related Priorities

Mathieu Doussineau, Smart Specialisation Platform (EC)

The Smart Specialisation Platform was created in 2011 to provide science-based professional advice to EU national and regional policy-makers for the establishment and implementation of their Research & Innovation Strategies for Smart Specialisation (RIS3), to make better use of the European Structural and Investment Funds (ESIF) and thus contribute to the Europe 2020 goals.

How to achieve synergies? It can be about: 1) successive projects that build on each other, 2) parallel projects that complement each other, 3) cumulative funding: bringing together Horizon 2020 and ESIF money in the same project and 4) alternative funding, taking up high quality project Horizon 2020 proposals for which there is not enough budget available and implement it via ESIF. There are 2 main principles: 1) the local (non-EU) co-funded element must still be in place and 2) the same cost item cannot be double funded (see the Synergies Guide for Combined Funding Scenarios¹⁶⁴). There is no derogation from the non-cumulative principle in the regulations on Erasmus+, Creative Europe, CEF and COSME18, meaning that for these programmes a combination of funds within the same project is not possible (see p. 57 of the Synergies Guide). Problems with cumulative funding are e.g. synchronising the timing and defining the cost items. The following fragmentation of innovation policies at EU level (SEG, 2011) exist: 1) sub-optimal coordination of R&I as well as cohesion policies at European, national and regional level, both within and between these levels; 2) lack of common strategies related to Europe 2020; 3) lack of a coherent and interacting governance structure; 4) weak complementarities / compatibilities / interoperability of policies and programmes, particularly regarding the regional dimension in R&I policy and the R&I dimension in regional policy; 5) lack of instruments aimed at

¹⁶⁴ http://s3platform.jrc.ec.europa.eu/documents/20182/114990/JRC92829_Synergies_EU_R%26I_Funding_Progs.pdf/2300a545-5902-46a9-b5e6-8cd286020fb9

supporting the pooling of European and national funds; 6) poor communication, coordination and cooperation between actors and stakeholders at all levels. Synergies as the alignment of and cooperation between policy frameworks, programmes and actions are allowing more and better attainment of their objectives.

RIS3 in Catalonia

Tatiana Fernández Sirera, Directorate General for Economic Promotion, Competition and Regulation of Catalonia and Mariona Sanz, Director of the Business Innovation Unit of ACCIÓ: Innovation Agency of Catalonia (ES)

The priority challenge of the Catalan Research and Innovation Strategies for Smart Specialisation (RIS3CAT) is to make the R&I system and the production system work together, in order to create economic and social value. The main challenge is to translate knowledge and technology into competitiveness, increase exports and generate more jobs. The RIS3CAT has four pillars: 6 key enabling technologies (pillar 1) as the main instrument for transforming the business fabric of the 7 leading sectors (pillar 2) in which Catalonia has competitive advantages, critical mass and future opportunities, and for generating new scientific, technological and economic opportunities (pillar 3). Improving the innovation environment (pillar 4) is very important for the success of the RIS3 strategy, although these public policies are not included as such in the RIS3 action plan. The Catalan RIS3 action plan includes 12 instruments financed by European funds.

RIS3CAT Communities are groups of companies and agents of the R&D that drive an action plan in the field of R&I for the economic transformation of the productive activities of leading sectorial areas. Communities encourage collaboration between companies and stakeholders from the leaders to carry out joint projects plans investment in R&D to improve the competitiveness of companies in Catalonia in the global market. Communities get a competitive, accreditation. The Government of Catalonia will give them the option to apply for European funds for their plan of action.

Topic: Lessons learned from Interactive Innovation Projects in Catalonia

Traditional and modern common wheat varieties production for artisan bread making

J. Serra, Fundacio Mas Badia et al. (ES)

The project objective: to come to qualitative artisan bread production incorporating proximity, respect of the environment (integrated production) and the use of singular plant material as differentiation factors. Project members: representatives from all the bread production chain: 1) farmers, 2) the flour industry (Farines Sunyer and Farinera Coromina), 3) bakeries (the Artisan baker's guild of the Girona region) and the research Centre Mas Badia

Foundation. The expected project results: 1) flour for quality bread (quality wheat/flour – artisan baker's talent), 2) flour for integrated production certified wheat (guarantee of environmental and human health respect), 3) proximity – Km 0 (local farmers, mills and bakers), 4) old and ancient bread varieties (SOISSONS and FLORENCE AURORA) and 5) to create a production area for these types of bread.

The Fruit.Net program

Vilardeli, P., IRTA-Mas Badia et al. (ES)

The project objective: to reduce the treatments and minimisation of residue levels in fruit with focus on market demands. Project members: the fruit sector of Girona, the ministry of agriculture and IRTA Mas Badia. The expected project results: 1) to eliminate post-harvest fungicide treatments, 2) to develop effective strategies based on field applications of chemical and/or biological products, 3) to develop strategies for cleaning and disinfecting packages, surfaces and atmospheres in fruit and vegetable plants to reduce inoculum sources, 4) to evaluate post-harvest strategies to eliminate or reduce residue levels (washing) and 5) to establish management strategies specific to each variety (or group of varieties).

Water saving in rice cultivation through the introduction of innovative cultivation techniques

Albert Grassot, CCRR del Molí de Pals et al. (ES)

The project objective: to introduce agronomic techniques and innovative processes allowing water savings, such as: 1) buried seeding and subsequent flooding, 2) aerobic drip irrigation and intermittent irrigation. The secondary objective: to measure rice As and Cd concentration in the different cultivation systems. Project members: Molí de Pals irrigation community, Right-hand Ebro Delta Canal irrigation community, Responsible for the water management of the right-hand side of the lower Ebro river, Pals rice Plant Protection Association, Farratges del Baix Ter, El Restallador, Arròs l'Estany de Pals, IRTA Mas Badia, IRTA EE Ebre and the engineering and irrigation management research group of the University of Girona. The project results are expected to lead to water savings of 10 to 50%. The tested systems may facilitate a greater control over apple snails, a significant reduction in the level of arsenic in rice grain and in the production of greenhouse gases (methane) in the rice fields. On the other hand, they may aggravate weed control problems, as no effective active materials are authorized in aerobic soil for rice cultivation.

Topic: Education and AKIS

Vocational training: key element of the Catalan AKIS system

Jaume Sió Torres, Department of Agriculture, Livestock, Fisheries and Food, Catalonia (ES)

The agri-food vocational training system in Catalonia exists of: 14 Agricultural Schools (Dept. of Agriculture (DARP), 10 Secondary Schools with some specialization in agricultural training (Dept. of Education) and many Agricultural Organizations, Universities and other institutions. All of them are involved in vocational and lifelong education in the agri-food sector under the coordination of the agricultural schools. The aim is to invest in human capital for training, knowledge transfer and advisory services. Topics to improve the AKIS system are the following. The professionals of the agricultural sector are very open to receiving training (breaking the stereotype that the agri-food sector is impervious to change). Flexible training models should be adapted to the needs of the entrepreneurs (distance training and learning-by-doing). Ad-hoc training programs should be created in order to facilitate knowledge transfer of new findings coming from on-going research projects. Organise collaborative projects with the sector, integrate minor sectors (such as cheese, wine, honey) and include "Innovation Management" in the training curricula for "Business Management". Investments in human capital are at least as important as investments in physical assets.

2nd Meeting 14-15 June 2016, Brussels (BE)

Topic: Impact and Evaluation of Innovation

IMPRESA: Implications for Agricultural knowledge and Innovation Systems

Peter Midmore, Aberystwyth University (UK)

The main objectives of the EU H2020 IMPRESA project¹⁶⁵ were to measure, assess and understand the impact of agricultural scientific research. The main lessons on innovation are that impact takes a very long time to happen (20 years at least). It is not a good principle for research programming. In most cases it is impossible to attribute an impact to research only, since it is a result of many complex interactions with different actors happening along the way. The main results from IMPRESA's cross cases analysis show that the ImpresS participatory tools helped to identify an unexpectedly large diversity of impacts (both positive and negative) and to understand how research contributes to impact through innovation. Research impacts public policies (and reverse), even when it is not planned. The role of research is essential to generate outcomes through different types of interactions, in particular

¹⁶⁵ <https://cordis.europa.eu/project/rcn/110944/factsheet/en>

strengthening capacity. These outcomes become key resources to enable outputs' use and generate different impact pathways. Research roles are very diverse along impact pathways but generally require interactions with other actors throughout the innovation process. For an institution such as CIRAD, the ultimate objective is to reinforce the culture of impact amongst its scientists and research teams, so they can better structure their interactions with the other actors in innovation processes for development.

Documentation & evaluation concept for agricultural research contributions to societal impact, using synergies with research funding

Birge Wolf, University of Kassel (DE)

An overview of criteria was presented to evaluate the societal impact of agricultural research. A distinction was made between application types (e.g. duration, change in skills, changed behaviour, etc.), application description (narrative and quantification of use – if possible) and impact description (positive impact and negative side effects). Innovation can have 1) economic, 2) socio/cultural and 3) ecological impact. A methodology was presented how to deal with diverse impact pathways and indicators. In particular, the project aimed at synergies with research funding in data assessment by using adapted research information systems open sourced (CRIS).

Topic: Advisory Services and AKIS

Advisory Services

CECRA (cecra.eu)

CECRA is a product of IALB which focuses on certification for European Consultants in Rural Areas. In 2015 it got its cooperation and licence agreement between IALB and EUFRAS. The CECRA Certificate is issued by IALB and EUFRAS. IALB covers the German speaking areas in central Europe, EUFRAS all other regions. The extension of CECRA to non-German speaking European areas is in process. The aim is to provide standardised training to develop the skills of consultants who are working in rural areas. There are 2 compulsory modules: 1) my profile as a consultant and 2) communication and relationship building in advisory work. In addition, 3 out of the 13 elective modules must be chosen. The requirements for the certificate are: 1) a completed degree course or complete vocational training, two years of professional experience in advising, a confirmation of completed modules, attendance of an event in another country and a visit to an advisory organisation in another country, and a final thesis (a case-study with self-reflection). Benefits for employers are e.g. professional services, staff with broader horizons and more effective advice. The certificate is impartial, issued by the public sector and qualification is considered as a confidence-building measure.

Cooperation experience through the Baltic Sea Region and Central Baltic Programmes

Zanda Melnalksne, Farmers' Parliament (LV)

The marine environment of the Baltic Sea is vulnerable and therefore calls for unique actions. The Baltic Sea Region (BSR) needs to produce at the same time high quality food and ecosystem services. The regional BSR initiative enhances business development in clean technologies and the bio-economy. Policies and investments should pave the way for a competitive and sustainable land use in the region. The Baltic Compass supports innovative solutions which are needed for the future of the region, regarding agriculture, the environment and the rural economy. It enhances Pan Baltic cooperation via transnational dialogue and knowledge transfer.

There is a large variation within the region between farms and between countries. Legislation and an adapted CAP will not be enough to cope with the unique challenges of the region. Increased global demands for food, fibre and energy, in addition to climate change, will cause increased eutrophication. The international cooperation is abundant but lack political support. Stronger commitment and better targeting on agriculture and the environment is needed.

Regional instruments should be reviewed to better cope with the challenges and build the political commitment. A new policy framework is needed in support of agriculture, rural development and the environment, for the next CAP period. The Baltic Agricultural Advisory Service should be strongly promoted, developed and supported.

Topic: The Food Value Supply Chain

Thematic networks targeting the food sector

Christophe Cotillon, ACTIA (FR)

The Reseau Mixte Technologique (RMT – Joint Technological Network) is a scientific and technical partnership tool for the agri-food sector, established and supported by the Ministry responsible for Food, under the coordination of ACTIA. ACTIA coordinates 10 RMTs (in 2016), whose areas of expertise contribute to the aim of sustainable food production. The RMTs consist of a network of research and education actors who pool their competences and technical resources to the provision of concrete solutions for companies and public authorities. Each RMT conducts research programmes while providing information about technical advances and making them available in an accessible manner, so that they can be used rapidly and optimally by all operators.

3rd Meeting, 5-7 October 2016, Budapest (HU)

Topic: Exchanges with FAO and EIT on enhancing innovation

Agricultural Innovation Systems: the FAO perspective

Nevena Alexandrova-Stefanova, FAO AIS and knowledge sharing officer (FAO)

According to the FAO, agricultural innovation refers to the process whereby individuals or organizations bring existing or new products, processes and forms of organization into social and economic use to increase effectiveness, competitiveness, resilience to shocks or environmental sustainability, thereby contributing to food and nutritional security, economic development and sustainable natural resource management. Drivers are: interactive processes, multiple actors, networking, focus on the impact in terms of development, a participatory approach, a pluralistic origin and demand driven. The AIS concept refers to a network of organisations, enterprises and individuals focused on bringing new products, new processes and new forms of organisation into social and economic use. It is about interactions with institutions and policies that affect their behaviour and performance. Drivers are: the market, environmental factors (climate change), policy and legal frameworks, science and technology and infrastructure.

We are facing several challenges at global and regional level that affect food security which require adequate actions now. Agricultural innovations and capacity development are much needed. A pluralistic agricultural innovations concept can succeed, if properly embedded in adequate national policies, programmes and infrastructure. A set of attitudes and practices is needed to create a 'culture of knowledge sharing and innovation'. FAO advocates a shift from single components' interventions towards a system-approach aimed at strengthening stakeholders' networks (see the 'TAP CD framework' - Tropical Agricultural Platform for Capacity Development). Research is important for innovation but not always the central element. Competitiveness depends on collaboration for innovation. The public sector has a role to play in regulation, integration of small scale farmers, nutrition agenda and other supportive policies. Support is needed to establish interactions and a learning culture, in order to enable responses to continuous challenges. Actions for facilitating knowledge sharing and innovation systems are critical. Integration and organization of rural stakeholders are central elements and ensuring leadership and ownership at all levels, is crucial.

European Institute of Innovation and Technology (EIT)

Michal Gorzynski, Head of Monitoring Section, EIT HQ (EU)

EIT's vision is to become the leading European initiative that empowers innovators and entrepreneurs to develop world-class solutions to societal challenges, and create growth and skilled jobs. It is the first EU initiative

bringing together the three sides of the 'knowledge triangle': business (companies and SMEs), education institutions and research centres. The aim is to increase the cooperation and integration between higher education, business and research to facilitate the transition from: 1) student to entrepreneur, 2) idea to product and 3) lab to customer. The EIT KICs in 2017 were: 1) Climate-KIC, 2) EIT Digital, 3) KIC InnoEnergy, 4) EIT Raw Materials and EIT Health (EIT Food was established end 2016).

The EIT's educational vision is to foster entrepreneurs and innovators in Europe. Its mission is to deliver a unique brand of excellent education that is responsive to both business and societal demands, focused on innovation, entrepreneurship and creativity distinguished by an EIT label. EIT's regional innovation scheme (RIS) includes ensuring the flow of both knowledge and people between KICs and selected partnerships and integral part of operations designed by KICs. Selected EIT RIS partnerships will primarily use other sources of funding such as national and regional funding. Benefits are: KICs' influx of talent and ideas, selected EIT RIS partnerships, exchanging knowledge and good practices as well as enhancing the regional innovation system and individuals applying and gaining knowledge and expertise.

Topic: Enhancing knowledge flows in AKIS

VALERIE: Boosting Outreach of Research for Innovation in Sustainable Agriculture and Forestry

Hein ten Berge, WUR (NL)

The main aim of the EU VALERIE CSA project (www.valerie.eu) was to improve the accessibility and availability of new knowledge for innovation in agriculture and forestry. The ultimate goal was to gain a better flow of information to drive innovation in agriculture and forestry around six VALERIE themes. The key VALERIE activities were: 1) working with practitioners in 10 case studies to identify current challenges for sustainability in agriculture and forestry, 2) extraction of knowledge from European research projects to help meet these challenge and 3) the development of the "ask-Valerie.eu" search engine to improve access to information and knowledge.

The Valerie ontology consists of a set of concepts, built by experts, hierarchy, relations, synonyms and languages. The document base consists of three layers: 1) mini-factsheets, each describing one innovation, 2) documents (scientific papers, technical papers, fact sheets, project reports) and collections taken from existing repositories, e.g. CORDIS, Teagasc, AHDB, and many more. Before the user accesses the documents, a computer program automatically annotates documents by identifying phrases in the documents that match concepts in the ontology. Key advantages of Ask Valerie are: an initial query for a specific term and results for a broader or narrower terms (e.g. for query "wheat fertilisation", results for "small grain fertilisation"), 2)

inter-language search (e.g. query in French, results in English) and 3) the role of experts and stakeholders in organising knowledge (dedicated document base, choosing document collections, and building the ontology).

4th Meeting 27-28 March 2017, Bratislava (SK)

Topic: Lessons learned from interactive innovation projects

Innovation and knowledge transfer in agriculture and food: RIS3 in Slovakia

Dana Peskovicova, National Agricultural Research Centre (SK)

The vision is to drive a structural change of the Slovak economy towards growth based, by increasing the innovation capability and R&D excellence to promote self-sustaining growth in income, employment and standard of living. The priorities for RIS3 implementation for the period of 2014-2020 have been elaborated in five areas of specialization from the point of view of available research and development capacities. This is in compliance with RIS3 and linked to the areas of economic specialisation and respective areas of specialization: 1) material research and nanotechnologies, 2) information-communication technologies, 3) biotechnologies and biomedicine, 4) agriculture and the environment, including modern, environmentally-friendly chemical technologies and 5) sustainable energy. There is high potential in biomaterials, biotechnologies, agriculture, food, forestry, chemical technologies and bioenergy.

The EU FP7 ARANGE project on Alternative Forest Management in Kozie Chrbty (Slovakia): an example of a collaborative innovation project

Zuzana Sarvašová, ARANGE (SK)

The EU FP7 ARANGE project (2012-2015, www. arrange-project.eu) was a collaborative project which aimed at developing an advanced multifunctional management of European mountain forests. Problems in the Slovak case were: the long-term extensive planting of spruce in unsuitable sites, the high share of damage and sanitary felling and the lacking consensus of stakeholder groups on management and target forest structure. The SIBYLA forest dynamics model was introduced to evaluate management regimes (current applied management, no-management scenario and alternative based management on - forest managers preferences). Stakeholders from outside the forestry community were included in the study. The project concluded that there are multiple societal demands for ecosystem services, which calls for informed decision making and policy development. Participatory processes support bi-directional knowledge transfer and awareness raising. A broader set of more intensive measures is needed to reduce the share of damage significantly.

The EU H2020 project Hennovation

Lisa van Dijk, University of Bristol (UK)

The EU H2020 project Hennovation (<http://www.hennovation.eu>) demonstrates the potential of innovation led by producers and industry practices in poultry (on farm, during transport and at the abattoir), through the establishment of innovation networks that proactively search for and utilize new ideas, to make their business more efficient and sustainable. The project focused on the search for more effective methods and approaches for promoting practice changes on-farm. Advisory systems are successful in persuading farmers to change practices when the changes required are simple. When changes required are more complex, farmers often seem reluctant. Despite large investments, there remains a gap between scientific research and the adoption of applied science into farm practices. Recognised shared common problems in the laying hen sector amongst EU countries are: feather pecking ('EU-wide beak trimming ban for hens') and low value of spent hens at the end of lay. The consortium consisted of seven participants (six universities and a consultancy company) from five countries. The participants complemented each other well in terms of the work proposed. All participants have proven expertise in the livestock sectors, and in particular the laying hen sector. A minor shortcoming of this proposal was the absence in the consortium of key private sector players who have influence on production. However, this was largely compensated by the Multi-Actor Approach taken up in the project in which actors from the whole value chain participated. According to the project, practice-led innovation includes a bottom-up approach for innovation in practice to solve problems using practical knowledge and creativity on farm, during transport and at the abattoir. It is about developing and testing a new product, a new idea or a better way of doing something based on practice, economics and scientific information.

The project worked with 20 innovation networks in 5 countries (the United Kingdom, The Netherlands, Sweden, Czech Republic and Spain). There was a distinction between on-farm networks led by producers (on feather pecking) and national and international off-farm networks, led by transporters and hen processors (on transport and handling of End-of-Lay hens). The networks were supported by scientists, a veterinarian, an egg packer, the feed company, a pullet rearer, catchers, the processing industry and others. There were 11 facilitators from 5 different countries. A facilitator reflection and action process was designed to support the development and implementation of the approach and to reflect on its application. The project developed a framework to support the facilitation of practice-led innovation processes. Success factors from the project were: 1) networks are a good mechanism for generating innovation (or a certain kind of innovation) at the 'on-the-ground' level of farming practice; 2) network facilitation takes many forms but is

critical in creating the capacity for achieving innovation, or moving towards innovation within networks; 3) the sorts of innovation generated through practice-based networks are different from the kinds of innovation emerging from science and more traditional top-down pathways of innovation delivery but are equally valid in practice; 4) networks can be supported in a variety of different ways. To sustain the process and results, among others, networks were encouraged to form Operational Groups (OGs) and other OGs were directly linked to the project (such as the Laying Hen Welfare Forum). Furthermore, other funding opportunities were discussed and throughout the project practice-led innovation in other livestock sectors was promoted.

The EU H2020 project AgriSPIN

Alex Koutsouris, AUA (EL)

The EU H2020 AgriSPIN (agrispin.eu) project identified best practices for innovation and support systems. It sought to find the answers to those questions and many more, by identifying best practices for innovation and support systems in European agriculture.

The EU H2020 project OK ARABLE NET

Bram Moeskops, IFOAM (EU)

The EU H2020 project OK ARABLE NET (www.ok-net-arable.eu) synthesizes the scientific and practical knowledge available about organic arable farming and identifies the best methodologies for exchanging this knowledge. It creates a European network of farmers to exchange experiences and to discuss the advisory material selected by the project. By doing so, the project creates an online platform offering evidence-based advisory material as well as facilitating farmer-to-farmer learning. The core group of the project consisted of 5 organisations experienced in R&I projects. Furthermore, 3 organisations from advice and research dissemination and 10 practice partners who coordinate 14 Farmer Innovation Groups, were involved. Farmers were actively involved in the project activities. There was a mix of well-established groups and starting groups, regionally spread over Europe.

A productivity gap exists between conventional and organic arable farming. Evidence shows the more experienced an organic farmer, the smaller the yield difference. The complexity of organic farming requires a very high level of knowledge and skills but exchanges on techniques remain limited. By promoting co-creation and exchange of knowledge, there is significant potential to increase productivity and quality in organic farming. In the project activities it became clear that farmers love to see what other farmers are doing. There is no one answer, many alternative solutions exist. Regarding communication, use of printed media is still well spread among the EU, physical meetings are preferred to anonymous exchange (farm days and on-farm experiments) and social media and online tools are getting an

increasingly important role in agricultural advice, but change quickly. Videos allow to reduce language barriers.

The EU H2020 project TREASURE

Meta Candek Potokar, AIS (SK)

The EU H2020 project TREASURE (treasure.kis.si) improved knowledge, skills and competences necessary to develop existing and to create new sustainable pork chains, based on European local pig genetic resources (local breeds). The consortium consisted of 25 partners from 9 countries and breeders' associations were linked. TREASURE was built on the inherent value encompassed in local pig breeds, their production systems and product qualities. The idea was a new paradigm of pig production that meets societal demands regarding the environment, genetic diversity, ethical and social aspects and economic value. The key challenge was the development of sustainable pork chains in geo-agro-climatically different regions of Europe by using the biodiversity resources encompassed in EU local pig breeds. The public opinion is not favourable to intensive pig production which is confronted with environmental and animal welfare issues. Local pig breeds and their respective production systems meet high criteria and expectations of modern society in regard to the environment, animal welfare and food quality.

Local breeds in Europe (the majority) are conserved thanks to the support of public money (gene banks). In order to be sustainable it is important to make them self-sufficient and economically viable. Research was needed because there was a big void of scientifically proven evidence of their qualities (e.g. characterisation) and of their needs (e.g. nutrition). Interaction of different actors was needed to build up 'pork chains'. Hence TREASURE activities focused on improving knowledge, skills and competences necessary to develop existing and create new sustainable pork chains, based on European local pig genetic resources (local pig breeds). In many cases the project created 'new' data for breeds, but often it was difficult to publish them in 'top' scientific journals. There were many activities for project promotion at regional events. Networking works best when people actually work together (in this case networks of breeders' associations and their advisors).

5th Meeting, 30 -31 May 2017, Bonn (DE)

Topic: AKIS in Food and Nutrition Security and Sustainable Agriculture across developing countries

Green Innovation Centres in Africa and Asia

Bastian Beege, GIZ (DE)

Green Innovation Centres (GICs) were established under the 'ONE WORLD – No Hunger' initiative by the Federal Ministry for Economic Cooperation and Development (BMZ). The centres were established in 14 countries under the

German development cooperation. The aim of the centres is to implement innovation in the agriculture and food sector, to increase regional food supplies, boost the income of smallholders and create more employment opportunities, particularly in the area of food processing¹⁶⁶. The programme runs from 2015 – 2021. Smallholder farms are the main target groups. The programme supports them in sustainably increasing their agricultural production, income and in generating new jobs in the area of food processing, by ensuring that a greater portion of the value added from agricultural production remains in the local area, especially within rural regions¹⁶⁷. The programme is budgeted at 206 million euro. Its programme management is based in Bonn (coordination), Eschborn (finance) and Feldafing (HCD), Germany. Most projects are conducted in Africa, some in Asia, and they focus on 2 to 4 different value chains each (in total: 35 value chains). The value chains consist of 22 different agricultural products, most of which are staple food like wheat, corn or rice, but the GICs also work with crops such as cacao or sunflowers. The different centres focus on different types of innovation, for example: 1) new seed: nutrient rich and drought resistant (e.g. sweet potato in Kenya), 2) efficient irrigation: efficient use of resources and promotion of yields (e.g. Mali, Burkina Faso), 3) producer groups: strengthening self-organisation of farmers (e.g. India), 4) utilisation of ICT – digital networking (e.g. exchange of market information data via mobile phones in Togo), 5) mechanisation: efficient and increasing yields (e.g. utilisation of modern machinery in Ethiopia) and 6) training: farmers turn into entrepreneurs (e.g. SME-Business Loop in Benin). The programme promotes networking between local innovation partners in order to improve and accelerate the spread of innovations within the participating countries. The private sector also provides support. Consulting firms are supporting programme implementation in six of the fourteen partner countries. The GICs apply the following approach:

- developing value chains from 'field to plate' through introduction of innovations;
- utilization of know-how from various partners (both from partner countries and Germany);
- linking research and development with agricultural technical and vocational training;
- facilitation of self-organisation;
- support of agricultural finance.

The SWG SCAR AKIS discussed what kind of innovation support the GIC can provide. The centres are not organised around sectors but around different value chains. Every country is assessed and a gap analysis is made, depen-

¹⁶⁶ https://www.bmz.de/en/issues/Food/gruene_innovationszentren/index.html

¹⁶⁷ <https://www.giz.de/en/worldwide/32209.html>

ding on the needs. Focus is on organising the innovation system around the farmers and partners involved, mostly through training and learning-by-doing. Peer-to-peer meetings are organised by an advisory group, including NGOs, education, etc. These groups have approximately 30 members who meet twice per year. They exchange experiences and expertise to improve their work. It is important to focus on the effects and the follow-up after the programme, to assure that the people remain self-supporting after the end of the programme. The GICs are working with other programmes from other countries but with regard to synergies in general, there is still efficiency to gain.

Topic: Improving EU East –West cooperation

The process of BioEast: how to improve EU East –West cooperation?

Andrew Fieldsend, AKI (HU)

The BioEast Initiative focuses on exploring possibilities for the deployment of the Bioeconomy in Central and Eastern European Countries (CEE). The objectives and immediate actions relating to the objectives, are: 1) initiating cooperation and knowledge based policies development: building a website for the BIOEAST Initiative and starting a regular newsletter dissemination, contributing to objective 1 and 7, 2) identifying common challenges and validate common research topics: more workshops to be organized, the first in Poland to cover the remaining CEE relevant research topics; 3) initiating strategies; 4) providing an evidence basis, 5) improving skills, 6) initiating synergies development: active involvement in the development of the H2020 SC2 2018-2020 Work Program (objectives 6 and 7) and 7) increasing visibility. Contributing to all objectives, the aim is to set-up a common CSA project and a common ERA-NET co-fund instrument.

6th Meeting, 10 October 2017, Lisbon (PT)

Topic: Lessons learned from Thematic Networks

The EU H2020 project WINETWORK

Eric Serrano, IFV (FR)

The EU H2020 Thematic WINETWORK (www.winetwork.eu) aims to co-create and exchange knowledge to control two economically important diseases that jeopardize the EU wine sector. It focuses on improving exchanges between the scientists and practitioners and bringing existing or new, innovative solutions. The network consists of 11 consortium partners from 7 countries involving Innovation Support Services, SMEs, wine producing clusters, and a research centre, and hosts 10 interconnected OGs from different European vineyards. The knowledge flow is organised in an interactive way between 10 facilitator agents, 10 regional technical working groups and the end-users. Until now, the network has reached 231 winegrowers. Scientific and practical

knowledge and results are combined in the network's knowledge reservoir leading to the following output and dissemination materials aimed at different target groups of end-users: video seminars, technical datasheets and power point presentations for advisors, and video clips, end-user flyers, training modules, and practice abstracts for winegrowers. With WINETWORK the importance of connecting to EU, national and regional initiatives to create synergy for co-publications of results and common approaches for knowledge exchanges, became clear. In order to extend the dissemination of the results at national level and beyond the regions and countries, linkages to other websites and newsletters at national level and joint workshops (including cross-border) should be simulated.

The EU H2020 project SheepNet

Jean-Marc Gauthier, IDELE (FR)

The EU H2020 Thematic Network SheepNet (www.sheepnet.network) aims to share expertise and experience for the improvement of sustainable sheep production (sheep meat and milk farming) in the EU through networking and knowledge exchange between the different actors, in particular researchers and end-users. The focus is on declining factors that affect sheep productivity: reproduction of efficiency, the reduction of lamb mortality and gestation efficiency. Ten consortium partners from six EU countries work towards the creation of a knowledge reservoir that combines both scientific and practical knowledge, key solutions with specific recommendations, communication, dissemination and training material, a pool of scientific and practical experts, a pool of innovative farms and a future research agenda. Through the MAA the project leads to a better mutual understanding between farmers, advisors and scientists, and a greater consideration of field inputs and an improved efficiency to respond to these needs. However, the process of trust takes a long time to be able to perform the different tasks and to provide relevant responses in exchange with the farmers. Moreover, not every farmer can take part due to time restrictions and not everyone has the right profile to take part. Rural farmers and community groups often innovate on their own and decide their own direction. To reach isolated groups, dedicated training and tools to facilitate workshops are required. Through the training activities behavioural changes have been observed. Farmers change their attitudes and are more confident, realising that their input adds value to the outcome of the project. On the other hand, advisors and scientists adopt an active listening behaviour. Nevertheless, there are difficulties for those who newly enter an already constituted group.

The EU H2020 project SMART AKIS

Spyros Fountas, AUA (EL)

The EU H2020 SMART AKIS thematic network (www.smart-akis.com) is an innovation-driven research project focused on smart farming technologies and

applications of ICT in agriculture that lead to a third green revolution. The aim is to mainstream digital farming for a climate smart agriculture in Europe. Examples of solutions for improved sustainability range from the development of new crop varieties, smart crop protection, precision agriculture, internet of things and remote sensing to big data analytics. In addition to a series of research and policy outputs, the project developed a smart farming online platform as an open source knowledge database. This platform is free and open and is the main entry point for smart AKIS services. Its target audience includes: farmers, the industry, researchers and advisors. The platform offers four different services: an online survey for smart farming technology (SFT) mapping (tech feed), an SFT database (tech browse), a quick assessment tool and an open message board for posts by registered users. One of the major challenges associated with SFT is the ownership of these data. A US study showed that 88% of the US farmers preferred not to store the data in a shared internet-based database, explaining the reluctance of software vendors to push in this direction, which emphasizes the importance of farm data ownership. Within the SMART AKIS project it was observed that:

- there is still a general unwillingness amongst farmers to share their data with third parties;
- farmers were eager to adopt new technologies, although in general they are more hesitant about the usefulness of digital platforms. The project found that farmers' interest in SFT's was closely correlated with their farm type;
- according to farmers the benefits of SFT included: the reduction of inputs, making compliance with regulations easier, easiness of data recording and reducing labour and monotonous tasks;
- when somebody uploads information, it is important to filter the quality;
- we have to find better ways to exchange (all open) data, particularly when it comes to communicating with the end consumer;
- farmers are more open to discuss their problems and concerns regarding SFTs with the commercial vendors, when more actors are involved (agronomists, researchers, peer farmers);
- commercial vendors adapted attitudes and became more pragmatic and researchers would talk in more practical terms instead of superficial research outcomes.

The EU H2020 projects FarmDemo and NEFERTITI

Claire Hardy, James Hutton Institute (UK), Fleur Marchand, ILVO (BE) and Adrien Guichaoua, ACTA (FR)

The EU H2020 thematic networks FarmDemo and NEFERTITI are examples of building blocks in H2020 Multi-Actor Projects. The aim is to avoid duplication

of work what has been done already and to build on past experiences, use it for other results and to optimise dissemination. Projects do not overlap but are to work as efficiently as possible. In the future more synergies between MA projects and follow-up of results, will be stimulated.

FarmDemo integrates the 2 projects Plaid and AgriDemo and is funded under RUR-11. The Plaid project focuses on peer-to-peer learning and accessing innovation through demonstration in agriculture. The AgriDemo project aims at building an interactive agridemo hub community that enhances farmer to farmer learning. Joint actions of both projects in FarmDemo are:

- to co-produce and co-design a geo-referenced inventory of demonstration farms and organisations;
- a joint farmdemo hub, an interactive, user oriented web-map application, including the inventory but also farm demo showcases, videos and other project results;
- joint policy recommendations, policy workshops and a joint final conference.

The results and output of FarmDemo form the building blocks for the EU NEFERTITI project which started in January 2018. NEFERTITI stands for Networking European Farms to Enhance cRoss ferTilisation and Innovation uptake Through demonstratIon. Approximately 50% of the NEFERTITI partners participate in Plaid and AgriDemo and both coordinators have a key role in the new NEFERTITI project. The work plan has been scheduled according to the expected Plaid/AgriDemo readiness deliverables. The Plaid and AgriDemo final conference will be jointly organised with the NEFERTITI mid-term conference. In NEFERTITI 10 interactive thematic networks are to be established which will bring 45 regional clusters (hubs) of demo-farmers and other actors involved (from advise, NGOs, industry, education, research and policy) in 17 EU member states.

Success factors and lessons learned from the building block projects:

- regarding the involvement of commercial oriented (private) partners, one of the advantages is the speed and willingness of developments, a disadvantage is the restraint to publish and willingness to publish and disseminate results;
- the call for proposals by the EC was very structured, which was a stimulant to combine both projects due to their similarity. Therefore the tasks were quite aligned but there are other countries involved in both projects. The work is complementary;
- regarding impact, EUFRAS will take up the results of FarmDemo and its follow-up takes place in NEFERTITI. It is good to know the outcome of the project beforehand;

- FarmDemo focuses on peer-to-peer networks, NEFERTITI implements the broader Multi-Actor Approach, hence it is complementary.

NEFERTITI makes a clear difference between the actors involved and stakeholder engagement. Actors who are not involved yet are welcome to discuss potential engagement.

Topic: Cross-fertilisation and exchanges with EIP Water and Agri-Water projects

Cross-sectoral engagement on water management and agriculture: exchanges with EIP-WATER

Hans Stielstra, EC-DG ENV-Deputy HoU-C1 (EC)

Achieving good quality water in the EU was an important point of departure for EIP Water. More in line with agriculture, the Nitrates Directive supported the reduction of pesticides but there are still many gaps regarding the protection of the aquatic system, against pesticides to be precise. EIP Water focuses on other challenges too, for instance assessing the river basin management plans by the member states. The European Commission concluded that chemical problems related to water quality were reduced but still half of the ecological water basins require improvement. In this regard, the EU is behind on schedule, which indicates how persistent the problems are. EIP Water supports achieving the goals of the following directives:

- the EU Water Framework Directive – WFD (2000) set 2015 as the deadline to achieve good water status. This has not been achieved yet;
- the Nitrates Directive, which had a measurable effect on the reduction of pollution from agricultural nitrogen. However, the Nitrates Directive alone will not lead to nutrient management at the scale necessary to secure the WFD environmental outcomes;
- (sustainable) use of Pesticides Directive (2009): an important instrument to help achieve good water status. The commission came to the conclusion that, while it helped to reduce pesticides, there are still a lot of gaps. The protection of the aquatic system against pesticides is still a large problem, among others;
- the Drinking Water Directive (DWD): the aim is to achieve minimum health standards in water intended for human consumption.

Why do we need EIP Water and connections with agriculture? Because environmental legislation will only get us so far. It provides us with a framework but it will not get us to the results we want and need to achieve. The 1st River Basin Management Plans (RBMPs) showed that progress has been made in improving water chemical and ecological status. However, more than 90% of the RBMPs indicate that agriculture causes significant pressure,

including diffuse or point source pollution by organic matter, nutrients, pesticides and hydro-morphological impacts. Nitrogen pollution is still a major European water issue. About 50-70% of nitrogen input to water comes from agriculture. Moreover, about 7% of groundwater stations reported excessive levels for one or more pesticides. Groundwater at risk appears to be located in areas used intensively for agriculture (EEA, 2013). Agriculture is considered the greatest contributor to pesticides in European surface and groundwater (EEA, 2013).

The Commission Staff Working Document "Agriculture and Sustainable Water Management in the EU" (28 April 2017), focuses on four priority areas: implementation, governance, investment and knowledge. EIP is highlighted under the knowledge priority. One challenge is to identify synergies between the EIPs on Agriculture and Water. Eight priority areas have been identified so far, including action groups such as WIRE (Water Irrigated Agriculture Resilient Europe), PVAIZEC (Irrigation using photovoltaic), MAR (Managed Aquifer Recharge), SPADIS (economic tools for water security), RESEWAM (remote sensing for scarcity and droughts) and ARREAU (resource recovery from waste water). Focus groups in EIP Water are comparable to focus groups in EIP-AGRI and can be linked to existing EU H2020 projects (or other projects). They operate rather independently.

The following 2 cross-sectorial examples of Water and Agricultural projects were discussed in SWG SCAR AKIS, for a better comprehension of a cross-sectorial approach and its implications.

The EU H2020 project WaterProtect

Piet Seuntjens, VITO (BE)

The EU H2020 project WaterProtect (water-protect.eu) aims at developing innovative tools enabling drinking water protection in urban and rural environments. Pesticide and nutrient pollution of drinking water sources is a continuous concern. Mitigation measures are not in place or not effective and farmer engagement is required. Objectives are:

- to contribute to effective uptake and realisation of management practices and mitigation measures, to protect drinking water resources;
- upscale findings from action labs to other regions;
- advise policy makers from WFD, CAP, nitrate and pesticide directives;
- strategic communication to stakeholders and dissemination to the public.

The project applies a Multi-Actor Approach leading to a transparent and fair process, visualization of the process for better understanding, an equal involvement of all actors, a neutral start for the process by sharing common

objectives and a common language, and social and emotional dynamics to encourage the overall group functioning.

Learning and exchanging experiences with operational groups from EIP Agri dealing with water and agriculture has added value because:

- of the focus on sustainable agriculture and water, which fits in 'sustainable management of the essential natural resources';
- scientists, practitioners and intermediaries, including farmers, advisors, NGOs, businesses etc. are all actors and partners in the project's bottom-up process;
- it will lead to enriched practical output.

Furthermore, it creates synergy between existing policies. WaterProtect has a policy oriented work package and will provide advice on cross-cutting issues addressing the WFD, the CAP, SUD, Nitrates directive and the DW directive.

The EU H2020 project FERTINNOWA

Els Berckmoes, Proefstation voor de Groenteteelt (BE)

The EU H2020 FERTINNOWA thematic network (www.fertinnowa.com) focused on the transfer of innovative water technologies in fertigated crops (vegetables, fruits & ornamentals). There were 23 partners + 2 linked third parties involved from 9 EU member states and South Africa. A European benchmark study revealed that growers struggle to achieve sufficient and qualitative irrigation water, use irrigation water in a more efficient way, avoid run-off leaching and manage waste fertigated water. Knowledge & innovative technologies are available but are not implemented by the growers. The main objective of the FERTINNOWA thematic network was to create a meta-knowledge database of innovative technologies and practices for the fertigation of horticultural crops. FERTINNOWA also built a knowledge exchange platform to evaluate existing and novel technologies (innovation potential, synergies, gaps, barriers) for fertigated crops and to ensure wide dissemination to all stakeholders involved of the most promising technologies and best practices.

The consortium members are active in numerous water related projects. More than 31 projects were linked. Water related projects were able to participate through consultation for technology reviews (initiative consortium), by taking part in the technology exchange, in the workshops, in showcase events and in the final event. All members were active in the core tasks. There was a high degree of interaction and the group's spirit was: 'let's go for it, together'. However, the high degree of interaction also led to risks of delays and frustrations if partners did not live up to the expectations. One other barrier was that some growers did not want to get too involved, not because they did not want to share their vision but they did not want to spend too much time.

It would also have been difficult to achieve close contact with some growers if NGOs and policymakers were to be involved (so they were not). One final major challenge for the project was to avoid that the thematic network would become commercial by avoiding advising on certain (commercial) technologies. The project's technology database includes all technology review reports and practice abstracts. Results were communicated to growers by organising both local and EU events, by organising technology markets , field visits and a final conference.

Additionally, in the discussion on possibilities for joint action between Water management and Agriculture, SWG SCAR AKIS came up with the following reflections:

- one of the reasons why some action groups do not stand the test to operationalize joint action on agriculture and water, is a lack of budget. It is recommended to evaluate on a regular basis why some action groups succeed, others do not and come up with actions for improvement;
- further insight is required if water pollution is (mainly) caused by pesticides, other agricultural factors or by different (potentially historical) factors;
- there is a need for better support on realising joint actions between EIP Water action groups and EIP AGRI focus groups. They have a different structure, hence they do not match one-on-one;
- it is equally important to focus on the water and environmental impact, as it is to focus on the technical and social approach on how to achieve goals in better water management. E.g. economic reasons are dominant in keeping growers from implementing solutions for better water quality. If there is no pressure (i.e. policies), then they will not invest in it. Not only because of cost efficient business reasons. There is also doubt among farmers if solutions are effective. One should also take into account the difference in questions and ambitions to address water pollution. Some farmers (pioneers or forerunners) are far more involved in addressing the problems than others (the peloton or laggards);
- to come from knowledge to implementing actions for better water quality among farmers, there are needs for more transparent communication in the overarching knowledge and innovation system. More actions for demonstration are required to persuade farmers of the needs and benefits of new technologies and innovative solutions. This also requires new mitigating governance incentives, e.g. rewards for on-farm innovations to improve water quality, next to or instead of regulation and fines for violations;

- in H2020 the average percentage of having a research proposal granted is approximately 10-15%. It would be good to pool the ideas by partners whose proposal was not granted to learn from their expertise, insight and inspiration. Incentives should be created to develop a network or pool of expertise among partners who sent in project proposals, to enrich and enhance potential solutions and to support consortia building for other potential EU R&I initiatives.

7th Meeting, 7 December 2017, Tallinn (EE)

Topic: cross-border cooperation in Operational Groups

Presentation of Cross-regional cooperation in Operational Groups in Estonia

Helena Pärenson, Ministry of Rural Affairs (EE)

In the next period of EIP AGRI and Horizon Europe, the capacity to develop trans-national OGs and projects, workshops and cross-visits between multiple actors should be enhanced. This presentation contained an example of cross-border cooperation in OGs in Estonia.

Estonia is an exemplary member state where they started organising a call for cross-border EIP cooperation (which opened in December 2017). A total call budget was amounted of 1.000.000 euro and a maximum of 350.000 euro per project. The application has to be submitted to the national funder according to its requirements. Estonian applicants can apply for co-funding for innovation cooperation (M16.2 activities) with partners from EIP OGs from in other countries which have already established or about to apply for support in their home countries/regions. The system works in a way that each applicant applies to its own agency, with partners who have already started or are planning to do so. Focus is on innovation cooperation in agri, food, forestry and dissemination cross-border, on solving a practical problem and developing a new product.

What is being supported? Innovation cooperation in agriculture, food and the forestry sector, as in: pilot projects, development of new products, practices, processes and technologies, dissemination of the results of these projects, including cross-border activities. Focus is on solving a practical problem, developing a new product, etc., by joining the needs of the enterprise and the expert knowledge of the research and development institution. The funding decisions are based on the ranking list. Evaluation is based on the pre-determined criteria: economic and environmental impact, scope of cross-border cooperation and dissemination activities. A prerequisite for a positive funding decision is passing the threshold of 40%. After a positive funding decision, the implementation of project activities must begin within three months.

How does it work? For a cross-border project, each country/region provides support to their participant. In each OG, there is at least one farmer/enterprise or an organisation of entrepreneurs present (cooperatives, non-profit organisations), a research partner, plus an EIP OG (participant) from another country is involved. Estonia supports the costs of the activities of the Estonian part and supports the costs for being able to cooperate and general project coordination costs. Funding decisions are based on a ranking list.

In the preparations for the cross-border call, Estonia exchanged information with colleagues in other countries and there was close contact and exchange of information between internal actors and parties involved. Two webinars for potential applicants were organised. They started with a series of seminars for potential applicants. Who are the other countries? Only Finland was in the picture at the time so they sent in requests but also Sweden showed interest. Other countries which indicated that they are organising or preparing possibilities for cross-border cooperation of OGs are: Slovakia, Greece and some German regions.

8th Meeting, 26-27 June 2018, Warsaw (PL)

Topic: Lessons learned from Erasmus+ projects supporting knowledge flows within the AKIS

Erasmus+ is a European Union program in the field of education, training, youth and sport for 2014-2020, with a total budget of 14,7 billion euro. The programme is based on the achievements of European educational programs, which have been functioning for 25 years . It is the result of a combination of the following European initiatives implemented by the European Commission in 2007-2013: the Lifelong Learning Program, the Youth in Action program, Erasmus Mundus, Tempus, Alfa, Edulink, and cooperation programs with industrialized countries in the field of higher education. Examples of projects of Erasmus+ projects presented at the SWG SCAR AKIS meeting, which support knowledge flows within the AKIS are described below.

To create more synergy between education, research and other AKIS actors, these types of education projects, initiatives and networks should be better linked to interactive innovation in AKIS. The interactive innovation model promoted at EU level via the EIP-AGRI, should contribute to the further enhancement of these linkages and interactions among different actors. The involvement of actors from education systems in interactive innovation projects within the EIP-AGRI framework, is of relevance for the further development, dissemination and uptake of the innovative project results. It enables stronger long-lasting effects through embedding the results in curricula and thereby strengthening the impact of projects.

The Association of the Regional Initiatives Development

Małgorzata Bogusz, ARID (PL)

ARID is an association working in the vocational education field. Their main goal is to strengthen enterprises through lifelong learning and rural development. ARID is involved in several Erasmus+ projects such as Beekeeping for European environmental sustainability 'To bee or not to beezz', Apiterapia, URESA, DIACEN, Care-T-Farms, Clean Air, Sema and Top 10 skills. The projects fall under Action 2 of the Erasmus + program, for Strategic Partnership and exchanges of the good practices for Vocational Education Trainers and Adult Education. This Action 2 provides opportunities for educational institutions to develop international cooperative partnerships with other VET stakeholders, including enterprises. Partnerships have to include a minimum of three entities from three different countries. They work on innovative results and exchange experience and good practices in a chosen field of education or vocational training.

SKIFF : a multilingual e-platform for training

Gintarė Kučinskienė, Lithuanian Agricultural Advisory Service (LT)

Skills for Future Farmers (SKIFF, www.future-farmer.eu) is an example of international cooperation based on projects from the past. It provides a new practical approach on relevant e-training programs and content. Partners conduct activities in promoting e-trainings after a project is finished and look for other possibilities for common activities. SKIFF works on advanced training, ICT tools, on-line training sessions and continuous dissemination. The results reach 1.070 users (as of 4/6/2018), from 10 countries of which the majority comes from Greece, the Netherlands, Lithuania and Turkey. 30% of the users reach a 'course completion certificate'. Most visited courses are: ICT – Precision Farming, Farming Management, Organic Farming, Rural Development Program 2014-2020, ICT in Agriculture, Agricultural Markets and Biobased Economy.

Escola Agrària de Manresa

Jaume Sio, Deputy director Generalitat de Catalunya (ES)

Escola Agrària de Manresa is an agricultural school which has 10 years of European involvement in Organic Agriculture. No other school in Spain worked on organic farming before. Erasmus+ provided the possibility for different schools in Europe to become connected. Escola Agrària de Manresa was involved in different projects on animal traction, short circuits of commercialisation, professional training (in orchard and fruit), biodynamics, methods and training tools, social gardens and organic cuni-culture. Based on these projects, the school could develop professional trainings. Teachers were taught new training skills, methods and educative material was developed.

9th Meeting, 28 February & 1 March 2018, Athens (EL)

Topic: Lessons learned from facilitating innovation

The EU H2020 INNO4GRASS project

Arno Krause, GLZ (DE)

The EU H2020 INNO4GRASS project is a thematic network for productive grasslands. Its overall goals are to close the gap between practice and science, to ensure the introduction of innovative systems on productive grassland, to strengthen the profitability of European grassland farms and to preserve the environmental values. More specifically, the project focuses on:

- improving the profitability and competitiveness of grassland-based dairy, beef and sheep farming;
- providing high-quality local feed for grazing animals that transform grassland vegetation into high-quality products for human consumption;
- improving the sustainability of grassland systems: efficient manure management with reduced N emissions in waters, ecosystem services as a contribution to biodiversity, landscape conservation and carbon storage;
- efficiency of multi-species green fodder and fodder legumes with particular focus on sustainable fodder production (optimization of grazing and cutting systems, reduction of operational costs and production costs).

The project's key features are: to enable the capture of innovative ideas from practice through case studies, networks and the internet, the establishment of a multi-stakeholder network for collaboration and exchange of information, the creation of new knowledge and demand-driven innovation and the implementation of large-scale structures in order to permanently bundle know-how and innovations and to distribute and train them sustainably.

INNO4GRASS aims at capturing innovations from farmers, belonging to the 'innovators' group and to reinforce dissemination to farmers' groups, organised around farmers, belonging to the 'early adopters' group. The composition of the INNO4GRASS consortium has identified these groups through its network in the participating countries. One of the core elements is to create Facilitator Agents Resources:

- to support in interconnecting the farming and practice community, industry, researchers and all other stakeholders and to enhance communication and adoption of innovations and to seek for hands-on solutions for the farming community with special emphasis on win-win relations;

- to act as a starting group for consolidating knowledge through moderated electronic discussion groups, open to all stakeholders and in doing so, to trigger fruitful discussions stimulating the further participation of stakeholders (especially the practice community).

The EU H2020 AgriLink project on Advisory Services

Pierre Labarthe, INRA (FR)

The EU H2020 project AgriLink stands for Agricultural Knowledge: Linking farmers, advisors and researchers to boost innovation. The overall objective is to stimulate transitions towards more sustainable European agricultures by furthering the understanding of the roles played by advisory organisations in farmer decision-making and enhancing their contribution to learning and innovation. AgriLink's key features are: to develop a conceptual framework, to analyse farmers 'micro-AKIS' in 26 focus regions, to compare governance models, to organise 6 Living Laboratories and to come up with policy recommendation and a sociotechnical scenario. The core is interactivity. AgriLink is looking at the roles that advisory services play in the cycles of farmers' decision making, the relationship between different types of farmer and advisory services in the decision making process, how the transformation of advisory services influences farmers' decision making and uptake of innovation and how transdisciplinarity contributes to sustainable transitions of advisory systems in a multi-level perspective.

Topic: Cross-fertilisation and exchanges with LEADER-CLLD

The potential of LEADER-CLLD for agricultural innovation

Peter Toth, ENRD (EU)

LEADER-CLLD (Liaison Entre Actions de Développement de l'Economie Rurale for Community-led Local Development) is defined as 'a local development method to engage local actors in the design and delivery of strategies, decision-making and resource allocation for the development of their rural areas'¹⁶⁸. The main principles are captured by the following key words: local management, partnership, a bottom-up approach, multi-sectoral, innovation, networking & cooperation and area based. The 2014-2020 LEADER-CLLD programme has a budget of 9,7 billion euro and supports 2.515 local action groups (LAGs), reaching more than half of the EU population in rural areas. LAGs are public-private partnerships, which also include citizens, research and education. In addition to bringing multiple actors together, facilitating the development of new solutions and knowledge sharing, LAGs can fund training and feasibility studies, cooperation, as well as piloting new solutions.

¹⁶⁸ enrd.ec.europa.eu/leader-clld_en

Poland, Germany, France, and Spain have the largest number of LAGs. The average LAG budget is between 3-4 million euro (for the entire programming period). LEADER is an instrument under the national and regional Rural Development Programmes (RDPs)¹⁶⁹ of the member states and co-financed by the European Agricultural Fund for Rural Development (EAFRD)¹⁷⁰. It contributes mainly to Priority 6 of Rural Development: Social inclusion and economic development (23,3 billion euro), among others related to poverty reduction. LEADER also contributes to other measures: knowledge transfer, farm viability and competitiveness, food chain organisation, resource efficiency and ecosystems.

Financial support from LEADER should be considered as seed money to function as a catalyst to get multiple actors organised for local development and search for funding opportunities for follow-up actions. Since 2014, three additional EU funds were added to the LEADER-CLLD instrument: the European Maritime and Fisheries Fund (EMFF)¹⁷¹, the European Regional Development Fund (ERDF)¹⁷² and the European Social Fund (ESF)¹⁷³. This provides possibilities for synergies and thereby extending the scope of LEADER-CLLD activities. LEADER is obligatory under EAFRD but there is the possibility to multi-fund activities, providing LAGs the opportunity to extend their collaborative networks, combining local needs with other rural, agricultural, urban and fishery developments. The mainstreaming and roll-out to all ESI Funds in the current period led to an increase in both funding and the number of LAGs as well as territorial coverage. However, it also provided more administrative work for the LAGs and more complex delivery systems (increased bureaucracy). Hence, one of the challenges in implementing LEADER has become to ensure an optimum level of ability for the LAGs to deliver/stimulate local innovation and balancing these activities with the administration of the LAG.

Cooperation between both LEADER and OGs in particular, has potential. However, one has to bear in mind that LEADER's specific focus is rural development in a broader sense than agricultural innovation, which is the scope of EIP-AGRI. LEADER can be defined as a local development tool/method with innovative elements, but it is not an innovation tool primarily. Possibilities for cooperation on innovation are supported by the European Network for Rural Development (ENRD) Contact Point via a Practitioner-led Working Group (PWG). The group brought together a variety of delivery stakeholders from 20 EU Member States, including LAGs, Managing Authorities and National Rural Networks, to discuss innovation at both the

¹⁶⁹ <https://ec.europa.eu/agriculture/rural-development-2014-2020/country-files/>

¹⁷⁰ https://ec.europa.eu/agriculture/rural-development-2014-2020_en

¹⁷¹ <https://ec.europa.eu/fisheries/cfp/emff/>

¹⁷² https://ec.europa.eu/regional_policy/en/funding/erdf/

¹⁷³ <https://ec.europa.eu/esf/home.jsp>

local and delivery chain levels through online exchanges and face-to-face meetings. The input is based on the initiatives of the stakeholders. In addition, the LEADER Innovation page has been developed and is going to be enhanced with a summary of key considerations for innovation in the LEADER delivery chain. This page also presents about 20 inspiring examples of LEADER innovation, both at the LAG level and in the delivery chain.

SWG SCAR AKIS came up with the following reflections on possibilities of cross-fertilisation between LEADER and interactive innovation in agriculture:

- LEADER focuses more on rural development, including poverty reduction, than innovation instruments in agriculture. Yet there are certainly opportunities for cooperation with OGs. For example, since LAGs are permanent groups for the whole programming period and since they also have some characteristics of Multi-Actor Projects (adapted to their specific rural challenges), it is an interesting instrument to build on the networks at local level which could lead to the genesis of OGs;
- SWG SCAR AKIS foresees 2 pathways for synergy between LEADER and EIP-AGRI. Leader could prepare the formation of OGs, for example by forming networks at local level, which could lead to OGs. The other way around, OGs could prepare the formation of a LEADER group for a follow-up phase. In this phase, the innovation is supported to pass through 'the valley of death' by embedding it in an existing or a new added value chain for a specific aim, supported by LEADER;
- there should be focus on stimulating cross-border cooperation between LAGs, including setting up a database containing relevant information at action group level, at regional/national and European level, to stimulate more exchange. This database could also support avoiding reinventing wheels for starting projects, implemented by LAGs.

10th Meeting, 30-31 October 2018, Brussels (BE)

Topic: Exchanges and cross-fertilisation between Multi-Actor initiatives and projects

The ProWeideland initiative: Supporting grazing using the value-add chain by labelling

Arno Krause, Grünlandzentrum (DE)

The ProWeideland label is a product designation for dairy products, which is subject to special criteria. In particular the label promotes dairy farming on meadows as a nature-related form of exploitation, with positive influence on environmental protection, animal welfare and biodiversity. The label should guarantee a uniform and transparent indication of grass milk products. Based

on defined criteria for the production and processing of milk, every farmer and every dairy is compliant with this directive. The aim is to keep livestock farming on grassland economically attractive by compensating the extra costs for dairy farming on grassland. The consumer honours the added value of this form of livestock farming by paying a higher price for these products. To establish the production criteria, a cooperative network of 27 organizations is responsible including the sector, government and organisations for the environment, consumers and animal protection. They signed a common 'Charta' (covenant) committing themselves to common value supporting grazing. It constitutes the basis to establish and maintain criteria for meadow based production in a multi-stakeholder dialogue. The label is managed and granted by ProWeideland (Deutsche Weidecharta GmbH). To conclude, Pro-Weideland is based on expert knowledge and participatory approaches (science, practice and administration), balanced between meaningfulness for consumers and production for relatively large quantities of farmers, aiming at supporting the competitiveness of grazing at farm level. It has been introduced on the German market by the biggest retailers.

The EU H2020 Liaison project

Suzanne Von Münchhausen, HNEE (DE)

The EU H2020 LIAISON Multi-Actor Project (<http://liaison2020.eu>) focuses on better rural innovation linking actors, instruments and policies through networks. The scope is to optimise interactive innovation project approaches and the delivery of EU policies to speed up innovation in rural areas. The consortium consists of 17 partners, including NO and CH. The project focuses on geographical coverage and macro regions. LIAISON aims to deliver 1) a series of in-depth, hands-on 'How To' Guides for fostering co-creation and co-learning when working with projects, networks, or innovation services, 2) policy briefs on improving the institutional environment for interactive innovation projects, networks and initiatives and 3) scientific papers and conference contributions. Furthermore the project will organise a European Rural Innovation Contest in 2019 and the nomination of 14 Innovation Ambassadors. There will be cooperation with institutions and working groups at European level (with DG-Agri, EIP-Agri Service Point, SCAR-AKIS) and at national level with managing authorities, innovation support / advisory services, experts / reviewers. Results will be translated in EN, FR, DE, ES, PL and a web-based Interactive Innovation Tool Box and videos shall be developed.

Topic: Knowledge Reservoirs for innovative solutions in sustainable agriculture and forestry

EURAKNOS MA project¹⁷⁴

Sylvia Burssens, Ghent University (BE)

From the experience with Thematic Networks (TNs) discussed in the SWG SCAR AKIS, we learned that diversity of dissemination material in a TN and between different TNs is important, as well as avoiding duplication of efforts between thematic networks. Widening and broadening the dissemination of outputs and results from TNs is needed as well as networks for benchmarking and international cooperation (integration of different data at several levels). Stronger and more interaction with other H2020 projects is needed (TNs, Multi-Actor) and OGs and sustainability of initiatives. In several parallel sessions the group discussed the following topics in previous meetings: 1) coordinating common issues for TN's, 2) constructing Multi-Actor consortia including synergies and 3) practical, financing and administrative aspects. EURAKNOS ("towards a **E**uropean **A**gricultural **K**nowledge **O**pen **S**ource System", 2019-2021) is an EU Multi-Actor Project which intends to build a network of the TNs by connecting all TNs, and reflecting together on a common format for outputs, saving costs and efforts and gain efficacy towards impact for each of the future TNs. The scope is to reinforce the EU agricultural knowledge base (RUR-17-2019). It aims to increase the sharing of Multi-Actor Project know-how and spreading of practical information between as many geographical areas and agricultural sectors in Europe as possible, drastically improving dissemination to end-users. The project will explore the possibility and added value of creating an EU-wide dynamic open source agricultural knowledge innovation data base, with readily applicable knowledge for the end-user (farmers, foresters, and advisors) and produce recommendations and technical specifications which favour greater interoperability and integration of EU and Members States' knowledge bases for practitioners in the future, in order to improve long-term access to practical knowledge produced by the Horizon 2020 Multi-Actor Projects.

Topic: Digitalisation for farmers

Which innovative knowledge do young farmers need in a data platform?

Jannes Maes, President of the European Association of Young Farmers (BE)

CEJA is a forum for communication and dialogue between young farmers and European decision makers. CEJA's main objective is to promote a younger and innovative agricultural sector across the EU 28. CEJA has 31 Member Organisations across 23 EU countries. Innovation for young farmers includes 3

¹⁷⁴ <https://www.euraknos.eu/>

principles: 1) research, 2) development and 3) implementation. A framework how farmers get access to the latest knowledge should be developed as well as tools to access information and to be able to properly invest in innovation. In particular digital innovation is important for technical improvements, for following up on markets and to be able to connect to the world. Regarding the new CAP, a clear message is that without funding, no policy can be effective. A new strategic CAP approach should not lead to re-nationalisation. Hence, structure to translate global strategies into local action for which farm advisory is key and develop guidelines for MSs. To work with farmers, involve them from the very beginning, focus on local relationships (better a good neighbour than a distant friend) and peer-to-peer learning (Erasmus for Young Farmers).

The Code of Conduct on data ownership for farmers: state of play and next steps

Daniel Azevedo, COPA (EU)

COPA COGECA is a joint and one of the biggest and most active lobby organisations in Brussels. Copa represents 23 million European farmers and family members. Cogeca represents 22000 European agricultural cooperatives. Copa and Cogeca welcome the initiative 'Smart Villages' because the agri-food chain is a major driver of the EU economy and agriculture is the backbone of EU rural areas. Agriculture and food production will remain a key element of the smart villages concept. Innovation needs to provide concrete solutions and all farmers need to access latest technology in order to respond to dynamic markets and maintain high quality of agricultural produce. In order to maximise the potential benefits of the technological and digital transformation of agriculture, we must have a coherent strategy at EU level and not 28 different plans. The farming community must lead this process based on a vision for the sector. Therefore we are committed to develop a coherent EU Strategy on Technological and Digital Transformation of agriculture. The EU Code of Conduct on agricultural data sharing by contractual arrangement, indicates that it is about setting transparent principles, clarifying responsibilities and creating trust among partners. the Code of Conduct can be found on https://www.copa-cogeca.eu/img/user/files/EU%20CODE/EU_Code_2018_web_version.pdf. The next steps include increasing the number of signatories and actions to make sure contracts are compatible with the CoC.

The EU H2020 RECAP project: Digital solutions enabling the delivery of added value advisory services

Dimitrios Petalios, Crevis (BE)

The RECAP H2020 project (RE-inforcing CAP, recap-project.eu) aimed at creating an infrastructure and developing knowledge, making best use of the satellite data available for the public authorities and the whole agricultural

ecosystem. The project breaks down this very complex legislation into practical everyday personalized guidance for farmers. Public authorities' procedures can be more transparent and more efficient. The project has achieved more targeted on-field inspections, a better control system based on satellite images & registry information and a reduction of costly & time-consuming procedures, for paying agencies. For farmers, the project achieved personalised guidance, active participation, access to up-to-date information, reduction of administrative burdens, a closer relationship with paying agencies and more transparent execution controls. For advisory services and extension workers, the project supported farmers' compliance, data (availability, accessibility & re-use) and the development of services, under an open approach.

How to enable data platforms to connect disparate data and convert it into valuable insights delivering real value to farmers?

Bruno Prepin, CEO Agro EDI Europe (FR)

BD Avicole is a national database combined to innovative ICT tools for all poultry sectors' traceability in France. It is a collective, federative and professional system, aiming to identify all the holders of living poultry on the French territory (poultry farmers, producers' organizations, hatcheries), poultry production, buildings and outdoor area and movements of living poultry to establish the traceability all along the production for poultry industries. BD Avicole aims at increasing productivity, increasing quality and providing new services to the sector. Due to several crises, the sector has to regain the consumer's trust and come up with solutions. It is not possible to continue like before. There is a gap with what the consumer wants and what is being produced. The poultry sectors have high quality products but the consumer does not know the whole history of the product. The objective is to have better knowledge of the French production, to make data reliable and improve the reactivity of the sector, answer to regulatory obligations and provide services. The supply chain of the poultry sector is very complex. Each sector has a different procedure regarding livestock aspects. Actors do not want to change their systems and organisations. BD Avicole wanted to create one standard, but that appeared to be impossible. Then a new solution was found to create transferability for all the chains. It was decided to develop a new data model through which one can have immediate information where the animal is (by tracking and tracing), towards a common database for traceability of all poultry industries in France. There are bigger and smaller companies involved. At the beginning of this project it was unknown if it would be possible to develop this tracking and tracing system in the French poultry sector. Now we know that it is.

The EU H2020 FAIRShare project: Enabling the farm advisor community to prepare farmers for the digital age

Tom Kelly, Teagasc (IE)

Electronic data generation, analytics and communication technologies potentially enable more accurate, faster and better decision-making on farms, with huge potential to improve agricultural sustainability. There is a major focus on digitalisation by EU and national/regional policy-makers to ensure that **digital innovation in agriculture keeps pace with other sectors and the benefits of digitalisation are available to the wider farming community**. However, there is a danger that digitalisation and future innovations will be hampered unless the rural advisory community is mobilised to take ownership of digital tools and to advocate at the user interface. This Coordination and Support project will engage, enable and empower the independent farm advisor community, through sharing of tools, expertise and motivations. FAIRShare (Findable, Available, Interoperable, Reusable and Shareable) has two main programmes. Firstly, WPs 1, 2 and 3 will gather an evidence base of the digital tools and services used internationally, leveraging the social networks of partner institutions that span EU and non-EU countries. The inventory of tools will be accessible to end-users on an intuitively navigable online interface that has been co-designed using the Multi-Actor Approach. Accompanying the tools in the online inventory will be information, for instance short 'good practice' vignettes, on how the tools may be used/adapted for use. Secondly, WPs 4, 5 and 6 will generate and resource a participatory user cases, **empowering advisor peers from across the EU to interact with the online inventory and, in a series of workshops, to exchange, co-adapt, co-design and apply digital tools**. The FAIRShare user cases will enable advisors to address challenges to embedding digital tools in different advisory and farming contexts across the EU. Special focus will be on co-designing powerful communication and engagement approaches for advisors to advocate and inspire their peers and farmer clients, driving a social movement for the wider and better use of digital tools.

JoinData NL: A cooperative data hub in the NL

Peter Patee, ZLTO (NL)

JoinData (www.join-data.nl) is an independent data cooperative initiative to tailor data exchange. It was founded by cooperatives and farmer organisations and is open for all data using organisations. All farmers are member through their organisations. Authentication and authorisation are at high level. No organisation can influence the data streams so there is no vendor lock-in. On every aspect of the farm, there is information you provide to others or not. JoinData is an important initiative to facilitate the implementation of the CoC. The aim is to bridge with different member states. In order to manage the data, ICT platforms are required. JoinData focuses on

transaction and sensor data with one authorisation for all. The plan is to make a dashboard to be useful for all farmers. It is foreseen to connect to other dashboards.

11th Meeting, 15-17 April 2019, Dublin (IE)

Topic: Exchanges of experiences from Operational Groups (in Ireland)

Overview of Irish Operational Groups

Maura Farrell, NRN and Margaret Murray, DAFM (IE)

In Ireland there are two types of OG projects:

- themed: the Hen Harrier project (a large OG of 25 million euro) and the Pearl Water Mussel (a large OG of 10 million euro);
- open call projects on:
 - 1) the environment with a budget of 20 million euro in total for smaller projects
 - 2) general topics with a budget of 4 million euro in total for smaller projects.

Regarding the themed projects, both themes were agreed with the EC as part of the Irish RDP. The OGs were recruited by a competitive tender. The projects were responsible for developing local partnerships on the ground and developing actions. Regarding the open call projects, a bottom-up OG Call was organised in which proposals were recruited by a simple application process, designed to be accessible to all. In the first call there were 118 applications of which 23 were selected to stage 2. In the end this led to 12 successful proposals for full implementation (3 General OGs and 9 Environmental OGs). All projects have commenced. In the second round there were 69 Applications of which 19 successfully led to stage 2. Two workshops were organised for all successful stage 1 proposals for both calls to support the developing of the plans for the second stage.

The national rural network (NRN) supports the Irish ministry with the EIP-AGRI programme and support for OGs through and with: 1) evaluations, 2) the EIP-AGRI Advisory Committee, 3) meetings and Workshops, 4) abstracts and 5) national and EU Dissemination. The NRN organised an OG Survey aimed at examining the initial 'start-up' process for the Irish OGs. The key learnings from the setting-up of the OGs were as follows. There was a strong Multi-Actor Approach in many OGs. The groups which had a shared history or ethos appeared to establish themselves quicker and easier. A high level of commitment is needed from all OG members, with many underestimating this. There are challenges across the board but most felt they were surmountable. There are many positive successes at this early stage but there

is a definite need for continuous workshop assistance, networking and communication skills development.

Presentations from the 2 themed OG projects

Two nationwide OGs, applied in respectively 6 and 8 Special Protected Areas (SPAs) to protect habitats with the help of farmers and advisors (35 million euro in total). The aim is to develop and test a results-based agri-environmental scheme which will financially reward farmers for delivering environmental benefits in the future CAP period.

- **The Hen Harrier OG**

Fergal Monaghan, Project Manager¹⁷⁵ (IE)

The reasons for starting an OG project on Hen Harriers were because it was a good indicator of ecosystem functionality, the designation of special protection areas (SPAs) for Hen Harriers are contentious and ineffective and the National Agri-Environment Schemes failed to resolve disputes. The project initiated in May 2017 and its objectives are: 1) to prepare and test an effective future scheme for the birds, 2) to ensure the sustainable management of High Nature Value farmland in the most important areas for Hen Harrier in Ireland, 3) to promote a stronger socio-economic outlook for these areas, 4) to develop an effective model for sustainable management of Hen Harrier areas and 5) to develop a partnership between farmers and the government for the delivery of ecosystem services. The project is fully funded through Ireland's RDP. The design and implementation are outsourced to an OG. Payments are calculated on the basis of costs incurred and income forgone. This may feed into the future agri-environment measure. The partnership consists of the Hen Harrier Project (Ltd Special Purpose Company, lead contractor), a Conservation NGO and an accountancy firm. The lead contractor reports to a steering committee including farmers, the Department of Agriculture, National Parks and Wildlife Service, the Forest Service and Farm Advisors. The challenges of the project are to come from 9.847 fields farmed by 628 farmers in 6 distinct SPAs spread over 9 counties (in 2018) to an estimated 20.000 fields farmed by 1.472 participants in 69% of Basic Payment Schemes (in 2019) with up to 50 data points per field. One challenge is that there is limited time for field assessments. Furthermore, advisors were initially unfamiliar with the process. The project focuses on upgrading the advisor skill sets.

- **The Pearl Mussel OG**

Patrick Crushell, Project Manager¹⁷⁶ (IE)

The freshwater pearl mussel is on the verge of extinction in Ireland and western Europe due to intensification of land use. The Pearl Mussel Project is

¹⁷⁵ <https://ec.europa.eu/eip/agriculture/en/find-connect/projects/locally-led-scheme-conservation-hen-harrier>

¹⁷⁶ <https://ec.europa.eu/eip/agriculture/en/find-connect/projects/pearl-mussel-project-%E2%80%93-farming-nature-vibrant>; <http://www.pearlmusselproject.ie/>

a locally led operational group whereby local farmers, researchers, and advisors are working together to develop a programme to ensure long term coexistence of farming and freshwater pearl mussel in eight priority catchment areas in the west of Ireland. The project started in May 2018 and is currently in the design stage. The aim of the project is to address agricultural pressures on endangered freshwater pearl mussel, to design and implement an innovative agri-environmental programme (results-based approach to aquatic target, locally adapted, partnership between farmers, agricultural advisors, and researchers). Added benefits are to address wider biodiversity loss, rewards provision of ecosystem services, to sustain agriculture in ecologically sensitive areas, to improve the effectiveness of agri-environment schemes and linking payments to quality, which will ensure value for public funds. The mussels are an indicator of good water quality and ecosystem services. Agri-environmental schemes to date did not live up to their expectations. The Pearl Mussel OG wants to put market value on the services that High Nature Value farmland provides (Biodiversity, Carbon sequestration, Protection of soil, Clean water, Flood management, Aesthetic value and Recreation + well-being). So it is really an ecosystem approach (including a combination of good land usage and care for nature so the mussels can revive). The whole programme is developed based on the farmer's mind of the countryside and their conditions. It is the farmer's own decision if (s)he wants to join or not.

Operational Group Sustainable Uplands Agriculture-environment Scheme (SUAS)

Declan Byrne, Project Manager and associates¹⁷⁷ (IE)

The SUAS OG was launched in November 2018 and is a five-year, locally led operational group, to develop practical solutions that will address the complex agricultural, environmental and socio-economic challenges associated with the land management of commonages and farms on the Wicklow/Dublin uplands. Members of the OG include upland farmers along with experts in hill production, agri-environment, ecology, rural development, water quality, conservation, public relations and administration & finance. Stakeholders in the project are the Wicklow Uplands Council, Teagasc, Department of Agriculture, Food and the Marine, Department of Culture, Heritage and the Gaeltacht, The Waters and Communities Office and UCD. Developed by Wicklow Uplands Council, the project is designed to assist both commonage groups and individual farmers across the Wicklow and Dublin uplands and will ensure the sustainable management of the unique, natural habitats the area is renowned for. The project, the first of its type in Ireland, was successful in

¹⁷⁷ <https://ec.europa.eu/eip/agriculture/en/find-connect/projects/sustainable-uplands-agri-environment-scheme-suas>; <http://www.wicklowuplands.ie/suasproject/>

securing a funding allocation of 1,95 million euro under the first round of the Irish EIP-AGRI call. The projects' goals are quite extensive and it is anticipated that it will result in an increase in the number of sheep on the hills and an extension to the grazing period over the coming years. This will be achieved through increasing the ecological and productive value of these habitats. Improvement of the biodiversity, the protection of water quality and maintaining recreational access are also key components and will be developed by integrating environmental and farming activities into a single management plan. A selection process resulted in three commonage groups and one individual farmer who have been chosen to participate in the initial rollout of the project. Applications from interested parties seeking to participate in the second round of the project, took place in the spring of 2019. The project has created a framework that consists of a facilitated process to assist the participating commonage groups to form their own constitution and to establish as a formal structure. It is the commonage group itself that collectively develops and agrees to a management plan with the support of the SUAS operational group. Current participants are working closely with an ecologist who will monitor and advise on the improvement of the ecology and water found on the selected sites over the duration of the project. SUAS will also be organising training courses and necessary support required by participating farmers.

Topic: Learning and feedback from interactive project approaches

AGRILINK project on Advisory Services

Pierre Labarthe, INRA (FR)

The EU H2020 AGRILINK project (<https://www.agrilink2020.eu/>) stands for agricultural knowledge, linking farmers, advisors and researchers to boost innovation. The project consortium involves 16 partners from 13 countries. There are strong expectations within policy frameworks to get advisory services back on the agenda, including reinvestments of research on advisory services and new networks of practitioners (such as EUFRAS and SWG SCAR AKIS). However, there are still knowledge gaps about farmers, advisory services, innovation in services and the effectiveness of public policy. The goal of AGRILINK is to stimulate transitions towards more sustainable European agriculture by 1) further understanding of the roles played by a wide range of advisory organisations in farmer decision-making and 2) enhancing their contribution to learning and innovation. Three core ideas with major methodological implications are : 1) the assumption that there are no straightforward relations between innovation and sustainable development, 2) addressing 34 EU focus regions and 3) integrating the diversity of advisory suppliers. The 3 major contributions by the project are: 1) new concepts for a multi-level analysis of the contribution of advice to innovation (MicroAkis and Farm advisory regimes), 2) strong effort of empirical data collection (e.g. > 1000

farmers' interviews) and 3) original approaches to foster interactive innovation (e.g. 6 Living Labs for co-design of service innovation). Preliminary results about AGRILINK's theoretical model of farmers' decision indicate a predominance of external triggers, a key role for advisory organisations in awareness building and an overlapping of assessment and implementation phases. Regarding the advisory landscape, there are new players, new knowledge needs and new roles for conventional advisors. There is a lack or limited presence of impartial advisory services in several cases. Farmers are dropping innovation, linked to a lack of support in assessment/the implementation stage. Farm structure matters. There is a need to understand the institutions (rules, norms) playing on advisory activity and quality (certification, standards, accreditation...), access to and price of services (subsidies...) and renewal of advisors' knowledge and investments (focus on back-office).

The H2020 NEXTFOOD project on Education

Martin Melin, SLU (SE)

The EU H2020 NEXTFOOD project (<https://www.nextfood-project.eu/>) for Building a future science and education system fit to deliver to practice (May 2018 to May 2022), includes a collaborative and Action-Oriented Learning Model which drives the crucial transition to more sustainable and competitive agri-food and forestry systems development. This will be achieved by designing and implementing education and training systems, to prepare budding or already practising professionals with competencies to push the green shift in our rapidly changing society. The consortium exists of universities, research institutes, NGOs and development foundations; 19 partners in total from 13 countries and 3 continents. The NextFOOD objectives are to create an inventory of the skills and competencies needed for a transition to more sustainable agriculture, forestry and associated bio-value chains, facilitate case studies to identify gaps and needs, test new relevant curricula and training methods, identify policy instruments that support the transition towards action-, and practice-oriented learning methods, develop peer-review tools for evaluating the quality of the practice-oriented research and create a platform for knowledge sharing. In several pioneering case studies in Europe, Asia and Africa, farmers solve real challenges related to sustainability together with researchers, students and other relevant stakeholders, while developing both green technical skills and soft collaborative competencies. NextFOOD contains a knowledge bank for experts and practitioners in agri-food training which includes action learning models, teaching tips and lessons learned. It is easily accessible for teaching practices and professionals incorporate the practical experience of all the involved partners and their conclusions regarding the impact of training.

AIS diagnostics and assessment of national extension and advisory systems

Nevena Alexandrova (FAO)

The FAO supports the strengthening of capacities in FAO member countries using the agricultural innovation system (AIS) concept in shaping their institutions and policies. National AIS and extension services (AEAS) are to be transformed by: 1) improving the enabling environment: evidence-based policies (assessment), governance and financial mechanisms, 2) enhancing capacities of the AEAS /AIS actors and 3) experimenting and learning. The purpose of the assessment is to guide and support actors, national policy and decision makers and other interested stakeholders to develop and implement evidence-based policies, planning and to better target investments towards strengthening AIS/EAS. An assessment focuses on increasing quality rather than judging it, which is often the case in evaluations. The assessment includes a pre-assessment (of planning, design and preparation), an assessment (based on framing conditions, structure functions operationalisation and feedback) and a post-assessment phase of analysis and reporting. The toolbox to perform the assessment provides many methods such as actor/network maps, social network analysis, stakeholder mappings, rapid appraisal, theory of change and key informants interviews, etc. Lessons learned indicate that the assessment is a process and not a data collection exercise. It is participatory, nationally owned and led. Furthermore, it is an endogenous process in which collective energy, motivation and commitment of stakeholders to engage in the assessment are crucial. Accountability by all key stakeholders engaged in the assessment is critical. Furthermore, sufficient resources (financial, human, equipment, stationery, etc.) are needed to allow a thorough assessment and regular consultation and feedback mechanisms (forming a double learning loop) between the assessment team and key stakeholders, are of utter importance.

