

D3.7. Smart-AKIS Policy Gaps and Briefs



smartAKIS
Smart Farming Thematic Network



Document Summary

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Author(s): CEMA – European Agricultural Machinery aisbl:
Sara Djelveh,
Vanja Bisevac

Contributor(s): Agricultural University of Athens, Iniciativas Innovadoras S.A.L.,
Wageningen University & Research, ACTA, ZALF

Reviewer(s): Andrea Knierim (ZALF), Thanos Balafoutis (AUA)

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Abstract

This deliverable proposes a number of Policy Gaps and related Solutions drawn by Smart-AKIS Network as a result of almost 3 years of project implementation. Different project deliverables and outcomes have been integrated to produce this report that complements and completes the results of the Policy Recommendations, as presented in deliverable D3.6. The knowledge thereby generated has been then integrated with the information gathered through the Innovation Hubs Policy Cases.

As a result, the policy gaps and briefs are structured following a thematic approach that aims at covering the most relevant areas for policy development for the adoption and uptake of SFTs in the EU. The main recommendations are also summed up in the Policy Briefs, crisp 1 or 2 pages documents highlighting the most important information to be used for dissemination purposes.

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Executive Summary

Smart-AKIS is a Thematic Network funded by the European Commission in the frame of the Horizon 2020 programme for Research and Innovation. The project's overall objective is to close the research and innovation divide in the field of Smart Farming. Smart-AKIS follows the EIP-AGRI "multi-actor approach", implementing an interactive innovation model, for engaging with different stakeholders within and outside the project. The project has implemented a bottom-up approach, integrating information gathered at the European level with the findings and insights gathered through surveys and workshops at the grassroots level in the project's seven Regional Innovation Hubs. As a result, the policy gaps and briefs are structured following a thematic approach that aims at covering the most relevant areas for policy development for the adoption and uptake of SFTs in the EU.

The methodology carried out for preparing this deliverable is complementary to the one used to draft the Policy Recommendations (Smart-AKIS deliverable 3.6, June 2018) and is thereby built on the outcomes of the project's different activities and tasks. About the production of the Policy Gaps and Briefs presented in this report, the knowledge already collected and analysed during the project lifetime has been integrated with the information gathered through the Innovation Hubs Policy Cases, included as annex 1 to this report. Information based on the policy review on national and EU level together with the outcomes of the regional and innovation workshops realized during the Smart-AKIS project lifetime have been used to identify several policy gaps which should be addressed by the future Common Agricultural Policy, such as:

- Cutting red tape;
- Stimulating innovation;
- Meeting the sustainability goals (emission limits);
- Sustainable production (producing more and better with less);
- Improving social health and vitality in rural areas;
- Adapting smart farming schemes to the farm scale.

This report proposes and summarizes solutions to these gaps providing good practice examples on the European level, such as:

- a) Support to access Smart & Precision Agriculture Technologies tailored to farm size;
- b) Supporting farmers investment in SFTs through the CAP Second Pillar;
- c) Lifelong learning, education and training together with demonstration in the farmers learning processes;
- d) Research and innovation as support strategies for boosting agricultural innovation stressing out the importance of advisers.

Furthermore, connectivity, complexity and compatibility issues for the adoption of Smart Farming Technologies have been pointed out as extremely important in the whole process.

Smart-AKIS vision for the new **Common Agricultural Policy** after 2020 should be to turn the policy (EARDF and EAGF) into an opportunity to make EU's Agriculture smarter and greener, so to contribute to a more sustainable and competitive EU agriculture. In this sense, EU policy makers are called to promote and realize a holistic approach aiming at:

- Promoting solutions that are farmers-centred and that reward farmers; in particular rewarding farmers' environmental performance;

- Supporting demand-side policies with stricter environmental and food safety regulations;
- Simplifying and improving the aid programmes' management.

At the end of the deliverable, a series of 7 policy briefs has been listed comprising the main recommendations and highlighting the most important information to be used for dissemination purposes, covering:

1. Access to Smart Agriculture for all farms;
2. Modern and simple support for farm investment in the future of the CAP;
3. Setting the stage for advisory services of the future;
4. Demonstration and sharing of topical knowledge;
5. The Review and Update of Educational curricula;
6. Ensuring rural broadband connectivity;
7. How to Simplify, Innovate and Network the Funding Instruments.

1. Introduction

Smart-AKIS is a Thematic Network funded by the European Commission in the frame of the Horizon 2020 programme for Research and Innovation. The project's overall objective is to close the research and innovation divide in the field of Smart Farming. Running for 30 months, Smart-AKIS is fostering the effective exchange between research, industry, extension and the farming community so that direct applicable research and commercial solutions are widely disseminated and grassroots level needs and innovative ideas thoroughly captured.

Smart-AKIS follows the EIP-AGRI “multi-actor approach”, implementing an interactive innovation model, for engaging with different stakeholders within and outside the project at regional, national and European level. Through its different activities, the project has gathered insights on the barriers and incentives for the adoption of Smart Farming Technologies (SFT) as well as on the needs from end-users and other stakeholders in the value chain, such as researchers, industry and advisors.

These findings, together with other project's outcomes, such as the trends on SFT research and industry solutions, have allowed the consortium to produce a set of recommendations for closing the research and innovation divide in the field of SFT in Europe, which are presented in this Deliverable. Being one of the central outcomes of Smart-AKIS, the recommendations have also been drafted in the form of fact-sheets, easily readable documents for wide dissemination among end-users and stakeholders in the value chain.

The Deliverable is divided into five Chapters:

- **Chapter 1 - Introduction**

Basic information on project has been provided in this chapter together with the project aim and objective.

- **Chapter 2 - The methodology**

Smart-AKIS follows the EIP-AGRI “multi-actor approach”, implementing an interactive innovation model, for engaging with different stakeholders within and outside the project. The methodology, carried out for preparing the Policy Gaps and Briefs, is complementary to the one used to draft the Policy Recommendations (Smart-AKIS deliverable 3.6, June 2018) and is thereby built on the outcomes of the project's different activities and tasks. The knowledge already collected and analysed during the project lifetime has been integrated with the information gathered through the Innovation Hubs Policy Cases, included as annex to this deliverable.

- **Chapter 3 - Policy review**

In the Policy review chapter digitisation and the use of big data in precision farming as Information and Communication Technologies (ICT) that make it possible to set up new systems for farming have been discussed together with the government/EU important role in implementing innovation systems have been considered. Additionally, a review of EU policies for the promotion of digital innovation in agriculture and rural areas, provided including Common agricultural policy, research and innovation policy including Horizon2020, The Multi-actor Approach and the EIP-AGRI have been discussed.

- **Chapter 4 – Policy Gaps and Smart-AKIS Solutions**

In the Policy Gaps and Smart-AKIS Solutions chapter outcomes of the regional and innovation workshops realized during the Smart-AKIS project lifetime have been used to identify several policy gaps which should be addressed by the future Common Agricultural Policy. Solutions to these gaps have been proposed through support to access Smart & Precision Agriculture Technologies tailored to farm size, supporting farmers' investment in SFTs through the CAP Second Pillar. Together with lifelong learning, research and innovation as support strategies for boosting agricultural innovation stressing out the importance of advisers, continuous education and training, the important role of demonstration in the farmers learning processes. Furthermore, connectivity, complexity and compatibility issues for the adoption of Smart Farming Technologies have been discusses in detail.

- **Chapter 5 – Policy briefs**

The whole set of policies are described in this deliverable. The briefs sum up policies with dissemination purposes. All in all, you will find 7 policy briefs in this chapter.

2. Methodology

2.1. Integration of the project's results

Smart-AKIS follows the EIP-AGRI “multi-actor approach”, implementing an interactive innovation model, for engaging with different stakeholders within and outside the project. The project has implemented a bottom-up approach, integrating information gathered at the European level with the findings and insights gathered through surveys and workshops at the grassroots level in the project's seven Regional Innovation Hubs.

The methodology carried out for preparing the Policy Gaps and Briefs is complementary to the one used to draft the Policy Recommendations (Smart-AKIS deliverable 3.6, June 2018) and is thereby built on the outcomes of the project's different activities and tasks, as summarized in Figure 1¹.

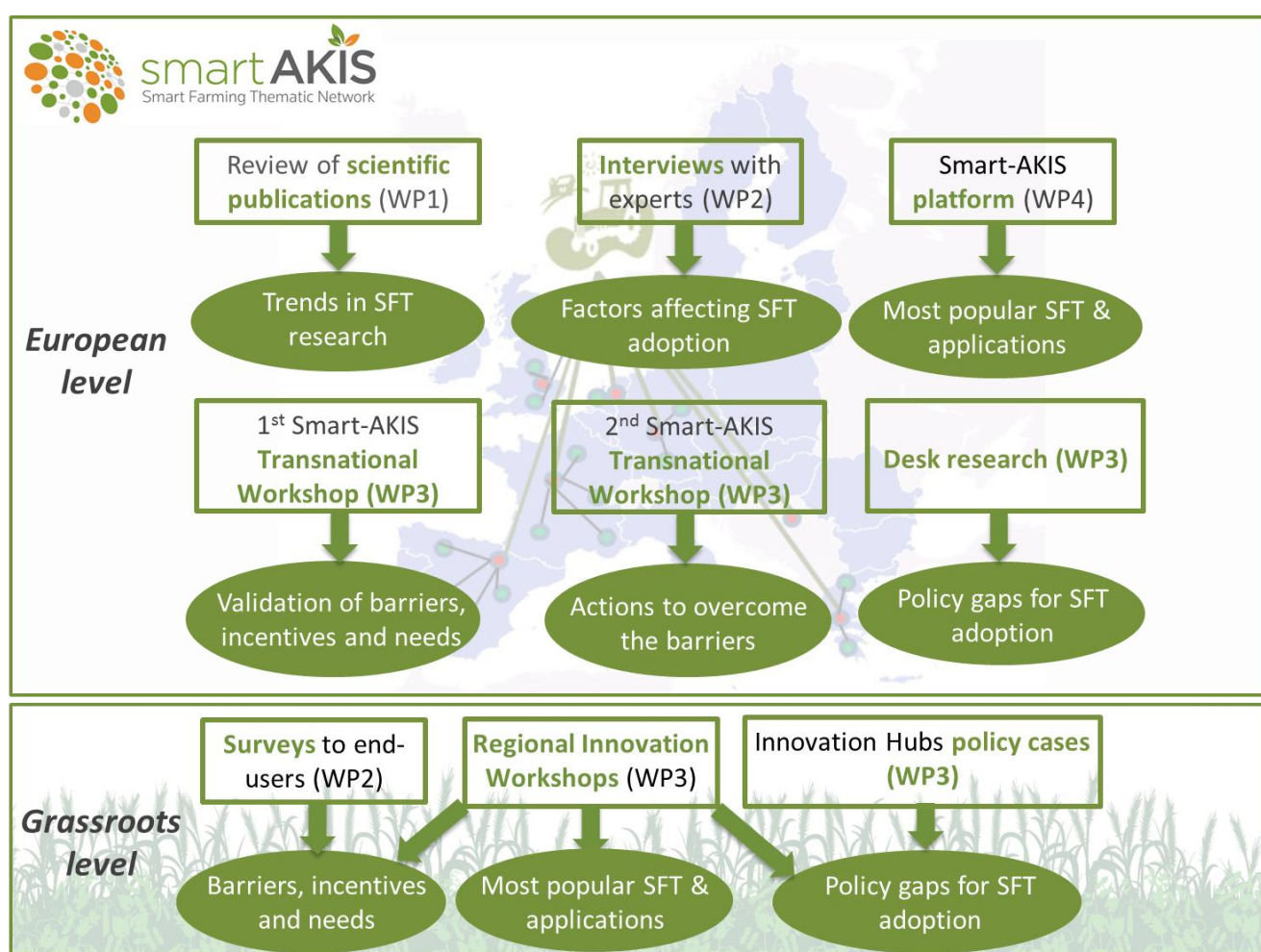


Figure 1. Project results that have been taken into consideration for the production of the policy recommendations and briefs, as explained in deliverable D3.6 Smart-AKIS Recommendations, June 2018.

The wealth of information gathered has been analysed and integrated in order to produce the set of recommendations for fostering the adoption of SFTs in Europe, which are presented in Deliverable 3.6, as well as for preparing the Policy Gaps and Briefs, presented in Chapters 4 and 5 of this report.

¹ Source: Smart-AKIS deliverable D3.6: “Smart-AKIS Recommendations and Timesheets”, June 2018.

Figure 2 shows the flow of integration of project results leading to the production of both the recommendations and policy briefs, as presented in deliverable D.3.6².

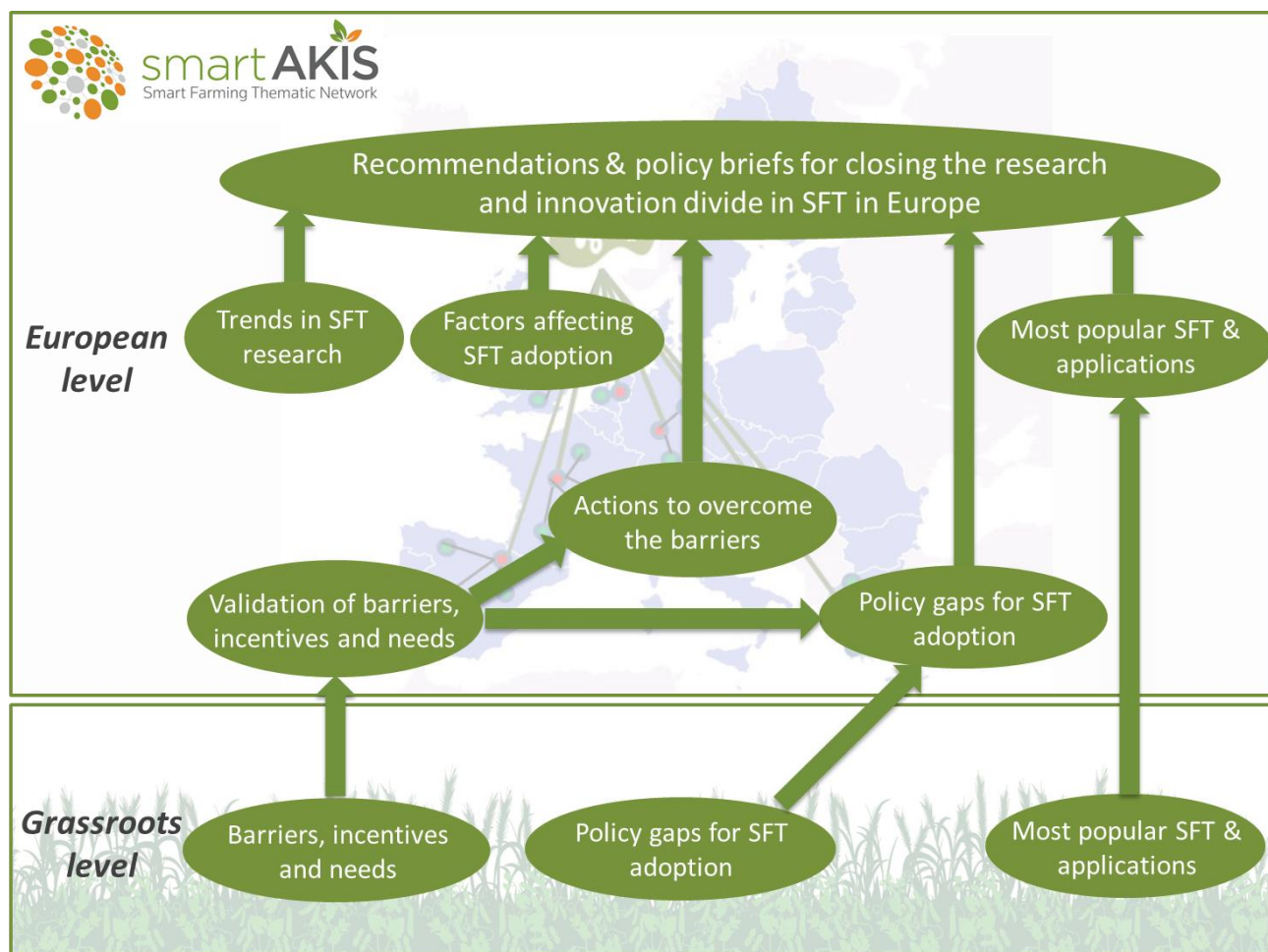


Figure 2. Flow of project results integration leading to the production of the recommendations and policy briefs.

Different project deliverables and outcomes have been integrated for the production of the recommendations and the policy briefs: for details on the methodology used to process such information, the reader is referred to Chapter 2 of deliverable 3.6. Similarly, for details on the methodology used by the different partners to produce the individual outcomes and results, the reader is referred to the individual deliverables mentioned in deliverable 3.6.

Regarding the production of the Policy Gaps and Briefs presented in this report, the knowledge already collected and analysed during the project lifetime has been integrated with the information gathered through the **Innovation Hubs Policy Cases**, included as annexes to this report.

2.2. The Innovation Hubs Policy Cases

At the Smart-AKIS project meeting held in Novi Sad (Serbia) in March 2018, the project partner CEMA, responsible for deliverable D3.7, presented to the rest of the consortium the template for

² Source: Smart-AKIS deliverable D3.6: “Smart-AKIS Recommendations and Timesheets”, June 2018.

gathering information about the innovation hubs policy cases. Such template has been developed in agreement with the project partner INI (task leader), the project partner ACTA (Work Package leader) and the project coordinator, AUA.

2.2.1. Objectives of the Innovation Hubs Policy Cases

Information gathered through the template presented in Novi Sad aimed at contributing to **D3.7. Report on identified policy gaps and policy briefs**: a review report for the identification of the policy gaps to be used as input to policy briefs.

In particular, policies were reviewed in terms of their **encouragement – or discouragement – of innovation and use of SFT and the actual uptake of these innovations in practice**. Based on the findings, the report seeks to identify potential gaps (chapter 4) and produce dedicated policy briefs (chapter 5) with specific suggestions.

2.2.2 Policy Cases Target groups

The template presented at the project meeting of Novi Sad targeted Project Partners and, in particular, **Hubs leaders**. Each Hub Leader was asked to collect at least one (and maximum three) example(s) of policy measures (one policy measure per template) and return the form filled (both part 1 and 2) to CEMA.

The first two sections of the template were designed to be autonomously filled and completed by Smart-AKIS project partners without involving any additional actors. The template also included a third part, which was optional. Such third section asked participants to have some short discussions/ interviews with external experts and stakeholders with a role in the planning/ implementation/ evaluation of the selected policy measure(s).

2.2.3 Structure of the template for the Policy Cases collection

The template shared (annex 1) was organized in 3 parts:

- **General Information**: the first part of the template aimed at collecting general information about policy measures and initiatives that might be relevant for the Smart-AKIS project's policy recommendations and briefs.
- **Description and details of the policy / initiative**: the second part of the template focused on more detailed information about the measures above, such as challenges addressed, objectives, relevance, etc.
- **Interview with one (or more) expert(s)**: the third and optional section proposed some questions to be addressed to external experts and stakeholders (policy makers, policy implementation bodies, and beneficiaries of the measures, in particular farmers) that had a role in the planning/ implementation/ evaluation of the selected policy measure. This section was not mandatory.

2.2.4 Guidelines for the Hubs leaders

The template shared with all Smart-AKIS partners (and included as annex to this report) aimed at gathering information mainly on policies measures and initiatives that, based on partners' experience, target challenges that can be addressed by SFTs, thus supporting, facilitating or boosting:

- Innovative practices in agriculture;
- Environmental impact of farming practices (target inputs use, reduction of GHG emissions, including renewable energy, etc.);
- Energy efficiency in agriculture;
- Agriculture productivity and/ or competitiveness;
- Smart Farming Technologies and equipment modernization;
- SMEs, start-ups, new business models in rural areas;
- Digitising European rural areas;
- AKIS and strengthening collaboration between Academia, industry, and farmers;
- Others.

The template also aimed at gathering information mainly on policy measures and initiatives implemented at Regional and/or National level in the different territories covered by Smart-AKIS (question 3). To this extent, each Hub Leader, with the support of the relevant project partners, was asked to identify 1 to 3 policies and/ or initiatives, following the explanation and training provided by CEMA during the Smart-AKIS meeting in Novi Sad. More specifically, Innovation Hubs Leaders were asked to focus either on successful stories (concrete examples of one/ more of such policy measures that have effectively addressed the challenges while supporting SFT adoption) or failure ones (policy measures that have failed addressing the challenges and/ or supporting SFT adoption), thus explaining the factors featuring “success” or “failure” (question 12).

CEMA took the responsibility for checking on the information collected, providing its feedback and, if necessary, asking for additional details or data.

2.2.5 Results of the survey

The results of the survey are summarized in the following table: in total, 16 policy cases were collected and analysed: 2 in Greece, 4 in Germany, 2 in France, 1 in the Netherlands, 2 in Serbia, 1 in Spain, 2 in the UK, 1 in Belgium and 1 at European level.

Table 1. Policy cases collected and analyzed between March and June 2018.

Title	Barrier(s) addressed	Policy measure/ initiative	Key words	Short Description	Partner / country
Greek RDP Measure 16 "Cooperation"	Economic; Support strategies	Rural Development	Operational Group, environment, Innovative funding instrument, collaborative scheme	Measure 16 is a policy measure taken by the Greek state in order to initiate and incentivize the use of new technologies and practices in agricultural and livestock production and to help the start of cooperation between public and private entities in assembling Operational Groups and run innovation projects in regional, national and international level.	AUA & CERTH (GR)
Greek RDP Measure 4 "Cooperation"	Economic; Support strategies	Rural Development	Lack of available investment, farm & machinery modernization, competitiveness,	Measure 4 was designed to help farmers in Greece to optimize their farm infrastructure in terms of buildings and machinery and for the first time, this Measure includes Smart Farming Technologies to be purchased by farmers and provide an extra motive to do so by applying bonus credit for applications that contain such technologies	AUA & CERTH (GR)
S3P Agri-Food – partnership on High Tech Farming	Smart Farming Support Strategies	Smart Specialization Strategy; Regional Development; Agricultural Development / Support from EU policies	Cooperation, complementarity of funding instrument, Regional and EU working together, pooling resources	The S3P Agri-Food orchestrates 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 Platform will also promote the complementarity of funding instruments in the support of an investment project pipeline	CEMA (EU)
Manure Policy: Flanders implementation of the NEC and ND directives	Economic; Support strategies	National & Regional implementation of EU directives / Support from National policies	High investment cost, environment, farmers centred, regulation	Since 1990s, Flanders managed to cut its ammonia emissions by half. Ammonia emissions from manure spreading only were cut by as much as 80% over the same period. This happened progressively through the implementation of the ND and NEC Directives. The application of this measures in Flanders has resulted in a shift of investment towards clean and efficient technologies, as in the intentions of the EC.	CEMA (BE)
Digital Infrastructures in rural areas	Technical	Agriculture & Rural Development; Digitising Rural Economies; Smart Specialization Strategy	Rural connectivity	Create appropriate digital infrastructures	ZALF & DLG (DE)
Digital technology in agricultural faculties, universities and	Smart Farming Support Strategies	Agriculture and Rural Development; Social Cohesion; Education & Skills	Update of Education & Training; New Curricula.	Introduce digital technology in courses and modules of agricultural faculties, universities and technical colleges	ZALF & DLG (DE)

technical colleges		Development			
Agricultural SFT Assessment Authority	Economic	R&D; Digitising Rural Economies; Smart Specialization Strategy; AKIS; Public transparency.	Value for money (also raised during the workshop)	Creation of a body which: Conducts or induces tests of agricultural SFTs; Engages in regular SFT assessments for the agricultural sector and; Makes this information accessible to any interested AKIS actor in an understandable way.	ZALF & DLG (DE)
Support of SFT adoption	Economic	Agriculture and Rural Development; Regional Development	Value for money	Support of SFT adoption Actual systems of subsidies and regulations should be adapted to motivate farmers in looking for information about and finally using SFTs (as an example: competitive scheme announced by DEFRA in the UK)	ZALF & DLG (DE)
Plan pour la Compétitivité et l'Adaptation des Exploitations agricoles (PCAE)	Economic	EAFRD; National Program funded by the French Ministry of Agriculture	Investment cost	This policy helps farmers to buy equipment when the demand is accepted by the region, after carrying out an impartial evaluation of equipment performances (done in real conditions of use). Regions are picking, in the national list, equipment which could fit with the environmental priorities of the territory.	ACTA (FR)
Fund for the training of life entrepreneurs (VIVEA)	Smart Farming Support Strategies	VIVEA	Lack of education & training + independent expert advice	Fund for the training of life entrepreneurs (VIVEA) - three-year strategic plan: Fee paid by farmers to benefit from a total or partial assumption of your educational training expenses. In order to develop such trainings, agricultural organisations (cuma, cooperatives), technical institutes and technical teachers are designing new training drafts. They are working together to adapt the trainings and its format regarding target profiles (direct online and modular training). Whereas it is also demanded that advisors are up-to-date in SFTs so that they can deliver subsequent information, support and training to farmers. Lifelong learning in SFTs is considered a must.	CUMA (FR)
VAMIL	Economic	RVO, Netherlands Enterprise Agency / paying agency (Dutch government)	High investment cost	VAMIL is an instrument from the Dutch government to stimulate sustainable developments in the Dutch economy. Farmers can get investment subsidy for specific equipment that contributes to sustainable development. There are 2 options: (i) Tax subsidy, a certain percentage of the investment is deductible from the taxes one has to pay. Percentage 13-36 %, depending on the type of investment. (ii) Voluntarily depreciation, in time and percentage. A farmer can choose	DELPHY (NL)

				the depreciation percentage (up to 75%) is a year of choice.	
FRACTALS	Economic	Development Found of Vojvodina (DFV)	Innovative funding schemes; SMEs	Supporting ICT SMEs and entrepreneurs in exploiting investments arising from the digitalisation and developing value added applications. The challenge was also to bridge the gap between the SMEs IT community and the community of farmers and relevant industrial value chain (agronomists, equipment vendors, agrochemicals, etc.).	BIOS (RS)
KATANA	Economic	European Commission, H2020 program, call: INNOSUP-1-2015: Cluster facilitated projects for new industrial value chains	Innovative funding schemes; SMEs	KATANA combines direct financial support to SMEs with tailored made business support services and a powerful technological framework of Large Scale Demonstrators (also developed by SMEs, partners in KATANA consortium). This holistic approach aims to contribute towards a symbiotic agrifood ecosystem that fully exploits the potential of emerging industries towards a new European agrifood economy.	BIOS (RS)
RTK Stations network to support GPS development in Navarra.	Technical; Support strategies; Economic	Department of Public Works of the Government of Navarre	Improve connectivity in rural areas, Social perception of automation, collaboration among different actors, investment in machinery	The Government of Navarre decided to install 8 RTK Stations to improve the GPS signal to be used by different types of users, including farmers. Then, the improvement of the accuracy in the positioning was a very important trigger to overcome the existing barriers. At the same time, equipment was becoming cheaper and the offers are reaching more professional users in the agricultural sector. The subsidies that the Government of Navarre gave to the farmers for the purchase of these machines (among others) were also a very important reason to explain the quick implementation of this technology.	INTIA (ES)
Agricultural and Horticultural Development Board (AHDB) – a statutory levy funded body.	Support strategies; Economic	Statutory levy funded body.	Research, collaboration among farmers lifelong learning and knowledge transfer, cost-effectiveness	(i) Deliver extensive research and development programmes; (ii) Undertake efficient farm-level knowledge transfer programmes; (iii) ensure that proper account is taken of Government priorities for agriculture and the agri-food industry, where appropriate.	DTA Ltd (UK)
RDP for England: LEADER Funding	Economic	Rural Development	LEADER, Economic, Environment, machinery	The measure is operated by a LAG: Each LAG decides which topics, and hence, projects, have priority and may be funded in their area. More information, application process, past projects, LAG members and the application process are via the website or contact details for each LAG. Although this a wide and	DTA Ltd (UK)

				localized tool it does offer funding for Agriculture and Rural Development and support to industry / SMEs. This includes farmers and an example of the LEADER funding being applied to SFT is supporting the purchase of tractor mounted sensors to enable variable application of nitrogen fertilizer e.g. Yara N-Sensor.	
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The information collected has then been integrated with the other best practices collected and shared by the Smart-AKIS partners during the project lifetime. The results of such analysis are summarized in Chapter 4 of this report. The complete list of Best Practices (24 in total) is presented in Table 2.

Based on this approach, the Policy gaps and briefs are structured following a thematic approach that should cover the most relevant areas for policy development, such as: education and training for addressing the skills gaps; the role of demonstration and knowledge exchange; research agenda; the 3Cs problem: Connectivity, Complexity and Compatibility; the future of Smart Farming Technologies in the CAP after 2020.

The policy gaps and briefs therefore complement and complete the results of the Policy Recommendations, as presented in Smart-AKIS Deliverable D3.6.

Table 2. List of Good practices and initiatives taken into account for drafting the Policy Gaps and Briefs.

Barrier addressed	Proposal	Partner proposing the solution	Source
Economic: value for money	Sustainable Productivity Bonus adapted to farm size	Desk Review: CEMA	Smart Agriculture for All Farms (CEMA publication: Dryancourt G., 2017)
Economic: farm competitiveness	Investing in new machinery for improved crops production in Slovakia	Desk Review: CEMA	Desk Review: European Network for Rural Development (ENRD)
Technical barriers (with economic component and including support strategies)	RTK Stations network to support GPS	INTIA	Policy case presented by project partner INTIA (ES)
Economic (farm competitiveness) with support strategies	Greek Rural Development Program (RDP) Measure 16 on "Cooperation"	AUA & CETH	Policy case presented by project partners AUA & CETH (GR)
Economic (high investment cost) with support strategies	Greek Rural Development Program (RDP) Measure 4	AUA & CETH	Policy case presented by project partner AUA & CETH (GR)
Economic: high investment cost	RDP for England: LEADER Funding	DTA Ltd	Policy case presented by project partner DTA Ltd (UK)
Economic: high investment cost	Plan pour la Compétitivité et l'Adaptation des Exploitations agricoles (PCEA)	ACTA	Policy case presented by project partner ACTA (FR)
Economic: high investment cost	VAMIL – Tax facility	Delphy	Policy case presented by project partner Delphy (NL)
Economic with support strategies	Manure Policy: Flanders implementation of the NEC and ND directives	CEMA	Policy case presented by project partner CEMA (EU)
Smart Farming Support Strategies	S3P Agri-Food – partnership on High Tech Farming	CEMA	Policy case presented by project partner CEMA (EU)
Smart Farming Support Strategies	Digital technology in agricultural faculties, universities and technical	ZALF & DLG	Policy case presented by project partners ZALF & DLG

	colleges		(DE)
Smart Farming Support Strategies	Fund for the training of life entrepreneurs (VIVEA)	FRCuma Ouest	Policy case presented by project partner CUMA (FR)
Smart Farming Support Strategies	NEFERTITI project	ACTA, CEMA, BIOS, AUA, INTIA, WR	Initiative of Smart-AKIS partners
Smart Farming Support Strategies	Digital Farm in Serbia (ANTARES project)	BIOS	Initiative of Smart-AKIS partner
Smart Farming Support Strategies	Digifermes	ACTA	Initiative of Smart-AKIS partner
Smart Farming Support Strategies	BAYER Forward Farming	Desk Review: CEMA	website
Smart Farming Support Strategies	Agricultural and Horticultural Development Board (AHDB)	DTA Ltd	Policy case presented by project partner DTA Ltd (UK)
Technical barriers	Village Renewal in rural areas: Broadband expansion and upgrading on the island of Samsø	Desk Review: CEMA	Desk Review: European Network for Rural Development (ENRD)
Technical barriers	Digital Infrastructures in rural areas	ZALF & DLG	Policy case presented by project partner ZALF (DE)
Technical barriers	RTK Stations network to support GPS	INTIA	Policy case presented by project partner INTIA (ES)
Economic barriers	Support of SFT adoption	ZALF & DLG	Policy case presented by project partners ZALF & DLG (DE)
Economic barriers	Agricultural SFT Assessment Authority	ZALF & DLG	Policy case presented by project partners ZALF & DLG (DE)
Economic barriers	FP7 FRACTALS project	BIOS	Policy case presented by project partner BIOS (RS)
Economic barriers	H2020 KATANA project	BIOS	Policy case presented by project partner BIOS (RS)

3. Policy Review

3.1. Introduction

The Commission recognises the chief contribution of digital technologies including precision agriculture for optimising returns on inputs whilst potentially reducing environmental impacts.

The European Union currently promotes digital innovation in agriculture and rural areas through its Rural Development Policy (support for investments, the European Innovation Partnership for Agriculture, training and advice)³, the research and innovation programme Horizon 2020 (for example through large scale pilots like the Internet of Food & Farm 2020 project – IoF2020⁴) as well as through other EU funds and instruments such as Cohesion Policy and the Thematic Smart Specialisation Platform On Agri-Food.

The Commission Communication: "The Future of Food and Farming"⁵ identified the need to boost investments in digital-based opportunities such as precision agriculture and smart villages in order to improve sustainability competitiveness and resilience, in agriculture, forestry and the wider rural economy. The new Common Agricultural Policy delivery model, as described in the Communication, would also allow for Member States to develop targeted schemes and programmes that promote precision agriculture and the use of environmentally sustainable technologies within their territories.

Finally, the adoption of digital technologies in agriculture features amongst the objectives of the Commission Communication on Digitizing European Industry⁶.

(Commissioner Hogan, European Parliament - Written Answers, 12/02/2018⁷)

Digitisation and the use of big data in precision farming are among the innovation areas addressing the challenges in the agri-food sector and in rural areas, as Information and Communication Technologies (ICT) make it possible to set up new systems for farming. A revolution comparable to the introduction of the tractor and chemical products in the 1950s is happening, with a deluge of data as a result of the use of sensors, satellites, robots and all types of machinery. This may raise

³ Regulation (EU) No 1305/2013, OJ L 347, 20.12.2013

⁴ For more information: <https://www.iof2020.eu/>

⁵ COM(2017)713 final

⁶ COM(2016)180

⁷ Answer given by Mr Hogan on behalf of the Commission to the written question E-007758/2017 to the Commission Rule 130, Doru-Claudian Frunzuliță (S&D) on the subject of Precision Agriculture.

productivity, make farming more climate-smart and help to improve solve environmental issues. It also improves food traceability (with blockchain technology or otherwise), oversees animal welfare, and helps consumers opt for more healthy and sustainable personal diets, in their smart kitchens. At the same time, developments in ICT are not neutral. Depending on who owns the data and how the exchange of data is organized, the food chain can be governed in many different ways.

The government has important roles to play in innovation systems. One of these roles within the innovation system is to steer and maintain the balance between economic growth and solving societal issues in a balanced way, as previously mentioned. Over the past decades, the use of joint problem solving, where each party has its responsibility and takes on an economically and socially responsible “licence to produce”, has increased. Policy makers, entrepreneurs, knowledge workers, NGOs and citizens are increasingly working together in public-private collaboration to produce sustainable agriculture while preserving nature and natural resources. The current EU CAP supports this, and the Commission’s Communication on “The Future of Food and Farming” (2017)⁸ emphasizes this point as important for the next decade. The government is therefore also required to create the preconditions and conditions to make innovation possible, together with the other actors involved. After all, research and innovation are part of the foundation of progress concerning all the challenges which confront the EU’s farm sector and rural areas: economic, environmental and social. The needs and contributions of rural areas should be clearly reflected on the research agenda both on national and European Union level, while the role of the future CAP will be to enhance more synergies with the Research and Innovation Policy in fostering innovation. This also includes innovation in regulation itself; agreements must be made between different countries, both within and outside the EU, to achieve responsible innovation.

One of the main reasons for government intervention in innovation is the fact that the level of innovation is sub-optimal due to market failures (Pomp, 2003)⁹. Such failures occur because (i) firms only take their own interest into account and not the possible knowledge spillovers, (ii) innovative companies do not receive all the gains derived from the innovation, as consumers and other customers profit from their investment, (iii) R&D and innovation are risky, because not every R&D project succeeds. When companies are not able to cover these risks well enough, uncertainty puts a brake on innovation; in these cases, the innovation efforts lag behind what is socially desirable. In the agriculture and food sectors in particular, with their small and medium enterprises, this is an important consideration for government intervention. In other cases, thanks to innovation, a company gains a market share over other companies, which reduces the profit of competitors; because of this business stealing effect (Pomp, 2003)¹⁰, companies can then innovate more than is socially desirable. In addition to market failure, there is systemic and transformative failure. In essence, this implies that market failures can exist within a certain (food) system, but that these systems as such are not resilient, run a risk of collapsing and have to be transformed into another

⁸ European Commission (2017): Communication from the commission to the European parliament, the council, the European economic and social committee and the committee of the regions: The future of food and farming. ([link](#))

⁹ Pomp M. (2003): Innovatie: wie het weet mag het zeggen. Feiten, onzekerheden en beleid. SEO, Amsterdam School of Economics Research Institute.

¹⁰ Pomp M. (2003): Innovatie: wie het weet mag het zeggen. Feiten, onzekerheden en beleid. SEO, Amsterdam School of Economics Research Institute.

state (Ge et al., 2016)¹¹. This is linked to an imbalance in private versus public-driven innovation: private parties mainly invest in economic-driven innovation, while the government strives for sustainability and takes the necessary measures. Companies must be encouraged to invest in sustainable developments, to achieve societal goals that make them and society better off. Sometimes it requires organizational innovations (and changes) in the food chain, to be able to transform the food system. This is where CAP steps in and should play a larger role in helping farmers make more money from the market, while taking into account social and environmental concerns.. There is a clear need to boost investments into farm restructuring, modernisation, innovation, diversification and uptake of new technologies and digital based opportunities such as precision agriculture, the use of big data, and clean energy.

Government involvement in innovation raises the question: which government(s)? Should innovation be encouraged by the EU instead of by a MS? There could be a number of reasons to have the EU involved, especially in agriculture and food. Firstly, the Member States benefit from spillovers and there is a level playing field within the EU. Furthermore, different agricultural sectors can benefit by connecting to European knowledge and innovation infrastructures: in the common market, the production of certain products is more and more concentrated (such as sugar), as are research and innovation for these products; this makes it attractive, certainly with the current communication technologies, to link producers in other regions to the hot spots of innovation. It makes Agricultural Knowledge and Innovation Systems (AKISs) more efficient, especially since the agricultural sector is part of the food chain. Many input suppliers, food processors and retailers operate across national borders; it is inefficient to nationally finance the same innovation projects within one country that are also conducted and nationally financed in other Member States, with the same international companies as partners.

Many of the challenges facing EU agriculture, agri-food and rural areas are public goods, both globally (e.g., biodiversity preservation or climate change) and locally oriented (e.g., preservation of water quality). Public goods are largely ignored by the different actors in agri-food chains, from farmer to consumer, when they make their production or consumption decisions. Support for knowledge, innovation and technology will be crucial to future-proofing the CAP. Public policies have to play a key role to ensure that functions 4 (guidance of the search), 5 (market formation), 6 (resource mobilisation) and 7 (creation of legitimacy / counteract resistance to change) of the Hekkert et al. (2007)¹² classification, are well fulfilled in order to preserve these public goods.

The adoption of Smart Farming Technologies is influenced by different levels of policies promoted by the European Union (Table 3).

¹¹ Ge L., Anten N.P.R., Dixhorn I.D.E., Feindt P.H., Kramer K., Leemans R., Meuwissen M.P.R., Spoolders H., Sukkel W., 2016. Why we need resilience thinking to meet societal challenges in bio-based production systems. *Current Opinion in Environmental Sustainability* 23, 17-27.

¹² Hekkert, M.P., Suurs, R.A.A., Negro, S.O., Kuhlmann, S., Smits, R. E. H. M. (2007): Functions of innovation systems: A new approach for analysing technological change. *Technological Forecasting and Social Change* 74, 413-432.

Table 3. List of EU Policies supporting the Smart Farming Technologies.

EU policies by topic	EC related website	DG responsible
Agriculture and rural development	link	AGRI
Banking and financial services	link	FISMA
Borders and security	link	HOME ; FRONTEX
Business and industry	link	GROW
Climate action	link	CLIMA
Competition	link	COMP
Consumers	link	JUST
Culture and media	link	EAC
Customs	link	TAXUD
Digital economy and society	link	CONNECT ; COMP
Economy, finance and the euro	link	ECFIN
Education and training	link	EAC
Employment and social affairs	link	EMPL
Energy	link	ENER
EU enlargement	link	NEAR
Environment	link	ENV
European neighbourhood policy	link	NEAR
Food safety	link	SANTE
Foreign affairs and security policy	link	EEAS
Fraud prevention	link	OLAF
Humanitarian aid and civil protection	link	ECHO
International cooperation and development	link	DEVCO
Justice and fundamental rights	link	JUST
Maritime affairs and fisheries	link	MARE
Migration and asylum	link	HOME
Public health	link	SANTE
Regional policy	link	REGIO
Research and innovation	link	RTD
Single market	link	GROW
Sport	link	EAC
Taxation	link	TAXUD
Trade	link	TRADE
Transport	link	MOVE
Youth	link	EAC

In the next paragraphs we are going to provide a review of EU policies for the promotion of digital innovation in agriculture and rural areas, based on Commissioner Hogan's statement presented at the beginning of this chapter.

3.2. Common Agricultural Policy

The Common Agricultural Policy (CAP) consists of two pillars: the first includes direct payments (i.e. annual payments to farmers to help stabilise farm revenues in the face of volatile market prices and weather conditions) and market measures (to tackle specific market situations and to support trade promotion), whereas the second pillar concerns rural development policy.

The CAP dates back to the early days of European integration. Today, the CAP still has a core position in the European Union, not just because farmland and forests account for more than 90% of land within the EU, but also because it has become an essential mechanism for facing new challenges in terms of food quality, environmental protection and trade.

The Common Agricultural Policy was reformed in 2013. After a wide-ranging public debate launched in April 2010, the Commission presented at the end of 2010 a Communication "The CAP towards 2020: Meeting the food, natural resources and territorial challenges of the future" (2010)¹³, which outlined options for the future CAP and launched the debate with the other institutions and stakeholders.

The [Europe 2020 strategy](#) then offered a new perspective: through its response to the new economic, social, environmental, climate-related and technological challenges, the CAP should contribute more to developing intelligent, sustainable and inclusive growth. The CAP must also take greater account of the wealth and diversity of agriculture in the EU's 27 Member States.

3.2.1 The first pillar of the CAP

More than **€308.72 billion** – out of the €408.31 billion of the CAP MFF for 2014-2020 – is allocated to **direct payments** and **market measures**. Within Heading 2, Sustainable growth and natural resources, the first CAP pillar accounts for €42.22 billion in 2016.

As far as the **market measures** are concerned, several market measures are embraced by the single Common Market Organisation, which accounts for **€2.7 billion** in the 2016 budget (in current prices). The first includes the rules on **marketing of agricultural products** (e.g. marketing standards, geographical indications, labelling) and the functioning of producer organisations, competition rules applicable to enterprises and the rules on State aid.

The second type of market measures contains **general provisions** concerning exceptional measures, including measures to guard against market disruption caused by price fluctuations or other events. A third typology includes specific **sectorial programmes** (for fruit and vegetables, wine, olive oil, school schemes). A fourth typology of market measures includes a **crisis reserve** fund of €400 million per year (in 2011 prices) established to secure the financial resources needed in case of crisis in the agriculture sector.

Finally, other typologies cover **issues related to international trade** (e.g. licences, tariff quotas management, inward and outward processing) and competition rules.

CAP direct payments are decoupled from specific production, market-oriented and intended to support farmers' income stemming from sales on the markets, which are subject to price volatility. To maximise their profits, producers must respond to market signals, so that they produce the goods which consumers demand. Moreover, with the introduction of the **greening component**, and in combination with cross-compliance rules, direct payments deliver basic public goods. Indeed, direct

¹³ European Commission (2010): Communication from the Commission to the European parliament, the council, the european economic and social committee and the committee of the regions: The CAP towards 2020: Meeting the food, natural resources and territorial challenges of the future. [\(link\)](#)

payments are multi-purpose payments, composed of three **compulsory components** and three **voluntary components** for Member State implementation (Table 4).

Table 4. Compulsory components and three voluntary components for CAP Member State implementation.

Compulsory components	Voluntary components
<ul style="list-style-type: none"> • basic payment per hectare 	<ul style="list-style-type: none"> • redistributive payment: up to 30% of the Member State direct payment envelope.
<ul style="list-style-type: none"> • a greening component, as additional support to compensate for the costs of providing environmental public goods not remunerated by the market 	<ul style="list-style-type: none"> • additional income support in areas with specific natural constraints: up to 5% of the Member State direct-payment envelope
<ul style="list-style-type: none"> • additional payment for five years for young farmers for the first 90 hectares of their farm 	<ul style="list-style-type: none"> • a specific support coupled to some production, granted to certain areas or types of farming in difficulties for economic and/or social reasons: up to 15% of the Member State direct-payment envelope.

As stated in the EU Commission's Communication on "**The Future of Food and Farming**" (2017), the Common agricultural policy (CAP) needs to evolve in various ways and sharpen its responses to the challenges and opportunities as they manifest themselves at EU, national, regional, local and farm levels. In the delivery model of the future CAP, the Union should set the basic policy parameters (objectives of the CAP, broad types of intervention, basic requirements), while Member States should bear greater responsibility and be more accountable as to how they meet the objectives and achieve agreed targets. Within the EU, governments are responsible in creating environment so that everyone has equal opportunities to learn, to do business and to live their lives.

3.2.2 The second pillar of the CAP: RURAL DEVELOPMENT POLICY (EAFRD)

The second pillar of the CAP budget is financed under the European Agricultural Fund for Rural Development (EAFRD). The EAFRD is aimed at achieving the balanced territorial development of rural economies and at sustaining a farming sector that is environmentally sound as well as competitive and innovative.

Since the reform of the Common Agricultural Policy, Rural Development is playing an increasing role in helping rural areas of the EU meet the wide range of economic, social and environmental challenges of the 21st century. The new legal framework points more clearly in which direction to boost growth, create jobs for rural areas in alignment with the Lisbon Strategy, and improve sustainability - in line with the Göteborg sustainability goals.

The future Rural Development policy 2014-2020 focuses on three areas which follow the three thematic axes laid down in the new rural development regulation:

- Competitiveness for farming and forestry;
- Environment and countryside;

- Quality of life and diversification of the rural economy.
- A fourth axis called "[Leader axis](#)" based on experience with the Leader Community Initiatives introduces possibilities for locally based bottom-up approaches to rural development.

Frequently called "the second pillar" of the Common Agricultural Policy (CAP), the EU's Rural Development policy complements the system of direct payments to farmers and measures to manage agricultural markets (the so-called "first pillar"). Rural Development policy shares a number of objectives with other European Structural and Investment Funds (ESIF) such as fostering research, knowledge transfer and innovation, promoting competitive innovative digital technologies, promoting efficient and sustainable management of natural resources together with social inclusion, poverty reduction and economic development in rural and other areas.

The EU's Rural Development policy is funded through [the European Agricultural Fund for Rural Development \(EAFRD\)](#) worth €100 billion from 2014-2020 promoting balanced development in the different regions of the EU, with each [EU country receiving a financial allocation](#) for the 7-year period. This will leverage a further €61 billion of public funding in the Member States.

There are [118 different rural development programmes \(RDP\)](#)¹⁴ in the 28 Member States for this period, with 20 single national programmes and 8 Member States opting to have two or more (regional) programmes.

The EAFRD shall contribute to the Europe 2020 Strategy by promoting sustainable rural development throughout the Union in a manner that complements the other instruments of the CAP, the cohesion policy and the common fisheries policy. It shall contribute to the development of a Union agricultural sector that is more territorially and environmentally balanced, climate-friendly and resilient and competitive and innovative. It shall also contribute to the development of rural territories.

EAFRD shall act in the Member States through rural development programmes¹⁵. Those programmes shall implement a strategy to meet the Union priorities for rural development through

¹⁴ Member States and regions draw up their rural development programmes based on the needs of their territories and addressing at least four of the following six common EU priorities: (i) fostering knowledge transfer and innovation in agriculture, forestry and rural areas; (ii) enhancing the viability and competitiveness of all types of agriculture, and promoting innovative farm technologies and sustainable forest management; (iii) promoting food chain organisation, animal welfare and risk management in agriculture; (iv) restoring, preserving and enhancing ecosystems related to agriculture and forestry; (v) promoting resource efficiency and supporting the shift toward a low-carbon and climate-resilient economy in the agriculture, food and forestry sectors; (vi) promoting social inclusion, poverty reduction and economic development in rural areas. The rural development priorities are broken down into "focus areas". For example, the priority on resource efficiency includes focus areas "reducing greenhouse gas and ammonia emissions from agriculture" and "fostering carbon conservation and sequestration in agriculture and forestry". Within their RDPs, Member States or regions set quantified targets against these focus areas. They then set out which measures they will use to achieve these targets and how much funding they will allocate to each measure. Member States must draw up their RDPs on the basis of at least four of the six above-mentioned EU priorities. For each of the 18 focus areas, they have to set quantified targets and indicate the measures they will use to reach them (from a menu of 20 measures listed in Regulation (EU) No 1305/2013). All measures are co-financed by the EAFRD. Co-financing rates depend on the type of rural area for which support is intended, as well as on the measures themselves. Member States must devote at least 30% of their EAFRD allocation on measures related to the environment and the fight against climate change. At least 30% of funding for each RDP must be dedicated to measures relevant for the environment and climate change and at least 5% to LEADER. See more on the expected achievements on the ESIF Open Data Platform and in the factsheets for each RDP

a set of measures as defined in Title III. Support from the EAFRD shall be sought for the achievement of the objectives of rural development pursued through Union priorities.

3.3 Research and Innovation Policies: Horizon 2020

The EU's Horizon 2020 work programme from 2018 to 2020 was launched on 27 October 2017, including an investment of €1 billion towards knowledge and innovation in agriculture, food and rural development. With the aim of making farming more sustainable, food healthier and more diverse and rural territories a better place to live and work, the money will be available for research and innovation projects that contribute to protecting the ecosystem, nurturing the soils, valorising genetic resources and adapting to climate change. Projects that promote a new generation of rural actors and value chains that are better connected, greener, more circular, and also better supported by a new set of modernised policies will also benefit from the new funding.

H2020 is the EU current framework programme for research and innovation, running until 2020, and the new work programme covers the last three years from 2018-20. The funding opportunities for programmes related to agriculture and rural development are mainly under the themes (known as 'calls') of sustainable food security and rural renaissance, with some additional opportunities under the information and communication technologies (ICT) heading.

These calls build on the long-term strategic approach to EU agricultural research and innovation¹⁶ published in 2016. Their priorities are also strongly aligned with current and future common agricultural policy objectives. This includes helping the agricultural sector to become smarter, more resilient and environmentally sustainable, encouraging more young people to get involved in agriculture and rural life and strengthening socio-economic life in rural areas.

Since 2014, agricultural research and innovation programmes have been run based on a so-called 'multi-actor' approach¹⁷, where scientists, farmers and other interested parties team up to create solutions to real problems encountered in the field. The current work programme doubles the total investment in Horizon 2020 multi-actor projects, bringing it to around €1 billion to be distributed through 180 grants over the seven years of Horizon 2020.

The sustainable food security call dedicates €753 million to a more sustainable use of resources and to producing better quality food, building in particular on better-managed ecosystems and natural resources. Improved ecosystem management can help fight pests and diseases in sustainable ways, decreasing chemical inputs or the use of anti-microbials.

¹⁵ A Member State may submit either a single programme for its entire territory or a set of regional programmes. Alternatively, in duly justified cases, it may submit a national programme and a set of regional programmes. If a Member State submits a national programme and a set of regional programmes, measures and/or types of operations shall be programmed either at national level or at regional level, and coherence between the strategies of the national and regional programmes shall be ensured.

¹⁶ Available on: <https://ec.europa.eu/programmes/horizon2020/en/news/final-paper-strategic-approach-eu-agricultural-research-and-innovation>

¹⁷ See next paragraph

Key features of this call also comprise a €75 million investment in soil management, including the creation of a €40 million European joint programme on agricultural soil management as a major contribution to climate-related mitigation efforts. This will be implemented in tandem with a global initiative for soil research. Beyond soils, the work programme also invests €45 million in environment and climate-smart farming systems as well as €63 million in breeding and genetic resources. The call will also support international cooperation activities, especially with China and Africa (€112 million). The rural renaissance (RUR) call offers €263 million to promote smarter, younger, greener, more circular and better-connected rural communities and value chains.

The emphasis is on making the digital transformation of society a reality for rural people and communities. Around €100 million is dedicated to activities under both RUR and the ICT part of the work programme focused on the uptake and development of digital technologies and on exploring the impact of these changes to prepare for the future.

Almost €100 million are also invested in innovation in value chains, with a focus on the circular bioeconomy. This will be a source of opportunity for new businesses and industries improving welfare in rural areas. The RUR call will also provide €60 million of funding for projects which will help modernise policies to favour so-called generation renewal (i.e. getting more young people interested in farming and rural business in general), increased capacity to adapt to climate and socio-economic changes and better environmental protection. It will finally invest in further boosting knowledge exchange and innovation systems.

3.4 Agriculture, Research and Innovation: The Multi-actor Approach and the EIP-AGRI

The EIP-AGRI (European Innovation Partnership Agricultural Productivity and Sustainability) is a new development in EU policy. The aim of the EIP-AGRI, launched in 2012, is to foster competitive and sustainable farming and forestry that 'achieves more and better from less'. The EIP-AGRI helps to ensure a steady supply of food, feed and biomaterials, in harmony with the essential natural resources on which we depend and with a dedicated attention to include the relevant actors in the chain.

To enable impact from projects, the basic concept of the EIP-AGRI is based on the Interactive Innovation Model, essential to tackle current complex challenges with good results. The two most important principles are:

- (1) to focus on end-users' problems/opportunities and develop innovative solutions which cover real needs. End-users like farmers, foresters or businesses will be more motivated to use the project results, because they were incorporated in generating them and therefore feel "co-ownership"
- (2) to bring together the most relevant partners with that complementary type of knowledge which helps solving problems and tackling opportunities of e.g.: farmers, advisors, researchers, suppliers, processors, agencies and/or other actors, who co-operate and co-innovate in project activities from the beginning till the end.

The EIP-AGRI synergetic system connects:

- Operational Groups (OG), developing practical innovations in specific regions or countries and funded under the second pillar of the CAP;
- H2020 Multi-Actor projects (MAP) on research and innovation at EU level;

- H2020 Thematic Networks (TN), collecting and making existing knowledge and best practices 'useable' while creating links between Operational Groups and other stakeholders;
- The EIP Network which organises communication and interactive events between everyone with a keen interest in innovating agriculture: e.g. through workshops or Focus Groups (FG) on specific subjects with high innovation potential.

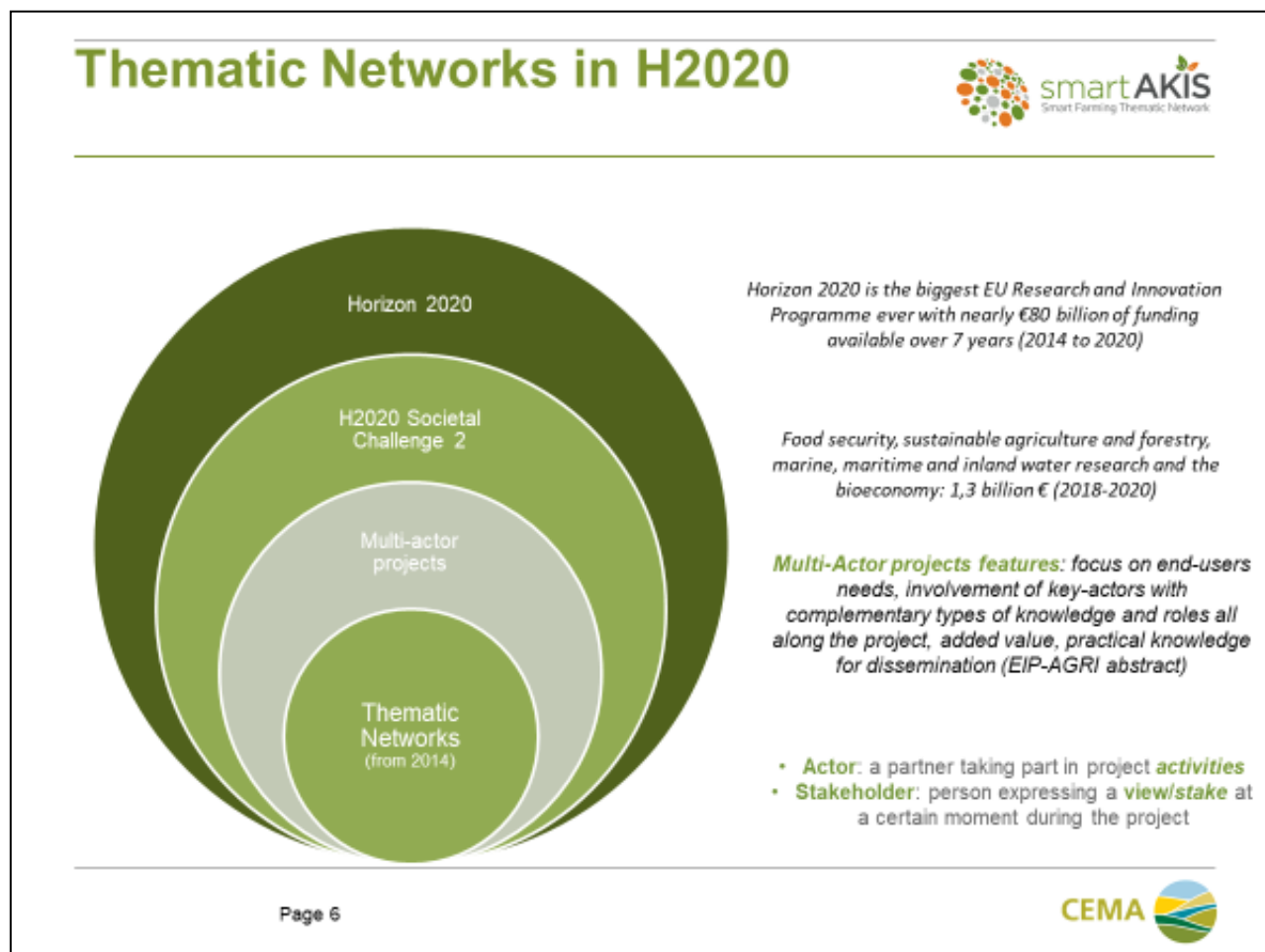


Figure 3. Presentation at the VDMA Technical Working Committee – AKT, Djelveh S., Frankfurt 15/02/2018.

Thematic Networks (Figure 3; Table 5) are a specific type of [Multi-Actor projects](#) funded by H2020 Societal Challenge 2 on “[Food security, sustainable agriculture and forestry, marine, maritime and inland water research and the bioeconomy](#)”. The first call for TNs was released in 2014: [up to now there are 21 TNs](#) focusing on the most urgent needs of agriculture and working for connecting the research and practice in agriculture, boosting existing scientific knowledge and best practices that are not sufficiently known (and applied) by practitioners, and supporting the [EIP-AGRI](#) activities.

Table 5. Thematic Networks and Demonstration Networks funded under H2020 (2014-2017). In green those CEMA participates in.

Thematic Networks				Demonstration on farms
2014	2015	2016	2017	2016-2017
AGRISPIN	FERTINNOWA	AFINET	ENABLING	AgriDemo-F2F
Hennovation	4D4F	CERERE	INCREdible	PLAID
OK-Net Arable	Smart-AKIS	Eu PiG	NEWBIE	NEFERTITI
WINETWORK	EUFRUIT	Inno4Grass	OK-Net EcoFeed	
	EuroDairy	SheepNet	PANACEA	
	HNV-Link	SKIN	INNOSETA	
	AGRIFORVALOR			

3.5 The future European Framework Programme: Horizon Europe

On 2nd May 2018, the European Commission published its proposal for Horizon Europe, an ambitious €100 billion research and innovation programme that will succeed Horizon 2020. This programme was presented as part of the EU's proposal for the next EU long-term budget, the [Multiannual financial framework \(MFF\)](#). The new MFF has been presented as a response to today's reality in which Europe is expected to play a greater role in providing security and stability in an unstable world, at a time when Brexit will leave a sizeable gap in EU budget.

The new European research programme, Horizon Europe, will help Europe remain at the forefront of global research and innovation (R&I) and to strengthen the EU's scientific and technological bases, to boost Europe's innovation capacity, competitiveness and jobs and to deliver on citizens' priorities and sustain its socio-economic model and values (Figure 4).

As highlighted in the report of the [High-Level Group](#), investment in research and innovation will allow the European Union to compete with other developed and emerging economies, ensure a prosperous future for its citizens, and preserve its unique social model. Building on the success of Horizon 2020, the new programme will continue to promote research excellence and strengthen the focus on innovation, for instance through the development of prototypes, intangible assets, knowledge and technology transfer.

Horizon Europe will be structured under three pillars (Figure 5): Open source, Global challenges and Industrial Competitiveness and Open Innovation. Current Horizon 2020 Societal challenges 2 (SC 2) topics are proposed under the €52.7 bn worth Pillar 2: Global challenges and Industrial Competitiveness, and within the cluster 5, Food and natural resources, (Figure 3). Cluster 5, which address interlinked challenges of natural systems, planetary health and sustainable production and

consumption, comprises 7 intervention areas: Agriculture, forestry and rural areas, Sea and oceans, Food systems, and Bio-based systems (representing the Horizon 2020 SC 2), and Environmental observation, Biodiversity and natural capitals, and Circular systems (representing the part of Horizon 2020 SC 5). €10 bn have been allocated to R&I on food, agriculture, rural development and the bioeconomy (under Cluster 5 on Food and Natural Resources).

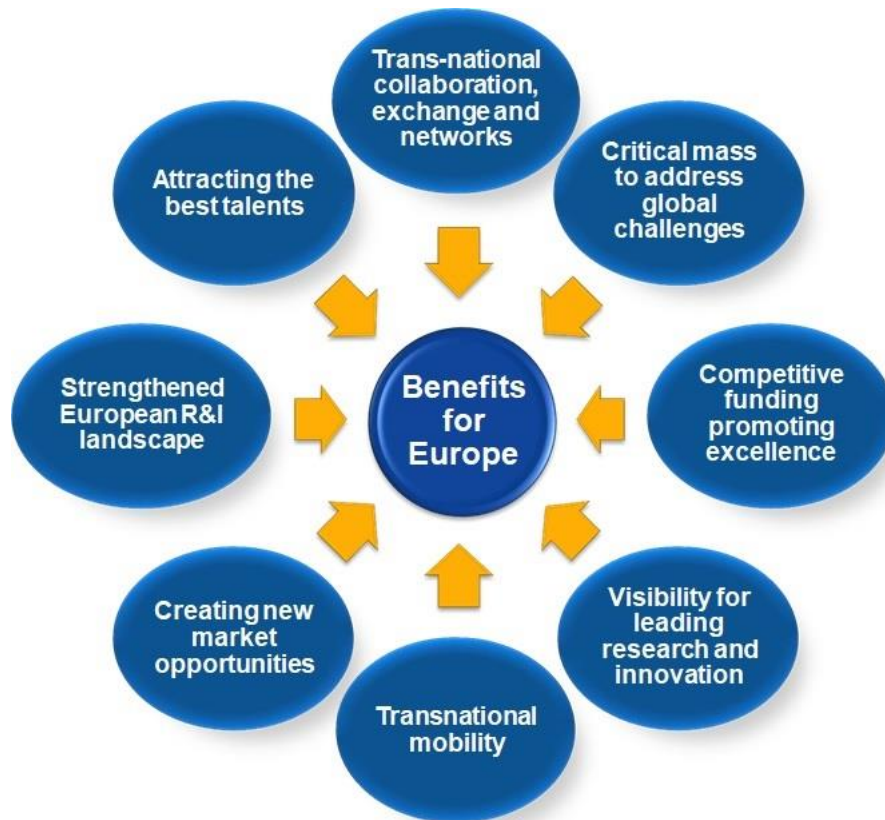


Figure 4. Added values through Horizon Europe. Source: European Commission.

The multi-actor projects and [Agriculture Knowledge and Innovation Systems \(AKIS\)](#) are expected to continue under the Horizon Europe funding scheme, together with the enhanced links between R&I activities and EU policies. This comprehensive approach should tackle the challenges in the future research setting the climate change as the high priority of Horizon Europe programme. Furthermore, with knowledge, innovation and digitalization as cross-cutting objectives (Art. 5) and greater focus on research, technology and digitisation as specific objectives (Art. 6) of the [Common agricultural policy \(CAP\)](#) including the contribution in setting-up of AKIS and development of digital technologies as part of CAP strategic plans on regional level (Art. 102), the synergy between the new Horizon Europe programme i.e. science, and [CAP post 2020](#) i.e. practice, is crucial to achieve overall EU's R&I goals. The [EIP-AGRI](#) will continue to act as a bridge to ensure the links and pool funding sources from Horizon Europe and CAP rural development in order to foster competitive and sustainable farming and forestry, mostly through their operational groups set with a specific purpose of bringing R&I projects results directly to end-users.



Figure 5. Specific objectives of Horizon Europe. Source: European Commission

3.6 Other rural development-related EU programmes and measures

Because of the cross-cutting nature of the CAP, various other EU funding programmes deal with similar fields. In a general way, relevant EU funds providing support include the following: the European Regional Development Fund, the European Social Fund, the Cohesion Fund and the European Maritime and Fisheries Fund. These are collectively known as the **European Structural and Investment (ESI) funds**. Many of the programmes funded through the ESI funds apply to rural areas. Take, for instance, the broadband coverage of rural areas. With the Europe 2020 strategy, EU commitments to be achieved by 2020 include full national coverage by broadband above 30 Mbps and 50% of the EU subscribed to broadband above 100 Mbps. Rural areas are also recipients of the funds distributed through the [European Fund for Strategic Investment](#), which is the main pillar of the Investment Plan for Europe. Additional programmes include aspects of interest to rural areas, such as the Fund for [European Aid to the Most Deprived](#) (FEAD), which supports EU countries' actions to provide those most deprived with material assistance, such as food, clothing and other essential items for personal use; the research and innovation framework programme [Horizon 2020](#) (including research funds on food security, sustainable agriculture and the bioeconomy); [European territorial cooperation](#) (with a budget accounting for **2.74%** of the total 2014-2020 allocation for cohesion policy, the programme includes among its objectives the connection between rural and urban areas, as well as the accessibility of rural areas and environmental protection).

3.7 The Cohesion Policy

‘Cohesion policy’ is the policy behind the hundreds of thousands of projects all over Europe that receive funding from the European Regional Development Fund (ERDF), the European Social Fund (ESF) and the Cohesion Fund. The idea is that cohesion policy should also promote more balanced, more sustainable ‘territorial development’ – a broader concept than regional policy, which is specifically linked to the ERDF and operates specifically at regional level. Cohesion policy makes a real difference, investing huge sums in some countries (up to 4 % of their GDP).

Cohesion Policy has set 11 thematic objectives supporting growth for the period 2014-2020 (Figure 6).

- Investment from the ERDF supports all 11 objectives, but 1-4 are the main priorities for investment.
- Main priorities for the ESF are 8-11, though the Fund also supports 1-4.
- The Cohesion Fund supports objectives 4-7 and 11.

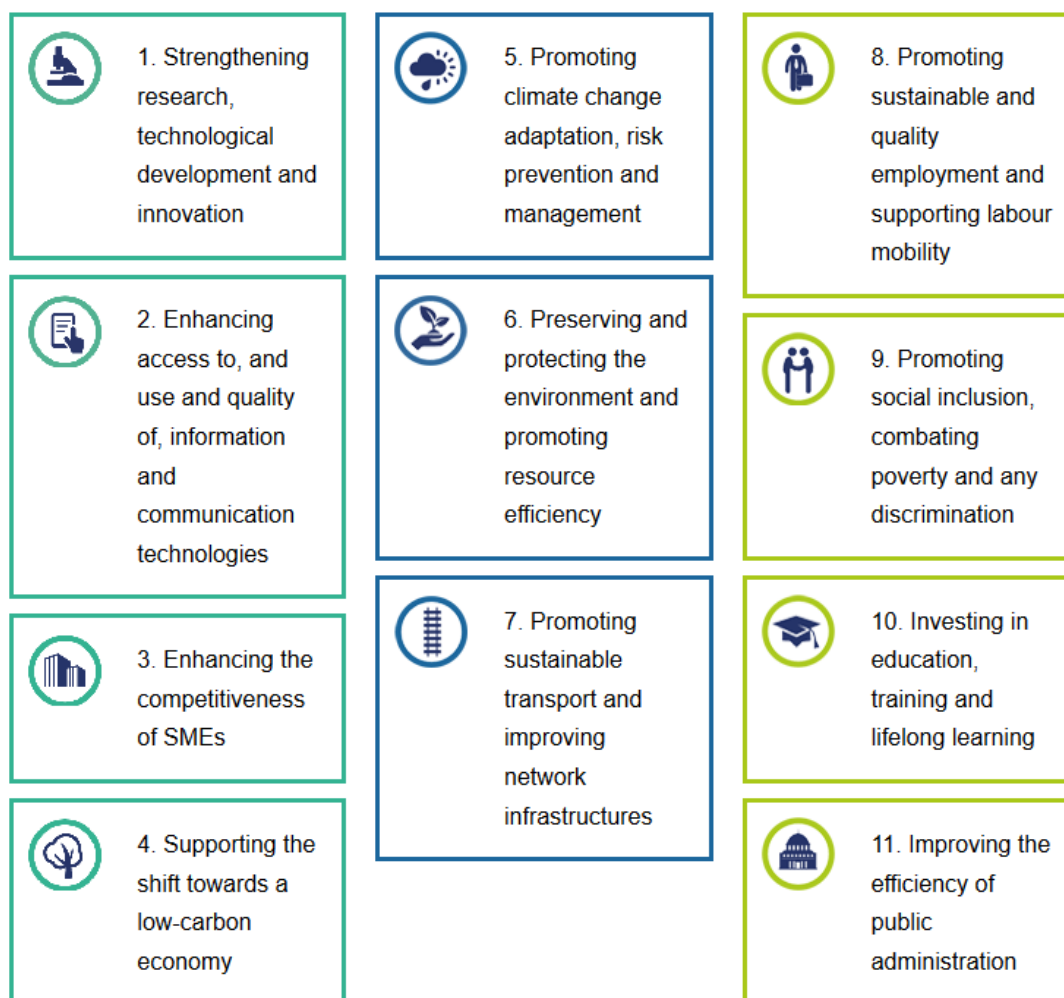


Figure 6. Cohesion Policy thematic objectives supporting growth for the period 2014-2020.

3.7.1 EU structural and investment funds for Broadband strategy & policy

In the area of rural broadband, the European Commission put forward multiple policy measures and financial instruments that encourage private and public investments in fast and ultra-fast networks. These measures will help European citizens and businesses reap the full benefits of digitalisation. The following objectives have been set in the field of '[provision of broadband](#)':

- Basic broadband for all citizens by 2013: this target is met, as [satellite broadband is available \(coverage 100%\) in every Member State](#).
- Coverage of Next Generation Networks (NGN): 30 Mbps or more for all citizens by 2020.
- Use of Next Generation Networks (NGN): 100 Mbps or more by 50% of households by 2020.

In addition, the European Commission adopted a strategy on [Connectivity for a European Gigabit Society](#) in September 2016. This strategy addresses the availability and take-up of very high capacity networks, which will enable the widespread use of new products, services and applications in the [Digital Single Market](#).

The three main strategic objectives for 2025 are:

- Access to 1 Gbps for all schools, transport hubs and main providers of public services and digitally intensive enterprises,
- Access to download speeds of at least 100 Mbps to be upgraded to 1 Gbps for all European households, and
- Uninterrupted 5G wireless broadband coverage for all urban areas and major roads and railways.

Among the Main measures for a future oriented broadband policy, to promote public funding in rural areas, the Commission revised the [guidelines for the application of EU State aid rules to the broadband sector](#) in January 2013 (concerning the Application of state aid rules to the deployment of broadband networks) and published a new [Broadband Investment Guide](#) in September 2014, with the aim of aiding municipalities and other entities in their planning of successful broadband development projects. The Guide gives practical tips to support public authorities in the preparation of broadband investment projects, including those co-financed from the European Structural and Investment Funds and the Connecting Europe Facility.

As about the financing instruments of the strategy, the European Commission's policy framework encourages both private and public investments in fast and ultra-fast networks to achieve the connectivity targets of the [Connectivity for a European Gigabit Society](#) strategy.

Within the [Investment Plan for Europe](#), the [European Fund for Strategic Investments \(EFSI\)](#) supports financing of the high-speed broadband roll-out. Member States have the opportunity to contribute to the Fund directly or through their National Promotional Banks.

Furthermore, the EU provides a framework for investment with the support of [European Structural and Investment Funds](#).

In addition, the [Connecting Europe Facility \(CEF\)](#) supports Digital Service Infrastructures (DSIs) and broadband networks. It offers funding opportunities for basic and re-usable digital services, known as building blocks, and contributes to the achievement of the Digital Agenda broadband access targets for European households by 2020. CEF aims at stimulating the deployment and modernisation of broadband networks.

Moreover, in an effort to revitalise rural communities and make them more attractive and sustainable, together with MEPs, the European Commission on 11 April 2018 launched an EU action called “**Smart Villages**”¹⁸

¹⁸ <https://www.euractiv.com/section/agriculture-food/news/commission-the-future-relies-on-boosting-smart-villages/> (last access 12/06/2018).

3.7.2 EU structural and investment funds for high-tech skills in farming

EU funding for training and knowledge transfer in farming primarily comes in the form of grants from the European Agricultural Fund for Regional Development (EAFRD), the European Regional Development Fund (ERDF), as well as the European Social Fund (ESF). These three funds contain 70% of the EU's total budget for 2014-2020.

Although funding from the ERDF, the ESF and the EAFRD come from the EU budget, the system is decentralized: funding allocation is governed by the content of the [partnership agreements](#) signed between the European Commission and the Member States at the beginning of each programming period. Money then comes in the form of grants co-funded by the EU and national or local authorities through so-called 'operational programmes'. The share of EU funds earmarked for knowledge transfer in agriculture is, therefore, a matter of local political will. Examples of goodwill include Greece, which, in 2015, partnered with national research and innovation institutes [to provide around 5000 farmers](#) with support to implement innovative practices through the ESF budget.

Other vehicles for supporting knowledge transfer in farming include the €7 billion Lifelong Learning Programme, which supports study visits, exchange programmes and networking activities. Last but not least, EU-funded R&I projects play a role in bridging the skills gap: for example, the [Trial Management Work Package](#) of IoF2020 foresees the development of training materials and training sessions for stakeholders to make proper use of the software and equipment applied along the project's 19 use-cases.

More information on how new teaching methods can contribute to reducing the gap between agriculture and society and speed up knowledge-transfer in farming can be found in the article "Ag education adapts as technologies progress".¹⁹

3.8 Digitising European Industry

The future of Europe and our economy is clearly digital, and the potential of digitalisation is enormous. Technologies change exponentially and there are an increasing number of disruptive technologies appearing. The pace of change of industry, however, is linear so there is a need for both speed and agility in adopting new business models and in creating smart products/services that offer new experiences to properly confront challenges which include:

- There are still big differences in the level of digitalization of industry across sectors, Member States and regions;
- Only 1 out of 5 companies across the EU are highly digitized;
- Around 60% of large industries and more than 90% of SMEs feel they are lagging behind in digital innovation;
- Europe is lagging behind on online platforms; EU industry cannot afford losing leadership in digital industrial platforms;

¹⁹ [http://www.whig.com/20171104/ag-education-adapts-as-technologies-progress#//](http://www.whig.com/20171104/ag-education-adapts-as-technologies-progress#/)

- 90% of future jobs will require some level of digital skills while 44% of Europeans lack basic digital skills.

For those reasons, the [Digitising European Industry initiative](#) was set up in 2016 to boost the competitiveness of European Industry aiming to reinforce EU's competitiveness in digital technologies and to ensure that every business in Europe – whichever the sector, wherever located, whatever the size - can fully benefit from digital innovation. After two years there are now 15 national digitalisation initiatives launched across member states (more expected in 2018) contributing to the alignment of national digitalisation strategies with priorities of the Digitising European Industry initiative. Additionally, increased investments from both Member States and industry in digitalisation of all businesses have been observed, in line with the initial target of €50 billion from 2016 to 2020. Public Private Partnerships in Research and Innovation allow industry and academia to deliver on key digital technologies and their integration into digital industrial platforms. [Digital Innovation Hubs](#) (DIH), as one of the available tools, foster the diffusion and adoption of these technologies by all businesses with a strong dimension of regional ecosystems. By bringing together IT suppliers, the farming sector, technology experts, investors and other relevant actors, DIHs will ensure the connection between the ICT and the farming communities.

To compete at the global level, an agile model is however required that allows Europe to invest in new areas quickly. It is not just about technology, it is also about business and cooperation networks. Alliances are key, and a major barrier is not technology readiness, but the human ability to cope with rapid introduction of new technologies. Digitalisation is not a short-term activity, but a strategic, long-term investment.

3.9 Thematic smart specialisation platform on agri-food

Smart specialisation is an innovative approach aiming at boosting growth and jobs in Europe, by enabling each region to identify and develop its own competitive advantages. Through its partnership and bottom-up approach, smart specialisation brings together local authorities, academia, business spheres and the civil society, working for the implementation of long-term growth strategies supported by EU funds. [The S3 Platform](#) provides a combination of mapping tools that allow users to identify regions' economic domains of specialisation and aim at facilitating interregional cooperation and the creation of partnerships among various actors throughout Europe. The S3 Platform provides advice to EU countries and regions for the design and implementation of their Smart Specialisation Strategy (S3) such as:

- Provide guidance material and good practice examples
- Inform strategy formation and policy-making
- Facilitate peer-reviews and mutual learning
- Support access to relevant data
- Train policy-makers

4. Policy Gaps

4.1 The future of Smart Farming Technologies in the CAP after 2020

4.1.1 Policy Gaps

Based on the outcomes of the regional and innovation workshops realized during the Smart-AKIS project lifetime, several policy gaps should be addressed by the future Common Agricultural Policy. The CAP is generally considered, by different stakeholders, firstly farmers, as the biggest opportunity to make EU's agriculture more competitive as well as greener²⁰.

Cutting red tape - Farmers and agricultural practitioners find CAP requirements too complex. As outlined, for instance, by Copa and Cogeca Secretary-General, Pekka Pesonen, in his reaction to the launch of EU Commissions public consultation on the modernizing and simplifying the Common Agricultural Policy (CAP): *"(...) For us, a key element of the future CAP is simplification of current rules as many farmers find that the worst thing about being a farmer is too much red tape and form filling (...)"*²¹.

Stimulating innovation - Moreover, in the current set-up, farmers are not sufficiently stimulated to make use of modern innovative technologies with important positive output in terms of productivity, thus making the upmost use of Smart Farming Technologies capabilities²². As outlined by CEMA, the voice of the Agricultural Machinery Industry in Europe²³, the CAP should be used as leverage for supporting farmers investing in those technologies, such as precision or digital farming, which have proven to have environmental benefits.

Meeting the sustainability goals - According to a recent study funded by the European Commission Joint Research Centre (JRC)²⁴, agriculture is a major source of GHGs liable for climate change: *"The major GHGs produced in the agricultural sector are methane (CH₄), nitrous oxide (N₂O) and carbon dioxide (CO₂). CH₄ is mainly produced from the anaerobic decomposition of organic matter during enteric fermentation and manure management, but also from paddy rice cultivation; N₂O arises from the microbial transformation of N in soils and manures (during the application of manure and synthetic fertiliser to land) and via urine and dung deposited by grazing animals; and CO₂ arises from: (i) energy use pre-farm, on-farm and post-farm; and (ii) from changes in above and below ground carbon stocks induced by land use and land use change. The agricultural sector contributes to the production of 25% of CO₂, 50% of CH₄, and 70% of N₂O emissions in a global basis summing up to nearly 13.5% of the total global anthropogenic GHG. The application of precision agriculture (PA) practices, using the large reservoir of Precision Agriculture Technologies (PATs) in agricultural field operations could positively contribute to GHG emission reduction due to: (i) the enhancement of the ability of soils to operate as carbon stock reserve by less tillage and reduced nitrogen fertilization; (ii)*

²⁰ Smart-AKIS deliverable D3.6: "Smart-AKIS Recommendations and Timesheets", June 2018.

²¹ Copa and Cogeca, Press Release, Reacting to the launch of EU Commissions public consultation on the modernizing and simplifying the Common Agricultural Policy (CAP), Brussels, 02/02/2017, available [online](#), last consultation 08/05/2018.

²² Smart-AKIS deliverable D3.6: "Smart-AKIS Recommendations and Timesheets", June 2018.

²³ CEMA Consultation Paper

²⁴ Sustainability Journal, MDPI Study, Precision Agriculture Technologies Positively Contributing to GHG Emissions Mitigation, Farm Productivity and Economics

the reduction of fuel consumption through less in-field operations with the tractor (direct GHG decrease); and (iii) the reduction of inputs for the agricultural field operations (indirect GHG decrease)”²⁵.

As presented in the recent paper published by CEMA on “**Smart Agriculture for All Farms**”²⁶, producing less GHG with a maintained crop production, or even an increased level, if we take into account the food security challenge, cannot be achieved with conventional practices. New Precision Agriculture technologies for all agricultural practices (ploughing, planting, fertilizing, spraying, harvesting) will be needed to ensure a GHG mitigation in line with the EU 2030 climate and energy binding targets adopted in October 2014:

- At least 40% cuts in greenhouse gas emissions (from 1990 levels),
- At least 27% share for renewable energy,
- At least 27% improvement in energy efficiency

Beyond the GHG binding targets, society wants more sustainability to justify the CAP payments. SFTs offer solutions to produce more with less and enhance food security and safety, providing farmers, for instance, with extra sensors which give them more information on how to manage natural variations like weather conditions, pests, insect and fungal infestation.

Sustainable production - Producing more and better from less is probably the biggest challenge of the agriculture of the future and digital farming technologies have a big role to play on that, as pointed out in several occasions by the European Commission itself: *“The challenges farmers are facing today are immense: producing more and better from less, at affordable prices, while reducing their impact on the environment and keeping pace with consumer demands, and all of this in the light of climate change and volatile global markets”²⁷.*

Agricultural productivity is thereby a *“prerequisite to meet the challenge of feeding more than 9 billion people by 2050, by achieving more with less”²⁸*

One of the crucial questions of the CAP would thus rely on how the most important instrument for supporting the agricultural sector in the EU will help breaching the gap between the most advanced and productive farmers and those lagging behind, without underestimating the importance of the social and economic dimensions of such activities.

Improving social health and vitality in rural areas - As already outlined by CEMA in the position paper release in February 2015²⁹, the European agricultural productivity challenge is not only about international competition, it is also about the social dynamics it generates for the sector in Europe, especially in terms of farmers GDP per capita.

²⁵ *Ibidem*

²⁶ Dryancour G., Chairman of CEMA’s Public Policy Group, Smart Agriculture for All Farms – What needs to be done to help small farms access Precision Agriculture? How can the next CAP help?, Brussels, November 2017. Available [online](#).

²⁷ European Commission, News, European Union funds digital research and innovation for agriculture to tackle societal challenges, Brussels, December 2017, available [online](#) (last consultation 08/05/2018).

²⁸ European Commission, Productivity in EU agriculture - slowly but steadily growing, EU Agricultural Markets Briefs, Brussels, N 10/December 2016, available [online](#) (last consultation 08/05/2018)

²⁹ Dryancour G., Chairman, Public Policy Group (PPG), CEMA, Towards a New Strategic Agenda for the Common Agricultural Policy (CAP) after 2020 – CEMA Position Paper, Brussels, February 2015.

For instance, according to OECD³⁰, productivity in the manufacturing sector increased at an average annual rate of 3,5% per cent, between 2000 and 2014. In other terms, the annual supplementary income generated by the manufacturing sector increases five times faster than the annual supplementary income generated in agriculture.

Parallel to the social economic challenge, the environmental challenge is also a fundamental part of the debate on the future CAP, a debate that need to focus on the role that agriculture can play in order to mitigate climate change and other environmental risks.

This is particularly relevant for smallholder farmers: as showed by CEMA in a recent publication, smallholder agriculture still dominates the European rural economy, with 86% of EU farms holding an area below 20 hectares³¹.

Adapting to the scale - Smart Farming Technologies are a **means to an end, not an end on itself**, to provide profitable alternatives for these farmers. Nevertheless, available economic evidence shows that there is a strong link between the size of a farm holding and its income, with larger farms tending to have higher income and investment capacity.

The importance of this 'scale factor' has also been evident in the uptake of SFTs: even if today SFTs have started to spread across the 100ha farm holdings segment, there still is a clear bottleneck for the farm segment below 100ha with an income below EUR 25,000. For these farms, it is still difficult to access certain SFTs in a profitable way, unless they operate in a niche production. As a result, currently less than 25% of EU farmers have access to Precision Agriculture technologies³².

Funding from the CAP for the uptake of these technologies in such way that it neutralizes the negative effect of farm scale, would significantly support small farmers to become more competitive, as recently addressed – among others - in the debate, which followed the presentation to the European Parliament AGRI Committee of a STOA study on Precision Agriculture and the future of farming in Europe on August 30th³³. As it is about the use of smart farming technologies, it not necessarily means the support for purchase. Therefore such support should be based on evidence that intelligence is gathered and best practices used based on smart farming technologies. Here, there is a strong role for advisors, contractors, cooperatives.

4.1.2 Smart-AKIS Proposals

The starting point for advising on the future of the CAP should be, as well explained by AG Commissioner Phil Hogan in an inspirational speech of the 13th of October, 2016 to keep the farmers at the centre of all future strategies to be implemented by the Common Agricultural Policy:

"We know that Europe has every capacity to become a champion in environment and climate-smart agriculture. We have some of the world's leading agriculture research institutes, with decades of expertise. We have policymakers who are fully in tune with these challenges. The recent European

³⁰ OCDE, The future of Productivity, Paris, 2015.

³¹ Smart Agriculture for all farms – CEMA paper

³² Ibidem

³³ [http://www.europarl.europa.eu/RegData/etudes/STUD/2016/581892/EPRS_STU\(2016\)581892_EN.pdf](http://www.europarl.europa.eu/RegData/etudes/STUD/2016/581892/EPRS_STU(2016)581892_EN.pdf)

Parliament reports by MEPs McIntyre and Huitema reports have been very positive contributions. They highlight **the need for the Commission to stimulate the development and uptake of precision farming. They also urge the Commission to include innovation in any forthcoming review or reform.** We know that we have the capacity and ingenuity to develop new solutions for keeping our soils healthy, our water clean, and our environment rich in species to keep away pests. However, I would add one proviso to your discussions. **Please make sure that all your strategies keep the farmer at their centre. At the end of the day, it is the men and women working the land who must deliver.** The CAP has always been, and continues to be, a farmer-oriented policy. New methods and innovations must serve the greater societal good, but they must also serve the farmer's bottom line. Without a fair reward for their work, we cannot expect farmers to continue delivering food security as well as this broad spectrum of wider public goods. **Therefore, I urge you to work towards solutions which reward the farmer.** Production efficiency has a direct impact on the farmers' wallet. They will be able to produce at lower costs and – with all other things being equal - farming income will increase”.

Starting from this principle to aim for increased efficient and sustainable production, the Smart-AKIS project proposes the following concrete measures to be adopted:

4.1.2.1 Support to access Smart & Precision Agriculture Technologies Tailored to Farm Size

The CAP should devote a specific percentage of the available budget to projects aimed at enhancing farm holdings' productivity (Table 6). The proposal already put forward by CEMA with the Position Paper released on March 2017³⁴, is to use a Total Productivity Factor as a general key concept for allocating the funding within the CAP³⁵.

Table 6. Support to access Smart & Precision Agriculture Technologies Tailored to Farm Size.

Barrier addressed	Proposal	Partner proposing the solution	Source
Economic: value for money	Sustainable Productivity Bonus adapted to farm size	CEMA	Smart Agriculture for All Farms (CEMA publication: Dryancour G., 2017)

In particular, the CAP after 2020 should help improve access to Smart & Precision Agriculture Technologies through a Sustainable Productivity Bonus which would be adapted to the farm size and differ according to the different sizes of farms (taking Smart-AKIS findings from Deliverable 2.2 into account, beside farm size, the dominant cropping system has to be taken into account when recommending targeted support). The CEMA proposes the following distribution:

³⁴ Dryancour G., Chairman, Public Policy Group (PPG), CEMA, Towards a New Strategic Agenda for the Common Agricultural Policy (CAP) after 2020 – CEMA Position Paper, Brussels, February 2015.

³⁵ To this extent, CEMA, representing the Agricultural Machinery Industry, encourages EU policy makers to re-establish a mechanism allowing Member States to dedicate up to 10% of Pillar 1 budget to specific projects aimed at enhancing farm holdings' productivity. This could also be applied for Pillar 2 for any unspent budget.

- **Farms < 50ha**

These farms should be eligible for a dedicated subsidy to invest in basic SFTs or a voucher for using contractual services. In addition, CEMA proposes for this size of farm to create a special voucher for buying small-scale communication technologies with agricultural applications, like smart phones, tablets, and computers³⁶.

- **Farms 50-100ha**

CEMA proposes a two-tier system for this category of farms: they could either go for the Sustainable Productivity Bonus or apply for a dedicated Smart Technologies subsidy or voucher³⁷. The dedicated Smart Technologies subsidy could be used either for investing in advanced technologies or renting the services of a certified contractor/cooperative equipped with these technologies.

- **Farms >100 ha**

Most of these farms already have access to SFTs, the point is to support and enhance the adoption of such technologies, when they are beneficial to the environment. The proposal is therefore to use the Sustainable Productivity Bonus also for these farms, thus rewarding those farmers who can increase their productivity while strictly following the cross-compliance requirements. Farmers investing a given percentage of their revenue in certified sustainable technologies would thereby be eligible to the Greening direct CAP payments. Different SFTs could potentially be eligible to the Sustainable Productivity Bonus, like: tools to analyse big Data, smart devices that generate useful data, data sharing, connecting devices/tools, integration of smart-phones, tablets, embedded computers with dedicated software and applications, unmanned systems like drones, robots, and highly automated machinery.

4.1.2.2 Supporting farmers investment in SFTs through the CAP Second Pillar

The EU's rural development policy helps the rural areas of the EU to meet the wide range of economic, environmental and social challenges of the 21st century. Frequently called "the second pillar" of the Common Agricultural Policy (CAP), it complements the system of direct payments to farmers and measures to manage agricultural markets (the so-called "first pillar").

Since the reform of the Common Agricultural Policy, Rural Development is playing an increasing role in helping rural areas to meet the economic, social and environmental challenges of the 21st century. Maintaining the CAP second pillar is thereby crucial for promoting a balanced territorial development of rural economies and sustaining a farming sector that is environmentally sound as well as competitive and innovative, as in the goals of the EAFRD.

In this framework, the CAP second pillar should support investments by sustainable farmers through schemes that can help them investing in new equipment and technologies, and particularly when such investments are assessed to have a positive environmental impact (Table 7). In such cases, different funding mechanisms and bodies working at different levels (European, National and regional) can work together, with different functions, for achieving the same objectives.

³⁶ This special annual voucher for lower-scale technologies could be in the range of 500-750 €.

³⁷ CEMA estimates that a dedicated subsidy ranging between 6,500 - 7,000 € would be suitable to cover the basic PA needs farmers of this size category.

Table 7. Supporting farmers' investment in SFTs through the CAP Second Pillar.

Barrier addressed	Proposal	Partner proposing the solution	Source
Economic: farm competitiveness	Investing in new machinery for improved crops production in Slovakia	Desk Review: CEMA	Desk Review: European Network for Rural Development (ENRD)
Technical barriers* (with economic component)	RTK Stations network to support GPS	INTIA	Policy case presented by project partner INTIA (ES)
Economic: farm competitiveness	Greek Rural Development Program (RDP) Measure 16 on "Cooperation"	AUA & CERTH	Policy case presented by project partners AUA and CERTH (GR)
Economic: high investment cost	Greek Rural Development Program (RDP) Measure 4	AUA & CERTH	Policy case presented by project partner AUA and CERTH (GR)
Economic: high investment cost	RDP for England: LEADER Funding	DTA Ltd	Policy case presented by project partner DTA Ltd (UK)
Economic: high investment cost	Plan pour la Compétitivité et l'Adaptation des Exploitations agricoles (PCEA)	ACTA	Policy case presented by project partner ACTA (FR)
Economic: high investment cost	VAMIL – Tax facility	Delphy	Policy case presented by project partner Delphy (NL)

Example Slovakia - A first example of such a scheme comes from the implementation of the EAFRD Measure on "Investments in physical assets" in Slovakia, as reported in the ENRD database of funded project. Here, several good practices examples are provided: one in particular "**Investing in new machinery for improved crops production in Slovakia**"³⁸ appears to be particularly relevant because of the demonstrated result of expanding the production capacity of a company producing pumpkin seeds and potatoes, by investing in new machinery.

A partially similar measure is the one implemented in the Spanish Navarre Region for supporting the installation of **8 RTK Stations to improve the GPS signal for farmers**³⁹. Such technical investment was indeed accompanied by subsidies that the Government of Navarre gave to the farmers for the purchase of precision farming machineries and equipment and, specifically, to the installation of GPS on the tractor. The latter is indeed identified by INTIA, the Smart-AKIS project partner responsible for this policy case, as one of the key attributes of success of this experience.

³⁸ More information about this project are available at the ENRD database: https://enrd.ec.europa.eu/projects-practice/investing-new-machinery-improved-crop-production_en (last consultation 16/05/2018).

³⁹ For more information on this policy case, please refer to paragraph 4.3 - Connectivity, complexity and compatibility issues for the adoption of Smart Farming Technologies.

Example Greek - If these are very economic and competitiveness-oriented examples, Smart-AKIS has also collected experiences addressing other sustainability dimensions, particularly as for the **environmental** one.

This is the case of both the Greek cases collected through the project. In the first one, related to the **Greek Rural Development Program (RDP) Measure 16 on "Cooperation"**⁴⁰, we observe a concrete example of Operational Groups established with the aim of attaining competitiveness and sustainability results (Sub-Measure 16.1- 16.2) and particularly environmental goals (Sub-measure 16.1 -16.5): partnerships can be set under this measure for exploiting new technologies, including SFTs, which may include, but are not limited to, the implementation of new, innovative processes in primary production of agricultural products and in the food sector, cultivation and production practices that contribute to environmental protection and adaptation to climate change.

The Greek RDP measure presented is also an example on how to promote collaborative schemes between the public and the private sector, moving the funding instruments from pure research to applied research and concrete product development actions.

The second Greek policy case collected refers to another **RDP Measure**, more precise the **number 4**⁴¹, designed to help farmers in Greece to optimize their farm infrastructure in terms of buildings and machinery: for example, equipment that is incorporated into buildings, automotive machinery, machinery and equipment, meteorological warning services and plant protection network equipment are included (Action 4.1.1). This measure thereby includes Smart Farming Technologies to be purchased by farmers and provide an extra motive to do so by applying bonus credit for applications that contain such technologies.

Example UK - Very concrete examples are also presented by the **Smart-AKIS Innovation Hub located in the UK**⁴² with respect to the implementation of the LEADER funding in this country. In the policy case collected, the Smart-AKIS partner David Tinker & Associates Ltd presents different examples of funding awarded to UK Local Action Groups and several cases included in the UK LEADER interactive map. Among them the case of the Whitbread farms using the available funding for adopting a sustainable zero tillage system with the aim of increasing agricultural productivity and making the farm more environmentally friendly in the process⁴³.

Example France - The environmental component is also present in the French policy case related to the **Plan for the Competitiveness and Adaptation of Farms – PCAE**⁴⁴. The PCAE is a good example of policy, which could foster the adoption of smart farming technologies. This measure helps farmers to buy equipment that is assessed for having a positive environmental impact on the regional territory. In this case, we therefore have a good articulation between farmers' needs, R&D knowledge and regional context:

- Farmers' need: the biggest barrier to increase SFT adoption, revealed by Smart-AKIS, was the investment cost of SFTs. This policy helps farmers buy equipment when the demand is accepted by the region;

⁴⁰ For more information: <http://www.agrotikianaptixi.gr> (last consultation 25/05/2018).

⁴¹ For more information: <http://www.agrotikianaptixi.gr/index.php?obj=cd3c3a903bfb1a6> (last consultation 25/05/2018).

⁴² For more information: <https://www.gov.uk/guidance/rural-development-programme-for-england-leader-funding> (last consultation 20/06/2018).

⁴³ For more information: www.magic.gov.uk (last consultation 20/06/2018).

⁴⁴ For more information: <http://agriculture.gouv.fr/plan-de-competitivite-et-dadaptation-des-exploitations-agricoles> (last consultation 16/05/2018).

- Research institutes are helping the French Ministry of Agriculture to produce the list of equipment, which have a good environmental impact. The evaluation of equipment performances is impartial and done in real conditions of use;
- Regions are picking, in the national list, equipment which could fit with the environmental priorities of the territory.

Another concrete example comes from a Dutch national instrument aimed at stimulating the investments in environmental friendly equipment and machinery, the tax facility for farmers called **VAMIL**⁴⁵. VAMIL is an instrument from the Dutch government aimed at stimulating sustainable developments in the Dutch rural economy. Through this measure, farmers can get an investment subsidy for specific equipment that addresses one or more of the biggest sustainable development's challenges: circular economy, agricultural sustainable production and the fight against climate change. There are alternative options on how the VAMIL works:

- Tax subsidy: through this option, a certain percentage of the investment is deductible from the taxes that the farmers must pay⁴⁶.
- Voluntarily depreciation: that is applied in time and percentage⁴⁷.

4.1.3 Smart-AKIS lessons learnt and recommendations: the future of Smart Farming Technologies in the CAP after 2020

The Smart-AKIS vision for the new **Common Agricultural Policy** after 2020 is to turn the policy (EARDP and EAGF) into an opportunity to make EU's Agriculture smarter and greener, so to contribute to a more sustainable and competitive EU agriculture. In this sense, EU policy makers are called to promote and realize a holistic approach aiming at:

- **Promoting solutions that are farmers-centred and that reward farmers.** In particular, concerning SFTs, farmers need to profit directly from the measure or, in other terms, the *"value for money needs to be clear"*. More specifically, farmers would need to see the advantage of adopting SFTs since, as outlined by Smart-AKIS, *"digitization is a means and not a goal"*. To this extent, policies to convince farmers to shift to sustainable agricultural schemes have been applied for many years, but they are not always effective. Combining such measures with State funding (as in **Greek policy cases on RDP Measure 4** and in the **Dutch policy case about VAMIL**, both presented in this chapter) and/ or through schemes that can help them invest in new equipment and technologies (policy case on **Investing in new machinery for improved crops production in Slovakia**, also presented in this chapter) can be a winning strategy for improving the impact of such measures.
- **Rewarding farmers also means rewarding their environmental performance and supporting demand-side policies with stricter environmental and food safety regulations.** As outlined in Smart-AKIS deliverable D3.6: "Smart-AKIS Recommendations and Timesheets" (June 2018), the perception about the usefulness for farmers of Smart Farming Technologies is almost

⁴⁵ For more information: <https://www.rvo.nl/sites/default/files/2017/12/Milieulijst%202018.pdf> (last consultation: 02/05/2018)

⁴⁶ The percentage varies between the 13% and the 36%, depending on the type of investment.

⁴⁷ A farmer can choose the depreciation percentage (up to 75%) in a year of choice.

exclusively based on the economic performance of the farm, overlooking other relevant aspects such as the **environmental impact** that the use of such technologies can bring into the fold, or the impact on the work conditions for farm workers. To this extent, the French **Plan for the Competitiveness and Adaptation of Farms – PCAE** presented in this chapter, is a good example of policy, which could foster the adoption of environmental-friendly SFTs since it helps farmers to buy equipment that are assessed for having a positive environmental impact on the regional territory. Moreover, **demand-side policies with stricter environmental and food safety regulations** would represent an opportunity for an increased adoption of SFTs as these technologies will ease regulatory compliance: nutrient inputs, water and carbon footprint, systemic approach to food traceability following increasing social demands for more sophisticated and safer food market, etc.⁴⁸ This might prove an additional added value for smart farming adoption besides the pure economic one.

- **Simplifying and improving the aid programmes management**, thus reducing the red tape involved in the application of public grants programmes and promoting synergies within the existing funding framework at EU and national levels⁴⁹. As recently outlined by T. Haniotis, Director, Strategy and Policy Analysis, DG Agriculture, European Commission, Agriculture, *“Simplification is not about introducing from scratch a new policy, but about making an existing policy simpler. Furthermore, it is about making it simpler while increasing the ambition stemming from demands from both analysis and public debate”⁵⁰*.

Of course, different options can be proposed for simplifying and improving the programmes implementation:. About the CAP management, positions range from those proposing to realize centralized and public authorities for the certification of technologies to those suggesting self-certification schemes. To this extent, to avoid unnecessary administrative costs and extra burdens for EU farmers, the manufacturers and producers should be able to self-certify the sustainable technologies they offer to EU farmers according to criteria clearly pre-defined in the CAP. In the middle between these two positions, the concrete and on-the-field demonstration of technologies and their application (see paragraph 4.2 - Lifelong learning, research and innovation as support strategies for boosting agricultural innovation) could work as a feasible compromise.

In the long run the devices itself, by the measurements they take, in combination with other sensors incorporated in smart applications will be able to monitor the overall benefits in terms of reduction of inputs, reduction in soil erosion, water pollution or increase in soil live. This digital information could be send directly to e.g. governments or appointed supervisory services as proof of good practice. It has the benefit to show the overall benefit for the production cycle and the specific are it is used in.

Also currently, such services, offered by manufacturers or other parties, should be considered as valuable alternatives to certification. At the end certification of equipment/application in such variable environment with so many parameters will enquire optimized, stabile lab conditions and are therefore not necessarily a reflection of the reality. In addition the effect over the whole production chain must be analysed, not for every single operation. It is the main downside of any certified performance, that it might be comparable but not necessarily representative. This is where the

⁴⁸ A concrete example is provided in paragraph 4.4 - An ecosystem for enhancing innovation in agriculture of this report.

⁴⁹ For more details, please refer to paragraph 4.4 - An ecosystem for enhancing innovation in agriculture of this report.

⁵⁰ Haniotis T., CAP simplification made simple (sort of...), article available online on <https://www.linkedin.com/pulse/cap-simplification-made-simple-sort-tassos-haniotis/?published=t> (12/07/2018).

aspect of data sharing becomes very important as it can be the key to exchange subsidies for knowledge.

Furthermore, simplification should also take into account the need of reducing the “**time to funding**”: as showed, in particular, in the policy case on **Greek RDP Measure 4**, State funding for farm modernization can be a double-edged sword if it stops farmers from investing (even if it is inevitable for the good operation of the farm) until this program starts. It is therefore necessary to adapt the functioning of such funding schemes to the reality of the agricultural businesses, thus, for instance, ensuring the continuity of already- working funding schemes.

- **Promoting collaboration between different actors**, for instance public and private entities to assemble Operational Groups and run innovation projects at the regional, national and international level. The **Greek RDP measure 16** presented in this chapter is one of the possible examples of how to promote collaborative schemes between the public and the private sector, moving the funding instruments to pure research to applied research and concrete innovative actions. Again, data sharing could be one aspect of such collaboration where the public bodies will orchestrate the analysis of big data for certain areas, giving knowledge back to farmers.

4.1.4 Improving farmers quality of life through the CAP Second Pillar and facilitating their access to funding schemes

Improving farmers’ quality of life is one of the crucial objectives that the second pillar of the CAP should address. Given that it is such a broad objective, we consider more appropriate to address it in terms of related sub-topics.

Based on the knowledge gathered during the Smart-AKIS project and coherently with the barriers analysis realized during the last year of the project, as well as with partners’ testimonials and the desk review, the next chapters, that focus on further policy gaps and Smart-AKIS solutions, are organized following a thematic approach that should cover the most relevant areas for policy development, such as:

- The role of advisory services, demonstration and knowledge exchange as support strategies for boosting agricultural innovation (paragraph 4.2);
- Education and training for addressing the skills gaps (paragraph 4.2);
- Connectivity, complexity and compatibility issues for the adoption of Smart Farming Technologies and the access to rural broadband (paragraph 4.3);
- Creating an effective ecosystem for enhancing agricultural and rural innovation (paragraph 4.4).

4.2 Lifelong learning, research and innovation as support strategies for boosting agricultural innovation

4.2.1 The role of advisors of the future – policy gaps

The new role of advisors in the digital age has been well deepened during the different Smart-AKIS workshops, where, thanks also to the participation of advisers dealing daily with challenges related to the uptake of SFTs, it was possible to raise several recommendations for the future of advisors⁵¹. Some of the main elements of such recommendations concern:

- The training of advisers: promoting activities focused on the training of trainers.
- The methodology and tools for such training: supporting all training and educational efforts with the latest digital and social media capabilities (videos, podcasts, Augmented Reality, Facebook, Twitter, serious games, etc.).
- The approach which should follow the “Agronomy First principle” when integrating smart farming technologies into training and information⁵².

From a policy point of view, this can be translated in several ways. In the framework of the EU Fund for Agricultural Development (EAFRD), at least two measures need to be mentioned:

- **Article 14 on Knowledge transfer and information actions**, that covers “*vocational training and skills acquisition actions, demonstration activities and information actions. Vocational training and skills acquisition actions may include training courses, workshops and coaching*”⁵³.
- **Article 15 on Advisory services, farm management and farm relief services**, aimed at a) helping farmers to benefit from the advice; (b) promoting the setting up of farm management, farm relief and farm advisory services; (c) promoting the training of the advisors⁵⁴.

The need to retain advisors with updated and in-depth qualification and training is explicitly mentioned in the Regulation 1305/2013, whereas at Article 14, it mentions that “*Bodies providing knowledge transfer and information services shall have the appropriate capacities in the form of staff qualifications and regular training to carry out this task*”. The measure directly refers to the need to train the trainers.

Nonetheless, “**training the trainers**” is only one of the policy gaps that should be addressed in this field and that are included in a more general evaluation of the role of advisors in the contemporary “information and knowledge society”: a framework in which, the role of information is crucial, as well as the mechanisms to decode and interpret such information (thus transforming the information into knowledge).

A first range of policy gaps that should be addressed by the policy makers, therefore relates to the new context in which the advisors work: **the rapid pace of innovation** often prevents advisors from being updated on the last or more appropriate technologies available on the market. Several authors

⁵¹ Smart-AKIS deliverable D3.6: “Smart-AKIS Recommendations and Timesheets”, June 2018.

⁵² *Ibidem*.

⁵³ REGULATION (EU) No 1305/2013 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 17 December 2013 on support for rural development by the European Agricultural Fund for Rural Development (EAFRD) and repealing Council Regulation (EC) No 1698/2005.

⁵⁴ *Ibidem*.

have indeed underlined the gap between the need for change and farmers' willingness to change, and the insufficient capacities of innovation agencies and advisory services to effectively support these changes⁵⁵. This is particularly alarming for small-scale farmers that would be particularly disadvantaged⁵⁶ due to problems of access not only to technical services, but also to appropriate knowledge and available staff. Particularly for such small players, then, the fragmentation of the advisory services can result in a considerable disadvantage⁵⁷.

The need is therefore not only to improve the training of advisors, but also the **availability of updated tools and methodologies** to support the transfer of innovation, and their ability to offer tailored solutions to the different problems incurred by different farmers in different countries and at different levels, thus avoiding fix-to-all solutions.

This range of policy gaps is completed by a second one related to the specific limits and bottlenecks currently existing in the different national and regional Agriculture Knowledge and Innovation Systems (AKIS) in Europe. Even though such issues highly vary across different systems, regions and countries, a basic common point is the need for organization and interaction as crucial factors for improving the functioning of AKIS in Europe, as pointed out on several occasions by the SCAR-Strategic Working Group on Agriculture Knowledge and Innovation Systems (SWG SCAR-AKIS group⁵⁸), surely one of the most accredited source of information concerning the role, functioning and evolution of AKIS in Europe.

The SWG SCAR-AKIS group as well as the PROAKIS Project (2012-15⁵⁹) have both highlighted the great diversity of advisory services that exist in Europe, involving both private and public actors, and in different forms⁶⁰. Generally speaking, however, the trend observed is oriented towards the decentralization and fragmentation (vertical and horizontal) of advisory services (e.g. France, Greece, Portugal, Italy, Spain, Poland), partially as a result of commercialization and privatization of public organizations⁶¹. Such complexity, fragmentation and diversity make clear, once again, that fix-for-all solutions cannot effectively work and that we need to tailor alternatives that are adaptable to different situations to be evaluated on ad-hoc basis.

⁵⁵ Knickel K., G. Brunori, S. Rand and J. Proost (2009). Towards a Better Conceptual Framework for Innovation Processes in Agriculture and Rural Development: From Linear Models to Systemic Approaches in The Journal of Agricultural Education and Extension. Vol. 15, No.2, 131-146, June 2009

⁵⁶ Labarthe, P. and Laurent, C. (2013) Privatization of agricultural extension services in the EU: Towards a lack of adequate knowledge for small-scale farms? Food Policy, 38, 1, 240-252

⁵⁷ *Ibidem*.

⁵⁸ The SWG SCAR-AKIS group was launched early 2010 based on 3 SCAR Foresight studies, indicating the deficiencies of AKIS. The objectives of the SWG pursue the outcomes of all 4 Foresight studies, indicating that interaction is crucial for innovation and for addressing the right challenges, in order to stimulate appropriate research and innovation activities, knowledge generation and knowledge exchange. This covers all Agri-food and biomass chains, from producer to consumer in a systems approach. SWG SCAR- AKIS webpage, available [online](http://www.proakis.eu/), last consultation 04/06/2018.

⁵⁹ PRO AKIS Prospects for Farmers' Support: Advisory Services in European AKIS <http://www.proakis.eu/> (last consultation 04/06/2018).

⁶⁰ Knierim, A., Labarthe, P., Laurent, C., Prager, K., Kania, J., Madureira, L. and Ndah T. (2017): Pluralism of agricultural advisory service providers - Facts and insights from Europe. Journal of Rural Studies, 55, 45-58. DOI 10.1016/j.jrurstud.2017.07.018 [link](https://doi.org/10.1016/j.jrurstud.2017.07.018)

⁶¹ *Ibidem*.

Different set of solutions are clearly possible, and this report doesn't aim at covering them all, but only to focus on those highlighted during the Smart-AKIS project participatory activities, as well as through the experience of the Smart-AKIS multi-actor consortium, as summarized in Figure 7.

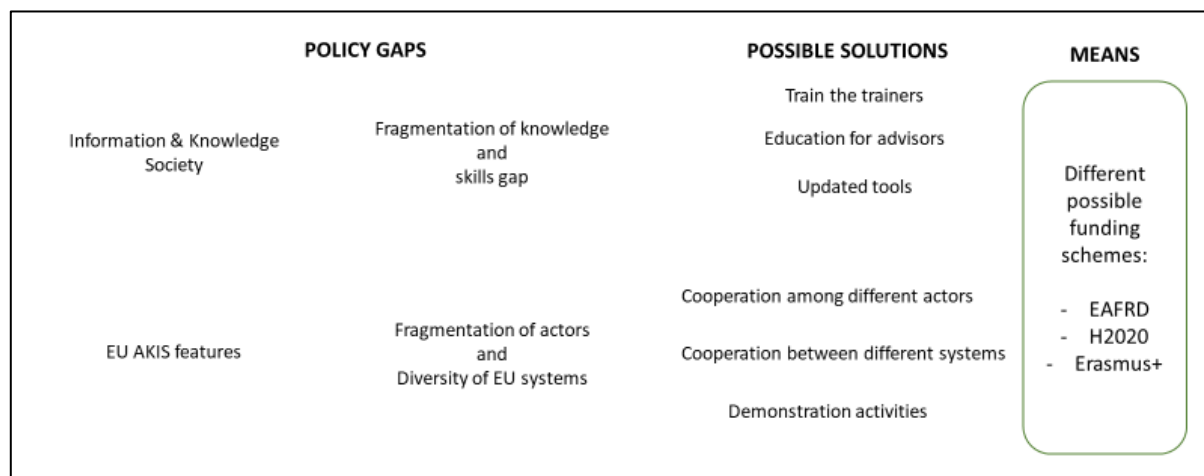


Figure 7. Policy gaps, possible solutions and means highlighted during the Smart-AKIS project participatory activities, as well as through the experience of the Smart-AKIS multi-actor consortium.

4.2.2 Education and training for addressing the skills gaps – policy gaps

The issue about education and training for addressing the skills gaps in agriculture is broader than the one addressed in the previous chapter and encompasses a comprehensive review of current curricula at all educational levels (higher education, vocational training and lifelong learning)⁶².

At the higher education level, the education offered from the academic world often confines farming to its “botanic” or biological aspects, leaving other equally important themes poorly addressed, if not substantially ignored. In the last decade University curricula have slowly evolved, incorporating aspects such as value and supply chains, or general notions on the bio-economy. Yet, the awareness that “agricultural” curricula are largely incomplete and would need to be re-designed. This is especially evident with the growing importance of data in the paradigm of precision farming. Farms have become places where data need to be collected, processed and analysed in order to take decisions about cultures, nutrients, cycles or other more strategic aspects of the agricultural practice. Farmers or farming managers who are not able to cope with data management will likely take wrong decisions, lose efficiency and ultimately decrease the overall competitiveness of their business. Given the new and severe challenges faced by the agricultural sector in the current globalised food markets, managing data in agriculture is becoming as important as agronomic knowledge and experience.

University programmes need to reflect the changes required by the 21st century's food security and productivity challenges. As computer technologies in agriculture continue to deliver innovation in farming practice, educational programmes will need to be tailored to address the continuously broadening range of educational needs. Closing the research and practice gap in agricultural data

⁶² Smart-AKIS deliverable D3.6: “Smart-AKIS Recommendations and Timesheets”, June 2018.

management is therefore crucial and should be taken into account in the planning of higher education didactical offer.

At the farmers level, several studies have indicated that farmers who do not adopt SFTs have insufficient skills and competences^{63,64}. The ageing rural population in Europe (with more 55% of farm managers above 55 years⁶⁵) might exacerbate this problem since older farmers can have diminished incentives to change and less exposure to SFTs⁶⁶. Once again, then, the role of farm advisors in the adoption of Smart Farming Technologies appears to be crucial.

4.2.3 The role of demonstration in the farmers learning processes – policy gaps

During the Smart-AKIS Innovation Workshops, farmers and advisors pointed out that they would need more empirical based evidence about the economic benefits of using SFTs, particularly concerning yield performance and the use of inputs. The lack of scientific evidence on the profitability and/or sustainability of the different smart farming technologies proposed has indeed been highlighted as one of the most relevant barriers for SFTs adoption. Different options have been proposed for cracking this barrier, thus helping farmers to take their decision. Not all actors can agree on some of the proposals, such as the nomination of independent and impartial, possibly, public certification bodies that would be responsible for assessing the different SFTs. Such a proposal, indeed, would imply addressing, at least, four main issues:

- Finding appropriate means to ensure that such a body would be really autonomous and independent and, at the same time, that it could work effectively.
- Testing of equipment must be neutral and is fraught with complications including trying to keep the testing procedures relevant to the latest technology advances
- Certification means working with methodologies that allow comparison. In a complex environment the trade-off between workability and simplification of such methodologies could lead to comparable but not necessarily representative findings.
- Certification is expensive and could result that specialised low volume innovative solutions do not receive the attention/place they deserve and are not marketed and such too expensive for successful uptake.

On the other side, in Smart-AKIS there have been proposals that all the actors involved in the network consider to be not only acceptable, but even desirable. This is the case of, in particular, **demonstration activities** at the farm level aimed at showing to the farmers how a technology or machinery actually works, with the benefit of having the possibility of testing the SFT directly on the field and in those particular field conditions.

Demonstration activities at the farm level are a crucial ingredient of agricultural knowledge exchange for innovation. Farmers tend to be very keen to listen to the practical experience of other farmers

⁶³ Adrian, A.M., Norwood, S.H., and Mask, P.L. 2005. Producers' perceptions and attitudes toward precision agriculture technologies. *Computers and Electronics in Agriculture*, 48:256-271.

⁶⁴ Pierpaoli, E., Carli, G., Pignatti, E., and Canavari, M. 2013. Drivers of Precision Agriculture Technologies Adoption: A Literature Review. *Procedia Technology*, 8:61-69.

⁶⁵ Eurostat, Agriculture statistics - family farming in the EU. Available [online](#) (last consultation 11/07/2018).

⁶⁶ Tey, Y.S., and Brindal, M. 2012. Factors influencing the adoption of precision agriculture technologies: a review for policy implications. *Precision Agriculture*, 13:713-730.

for getting inspired, and they often mention “other farmers” as their main source of information, as outlined, among others, by the NEFERTITI project⁶⁷. Farmer-to-farmer learning is thereby one crucial example of knowledge exchange in agriculture that can help in the up-take of new farming technologies or practices through the iterative engagement in non-linear knowledge networks or systems⁶⁸. Such activities could also have additional functions, for instance contributing to network building, generating dialogue and exchange, and starting new collaborations, projects, or joint initiatives between different stakeholders⁶⁹.

Demo-farms and, generally demonstration activities are also a perfect meeting point for farmers to interact with other actors such as advisors and industry representatives. The analysis carried out in Smart-AKIS Work Package 2 has showed that demo-activities are one of the relevant factors paving the way for success of the innovations: for example, the case studies collected through the “*Task 2.4 report: An ex-post study of successful innovation processes and best practices regarding SFT development*”⁷⁰ show that demonstrations can provide evidence that innovations works.

Furthermore, as pointed out by the Smart-AKIS Policy Recommendations⁷¹, advisors should promote outdoors fairs and field demonstrations of Smart Farming technologies, jointly with industry, for the benefit of exchange and learning among the various actors and in particular, farmers. Demonstrations is deemed aa key factor for adoption: demonstration farms, peer groups, farmers groups, etc. are efficient approaches for users to see upstream and downstream implications, costs and usability of Smart Farming technologies. Concrete examples of farms with such features collected through the Smart-AKIS project are: the [Bayer](#) digital farming demonstration farms in Belgium and Germany, [Digifermes](#) demonstration farms in France and the [Digital Farm](#) in Serbia.

Thus, Smart-AKIS encourages a more in-depth exploration of the role of field days and demonstrations for innovative practices to underline the strength of the innovation characteristic “observability” for its success.

4.2.4 Smart-AKIS Solutions: Smart Farming Support Strategies for unlocking technical and economic barriers

Education and training, advisory services and demonstration are the three main components of the forth group of policy recommendations issued by Smart-AKIS and centred on **Smart Farming Support Strategies**⁷². As the name suggests, this block of recommendations concerns measures to support the adoption of SFTs, such as initiatives related to strengthen knowledge exchange within the AKIS, to the update of education and training curricula as well as to the promotion of farmers-to-farmers demonstration activities. Not surprisingly, then, in the policy cases collected, the examples addressing barriers included in this “block” are often mentioned as support measures to bigger

⁶⁷ NEFERTITI project - Networking European farms to enhance cross fertilisation and innovation uptake through demonstration (H2020 – G.A. 772705): https://twitter.com/NEFERTITI_EU?lang=fr

⁶⁸ *Ibidem*.

⁶⁹ For more concrete examples, please refer to the NEFERTITI project - Networking European farms to enhance cross fertilisation and innovation uptake through demonstration (H2020 – G.A. 772705).

⁷⁰ Kernecker M., Kraus T., Knierim A., Borges F., Wurbs A., Task 2.4 report: An ex-post study of successful innovation processes and best practices regarding SFT development, Müncheberg, June 2018.

⁷¹ Smart-AKIS deliverable D3.6: “Smart-AKIS Recommendations and Timesheets”, June 2018.

⁷² *Ibidem*.

initiatives, where the components related to the training, advisory and/or demonstration are not the central ones, but they are just one of the necessary steps in achieving the general objective described in the policy case. This is the case of the initiatives listed in the table 8, where the main barrier addressed is either economic or technical, but components related to the training, or to the role of advisory, or more in general to the knowledge exchange are enabling factors for the effectiveness of the measure.

Table 8. Smart Farming Support Strategies for unlocking technical and economic barriers

Barrier addressed	Proposal	Partner proposing the solution	Source
Economic with support strategies	Greek Rural Development Program (RDP) Measure 16 on "Cooperation"	AUA & CETH	Policy case presented by project partner AUA & CETH (GR)
Economic with support strategies	Greek Rural Development Program (RDP) Measure 4	AUA & CETH	Policy case presented by project partner AUA & CETH (GR)
Economic with support strategies	Manure Policy: Flanders implementation of the NEC and ND directives	CEMA	Policy case presented by project partner CEMA (EU)
Technical with support strategies	RTK Stations network to support GPS	INTIA	Policy case presented by project partner INTIA (ES)

In the **Greek Rural Development Program (RDP) Measure 4**, for instance, an additional benefit provided is that in order to achieve, for achieving the primary objective of optimizing their farm infrastructure in terms of buildings and machinery, farmers need to get in touch with their advisors and discuss the applicability of the technologies available on their farms. Moreover, in some of the cases, the training of farmers on new technologies is carried out by the companies providing the SFTs. The **other Greek policy case** considered (Measure 16) has clearer training components which regards the establishment of Operational Groups: OGs on training regarding specific subjects (e.g. spraying methods and machinery) will be assembled to cover lack of SFT knowledge from advisor services and farmers. Advisory services, training and demonstration are all crucial success factors of the Spanish policy case focused on building **RTK Stations network to support GPS** in the Navarra Region. In this case, central role of advisors is related to the dissemination of the advantages and difficulties of the GPS technology in agriculture through meetings, seminars, demonstrations and publications. Furthermore, among the success factors of the Spanish case, it is also mentioned the personalized advice provided by the technical specialists, particularly the one provided by machinery retailers who trained the farmers on how using the system through on-the-field demonstration, as a tool widely used by farmers.

4.2.5 Smart-AKIS Solutions: Smart Farming Support Strategies – AKIS, demonstration & learning

In other examples (Table 9), Smart Farming Supporting Strategies are at the center of the solutions proposed: this is the case of the [Smart Specialisation Platform for Agri-Food](#) (S3P Agri-Food), a

partnership promoted by the European Commission, DG REGIO and the Joint Research Centre (JRC) with the involvement of the DGs AGRI and RTD. In this initiative, there is no direct funding provided, but only support by means of experts paid by EC with the aim of encouraging and supporting interregional cooperation in thematic areas based on smart specialization priorities (as defined by regional and national governments) and linked to agriculture and food. The objective is also of promoting the complementarity of funding instruments⁷³. Currently, five different thematic areas have been identified through manifestations of interests of Public Administrations⁷⁴: among these, many EU Regions have addressed High Tech Farming as a priority/issue in their Smart Specialization Strategies. A dedicated partnership on High Tech Farming has thereby been promoted by Tuscany Region (Italy) to facilitate interregional and cross-border cooperation and projects, thus accelerating the uptake of SFTs in European agricultural systems^{75 76}. This is then also an example of different levels of Public Administrations cooperating to promote rural development and agricultural innovation. At the Tuscany Regional level, indeed, one of the activities undertaken thanks to the support provided by the EC experts would be oriented towards the creation of a regional knowledge platform linked to demonstration farms⁷⁷.

Table 9. Smart Farming Support Strategies – AKIS, demonstration & learning.

Barrier addressed	Proposal	Partner proposing the solution	Source
Smart Farming Support Strategies	S3P Agri-Food – partnership on High Tech Farming	CEMA	Policy case presented by project partner CEMA (EU)
Smart Farming Support Strategies	Digital technology in agricultural faculties, universities and technical colleges	ZALF & DLG	Policy case presented by project partner ZALF & DLG (DE)
Smart Farming Support Strategies	Fund for the training of life entrepreneurs (VIVEA)	FRcuma Ouest	Policy case presented by project partner CUMA (FR)
Smart Farming Support Strategies	NEFERTITI project	ACTA, CEMA, BIOS, AUA, INTIA, WR	Initiative of Smart-AKIS partners
Smart Farming Support Strategies	Digital Farm in Serbia (ANTARES project)	BIOS	Initiative of Smart-AKIS partner
Smart Farming	Digifermes	ACTA	Initiative of Smart-AKIS

⁷³ See also paragraph 4.4 - An ecosystem for enhancing innovation in agriculture of this report.

⁷⁴ The five areas are the following: (i) High Tech Farming, (ii) Traceability and Big Data; (iii) Consumers involvement in Agro-Food; (iv) Nutritional Ingredients; (v) Smart Sensors 4 agri-Food. For more information: <http://s3platform.jrc.ec.europa.eu/agri-food-thematic-areas> (last consultation: 06/06/2018)

⁷⁵ The value chains addressed are the following: (i) Tree nursery, Viticulture, Fruits (relatively more intensive); (ii) Livestock outdoor; (iii) Arable, Cereals, vegetables (outdoor); (iv) Protected cultivation (different types of greenhouses, highly intensive).

⁷⁶ For more information: <http://s3platform.jrc.ec.europa.eu/high-tech-farming> (last consultation 05/06/2018).

⁷⁷ This business case is currently under development, as explained by F. Boscaleri (policy officer, Brussels Office, Tuscany Region) interviewed by CEMA on the 30/05/2018.

Support Strategies			partner
Smart Farming Support Strategies	BAYER ForwardFarming	CEMA	website
Smart Farming Support Strategies	Agricultural and Horticultural Development Board (AHDB)	DTA Ltd	Policy case presented by project partner DTA Ltd (UK)

Demonstration farms are other crucial examples of support strategies facilitating the adoption and uptake of SFTs met during the Smart-AKIS project. The NEFERTITI project⁷⁸ is one of the most recent initiatives funded by the Horizon 2020 programme to boost innovation uptake, to improve peer to peer learning and network connectivity between demonstration farms actors across Europe. The project connects 45 regional clusters (hubs) of demo-farms in 17 EU countries, with concrete examples of precision agriculture applications to be shown on several demonstration farms⁷⁹. Several Smart-AKIS partners are involved in the NEFERTITI network (CEMA, BIOS, AUA, INTIA, WR and ACTA as Project Coordinator).

In addition, other examples of demonstration farms presented by the Smart-AKIS consortium during the participatory events of the project are the following:

- **Bayer ForwardFarms** are independent demonstration farms organized in the form of public-private partnerships and coordinated through a common network. Concrete examples exist in the Netherlands, Belgium, Germany and Italy;
- The **Serbian Digital Farm** has been created in the framework of the EU project ANTARES under the impulse of the Smart-AKIS partner, BIOS. The digital farm has both a virtual part (the [AgroSens knowledge platform](#)) and a physical space, that works as an open air showroom where innovative AgTech solutions will be presented and implemented on a real-life production farm, to allow farmers to see, test and assess them in real-world settings;
- The **French Digifermes** are two digital farms located in France, each one of them specialized on a regional priority's domain (field crops in the Essonne Region and beef cattle in the Lorraine Region) and organized as farms-lab devoted to demonstrate the use of SFTs. In this case, the promoter of the initiative is ARVALIS - Institut du végétal⁸⁰, a French applied agricultural research organization dedicated to arable crops and member of the Smart-AKIS partner, ACTA.

Even with the specific differences of each of such experiences, something that all these initiatives have in common is the need to establish partnerships with different value chain actors: research collaboration, farmers and advisors engagement, as well as industry partnerships. As explained in the policy case of the S3P Agri-Food – partnership on High Tech Farming: “*The involvement of SMEs,*

⁷⁸ NEFERTITI project - Networking European farms to enhance cross fertilisation and innovation uptake through demonstration (H2020 – G.A. 772705).

⁷⁹ In particular, NEFERTITI Thematic Network Num. 5 “Crop sensing and variable rate applications” focuses on the application of the main Precision Agriculture principles with the aim of informing farmers on the added value in term of income, quantity, quality, environmental impact, investments & application usability of SFTs. For

⁸⁰ <https://www.arvalisinstitutduvegetal.fr>

Clusters, Industry is essential when defining the common objectives/priorities and, moreover, when identifying potential joint operations/investments. (...) Industry is more involved in direct operations. The involvement of such actors relies on the activism from each single partner⁸¹”.

Another crucial ingredient of the main strategies foreseen to enable farmers to fully benefit from the new smart farming paradigm shift is the one related to Agricultural Education, Training and Lifelong Learning. As pointed out by the Smart-AKIS Recommendations and Timesheets (June 2018), an ongoing review of current curricula at all educational levels (higher education, vocational training and lifelong learning is encouraged to keep abreast with current and future farmers and agronomists demands⁸². To this extent, two concrete examples are provided by the policy cases collected through the project: one focusing on training and the other on higher education.

As about the first, **VIVEA** is a French fund for the training of farmers⁸³ that is activated at regional level and is mainly funded by annual fees paid by the farmers (but other funds as the EAFRD might integrate the contribution). During Smart-AKIS regional workshops, farmers requested impartial, non-commercial and independent expert advice and trainings for accompanying their purchase decision, equipment set-up's quality and conformity. In order to develop such trainings, in France, agricultural organizations (such as CUMA, cooperatives, syndicates), technical institutes and technical teachers are designing new training drafts and adapting the existing ones to different target audience (including online and modular training).

Furthermore, with the policy case on **“Digital technology in agricultural faculties, universities and technical colleges”**, the Smart-AKIS partner ZALF & DLG point out that in the discussions through the RIWs in Germany, it was clear that that even schools and universities lack on specific knowledge about SFTs and this is an important factor hindering the uptake of SFTs: without a sound education of agricultural junior staff, it cannot be expected that SFTs are introduced in practical farming. By improving the education of young farmers about SFTs an early understanding, recognition of benefits and improved interest in the adoption of SFT could be enabled. This is why introducing digital technology in courses and modules of agricultural faculties, universities and technical colleges should be a priority when updating agricultural studies curricula.

The last policy case collected by the project is located in the UK and focuses on the activities of the **Agricultural and Horticultural Development Board (AHDB)**, a statutory levy board, funded by farmers, growers and others in the production and supply chain and managed as an independent organization from both the Government and the industry⁸⁴. AHDB is a large organisation funded predominantly by farmers and growers, whose main aim is to accelerate innovation and productivity growth through coordinated Research and Development and Knowledge Exchange. The AHDB does fund research in various topics but it also has a major program of Knowledge Exchange including *Monitor Farms*⁸⁵ (owned and operated by commercial farmers and open to farmer visits and discussions for three years), *FarmBench*⁸⁶ (a tool to enable farmers to benchmark their costs) and *Strategic Farms* (run for six years to allow independent demonstration of research across a full

⁸¹ Explanation provided by F. Boscaleri (policy officer, Brussels Office, Tuscany Region) interviewed by CEMA on the 30/05/2018.

⁸² Smart-AKIS deliverable D3.6: “Smart-AKIS Recommendations and Timesheets”, June 2018.

⁸³ For more information: <https://www.vivea.fr/>

⁸⁴ For more information: <https://ahdb.org.uk/about/>.

⁸⁵ For more information: <https://cereals.ahdb.org.uk/get-involved.aspx>

⁸⁶ For more information: <https://cereals.ahdb.org.uk/get-involved/farmbench.aspx>

rotation and demonstrate new ways in a commercial setting and, by using to full cost-benefit analyses, help farmers assess the need for changing their own systems). Such tools, particularly the Monitor and Strategic Farms and the new FarmBench, are defined and put in place to encourage farmers to consider and pass on experiences, whether good or bad, thus favouring the peer-to-peer learning and knowledge exchange processes and addressing more than one of the barriers identified during the Smart-AKIS workshops. To this extent, it is also worth to mention the “Be Precise” Precision Farming presentation series Knowledge Transfer Program that has been developed by the AHDB predecessor, the Home Grown Cereals Authority: much of the program was also dedicated helping farmers determine whether Precision Agriculture, particularly related to arable crops, would be cost-effective for a particular farm bearing in mind the size, cropping system, existing machinery and more. Following research by agricultural consultants, a series of talks and publications based on the research report were presented to farmers and growers to help answer the question “where do I start?”⁸⁷.

4.2.6 Smart-AKIS lessons learnt and recommendations: Lifelong learning, research and innovation as support strategies for boosting agricultural innovation

1. **Setting the stage for the SFT-related advice of the future.** Advisory services have a crucial role for bridging the gap between research and innovation. Policies should thereby reinforce the role of **advisory services** in the AKIS system and, particularly, in Rural Development (EAFRD), thus “*rethink the role of advisors, make them more central in AKIS, refinance them, support their training and reconnect them to tackle current challenges*”⁸⁸. For achieving this, future policies should:

- Support a **reorientation of advisors** through updated training and VET programmes, able to achieve a balance of the skills needed for targeted future advisory services that will need, at the same time, deeper technological competences (so to become a “specialized advisor”), general and cross-cutting knowledge (for instance on topics related to sustainability issues with agro-ecological focus), but also some essential soft skills (such as a “knowledge exchange” attitude);
- Promote the participation of advisors in the setting up and planning of policies, involving them in the decision making, thus improving their connections with the rest of the AKIS actors. To this extent, the participation of advisors at **multi-actor projects** should be further promoted so to support them in better picking up farmers’ needs and contributing to reinforce links between farmers and researchers. Multi-actor projects should particularly promote and foster the development and deployment of easy to understand and use databases, repositories and resources, with audio-visual materials (videos, games, etc.), field testimonials, etc. about Smart Farming use and benefits, following the model of online platforms such as the Smart AKIS Platform, but avoiding the duplication of the existing, planned and funded tools⁸⁹.
- Promote the **coordination of multi-actor projects**, facilitating the **networking of advisory services**, not only in the same region or country, but also across the borders;

⁸⁷ An example can be found on https://farmnw.co.uk/factsheets/precision_farming_where_do_i_start

⁸⁸ SWG SCAR-AKIS Policy Brief on the Future of Advisory Services, page 7.

⁸⁹ More detailed recommendations for multi-actor projects (and particularly Thematic Networks) are included in paragraph 4.4 - An ecosystem for enhancing innovation in agriculture of this report.

- Create a **new funding measure** (under the Second Pillar of the EARDF or even under Horizon Europe) for cross-border activities, possibly involving Operational Groups, as mini-projects oriented to facilitating the transfer, adoption, absorption and replication of technologies.

2. **Demonstrate and share the knowledge.** Agricultural practitioners, and particularly farmers, demand **empirical-based evidence** about the economic benefits of using SFTs (for instance in yield performance and on a more efficient use of inputs). Based on the Smart-AKIS experience and policy cases collected, **demonstration activities** realized on the field have demonstrated to be a valid, effective and cheap solutions to address this grassroots level's need. At the same time, the information provided through such activities should be organized and made available to all the potential beneficiaries and users of the tools provided.

Future policies should thereby contribute to support, promote and enhance such activities, using and reinforcing the already available tools or even creating new ones:

- The **multi-actor approach can be strengthened** in order to increase farmers' participation to realise more coordinated on-the-field demonstrations during the different multi-actor projects and, in particular for Thematic Networks. Field visits, cross-visits, set-up of demo farms should be fostered as crucial activities in this kind of projects, thus mixing different types of approaches for engaging with farmers: not only online and digital tools, but direct contacts and peer-to-peer demonstration activities;
- Thematic Networks represent one crucial examples of multi-actor approach. The need is to further promote the **coordination of Thematic Networks**, among them but also with other multi-actor projects that focus on cross-cutting issues, especially those focusing on demonstration farms, peer-to-peer exchanges, advisory services, AKIS, etc. (PLAID, NEFERTITI, AgriLink, etc.);
- With the same aim of facilitating the coordination of Thematic Network, the **EIP-AGRI platform** should evolve as a one-stop shop knowledge platform for delivering to practitioners the wealth of practical information gathered from Operational Groups and Thematic Networks, identifying a common database or platform for these projects results and avoiding the duplication of platforms.
- Create a **new funding measure** (under the Second Pillar of the EARDF or even under Horizon Europe) for cross-border activities, possibly involving Operational Groups, as mini-projects for common on-the field demonstrations, co-creation and joint development of innovative projects.

3. At the different National levels, an ongoing review of current curricula of all the educational levels is needed in order to keep abreast with latest technological developments, innovation and agricultural practice demands. Policy should therefore contribute to enhance the quality and relevance of the learning offer in education, training and youth work, in a lifelong and life-wide learning perspective:

- Keep updating **agricultural studies curricula** in University and Schools, mainstreaming well-established and upcoming smart farming technologies;

- Develop **Vocational Education Training** programmes addressing the deficiencies of the Technical Staff of Agricultural Farms and other Technicians working in the Agronomic field regarding the use of Smart Farming Technologies;
- **Define updated education programmes** following a multi-actor approach, thus involving advisors, education centres (like universities, training centres, etc.), and public institutions responsible for policies/programmes. This would allow systemizing a common approach for lifelong learning in agriculture;
- **Mainstream into European projects**, such as Thematic Networks and other multi-actor projects, an Education & Training strand, including training in their work plans in order to maximize their impact and facilitate the knowledge transfer;
- Facilitate **synergies between different funding mechanisms** and pooling resources for addressing the skills gap in agriculture, thus including the EIP-AGRI funding scheme (EARDF, H2020 and the future Horizon Europe), the European Territorial Cooperation (INTERREG), and the **Erasmus Plus Programme**. As about the latter, in particular, it could provide an effective framework for addressing the skills gap in agriculture, but also for promoting cooperation among different actors across Europe (e.g. an Erasmus Plus for young digital farmers).

4.3 Connectivity, complexity and compatibility issues for the adoption of Smart Farming Technologies

4.3.1 Connectivity, complexity and compatibility – policy gaps

The participatory activities carried out under the Smart-AKIS project, characterized by frequent and bidirectional interactions with the different SFTs stakeholders, have helped identifying a composite category of technical and technological barriers (and related possible incentives) for the adoption of SFTs⁹⁰. Under this block, the 3Cs problem refers to Connectivity, Complexity and Compatibility issues:

- **Connectivity:** SFTs depend on a steady and high-quality access to internet connection considering the number of communication nodes and the big data managed, stored and used.
- **Complexity:** farmers and advisors often report the complexity in the set-up, running and maintenance of SFTs (including the occurrence of possible technical problems) as an important barrier to their adoption.
- **Compatibility:** farmers and advisors often ask for the improvement of the compatibility and interoperability of solutions and data systems. On the other side, the industry highlights that the replacement of older equipment with new ones is often a necessary step for ensuring a sufficient increase in intelligence both for precise information gathering and acting in the field.

These three issues have been adequately addressed in the previous Smart-AKIS reports and different stakeholders are the ones called to act, often in collaborative ways, such in the case of the “complexity” and “compatibility” problems, where particularly industry, farmers and advisors are those called to find joint solutions to common problems.

⁹⁰ Smart-AKIS deliverable D3.6: “Smart-AKIS Recommendations and Timesheets”, June 2018.

As extensively discussed in previous paragraph of this report, demonstrative activities in demo-farms are, for instance, one of the possible options for addressing such kind of issues, and particularly the ones about the “**complexity**” barrier, since they imply a common agreement between different stakeholders to commit and work together for testing new solutions in the field. New and agreed methodologies for testing should therefore be planned and implemented, and some H2020 European projects funded in this area are already working in order to develop and inventory and assessment of such approaches and tools. The European projects PLAID “Peer-to-peer learning: accessing innovation through demonstration⁹¹”, AGRIDEMO “Enhancing farmer-to-farmer learning⁹²” and NEFERTITI Networking European farms to enhance cross fertilization and innovation uptake through demonstration⁹³ are all born from the consideration of the unique and essential role of on-farm demonstration in the context of innovation for sustainable agriculture.

On the **compatibility**-side, the support provided by the CAP to sustainable farmers investments through schemes that can help them investing in new equipment and technologies could be strengthened for supporting smart equipment replacement strategies, as discussed in paragraph 4.1 of this report. Furthermore, improving the visibility and outreach of standardization initiatives pushed by the industry, such as the **Agricultural Industry Electronics Foundation⁹⁴ (AEF)** initiative would be an important step in the path towards standardization and interoperability.

Established in 2008 by seven international agricultural equipment manufacturers and two associations, the AEF is an independent international organization to support the development, implementation and enhancement of standards for the increased use of electronic and electrical systems in mobile farming equipment. Initially, the main focus of AEF was the development of the so-called ISOBUS standard (ISO 11783) which governs electronics and data exchange between different farm machines (e.g. tractor – farm implement).

With the digital revolution in farming unfolding, the AEF’s scope of work is no longer limited to ISOBUS only, but has been expanded to cover additional areas of critical importance for Digital Farming such as: Farm Management Information Systems (FMIS), wireless in-field communication, high-speed ISOBUS, electric drives, and camera systems. Currently, more than 190 members work together under the umbrella of the AEF. The AEF will provide the continuous encouragement and support necessary for introducing its guidelines to ISO standards in agricultural electrical and electronic systems.

As about the **connectivity** problem included in this technical and technological block of barriers, it is clear that **access to broadband** is particularly important if farmers are to use new technologies like precision farming and become more efficient producing more with less.

Precision farming is all about connecting: connecting different devices (sensors, tractors, satellites data, drones, etc.) and bringing them in an integrated and connected system for optimizing and securing the farming operations. Connectivity is therefore crucial, and an adequate rural broadband is a key enabling pillar for the adoption and uptake of SFTs. Smart Farming devices need connectivity and constant data flows for working, but broadband access is still lagging behind dramatically in many rural and less densely populated areas of the EU. From the 300 million EU citizens living in

⁹¹ H2020 project, Grant Agreement number: 727388

⁹² H2020 project, Grant Agreement number: 728061

⁹³ H2020 project, Grant Agreement number: 772705

⁹⁴ <http://www.aef-online.org/>

rural areas, only 25% are covered by fast or ultra-fast broadband, compared to around 70% coverage in urban areas⁹⁵.

As discussed in the Policy Review section of this report⁹⁶, increasing broadband network in rural areas is one of the main priorities of Broadband Europe, the European Commission's strategy that aims at giving every European access to 30 Mbps connectivity and half of the households a subscription at 100 Mbps by 2020. Moreover, the Smart Village Action, set up in early September 2016, explicitly addresses the digital divide between rural and urban areas as one of the priorities for an "A Better Life in Rural Areas", as addressed by the Cork Declaration 2.0⁹⁷.

At the European level, several measures and initiatives have been therefore activated as impulse for improving rural connectivity. Nonetheless, the European Commission has repeatedly stated that each EU country and region is responsible for its own timetable for broadband roll-out⁹⁸. Different levels of policies should therefore work together for addressing this huge challenge represented by rural access to broadband. In this sense, a crosscheck of national initiatives for rural connectivity should probably be encouraged in order to minimize the number of technologies to be used and, thus, harmonize the solutions proposed in different territories.

4.3.2 Smart-AKIS Solutions: ensuring rural broadband connectivity

In case of rural connectivity, the policy cases collected provide evidences that, without appropriate infrastructure in rural areas, farming cannot benefit from new technologies: data transfer must be made possible in medium to high transfer rates (Table 10). Robotic systems, autonomous irrigation control etc. are dependent on sufficient and stable net coverage to ensure safety and reliability of the systems. Therefore, actual lack of net coverage should be identified and tracked, and solutions developed to close gaps. For doing so, the regional and local dimension of the actions appear to be crucial.

Table 10. Ensuring rural broadband connectivity.

Barrier addressed	Proposal	Partner proposing the solution	Source
Technical barriers	Village Renewal in rural areas: Broadband expansion and upgrading on the island of Samsø	Desk review – CEMA	Desk Review: European Network for Rural Development (ENRD)
Technical barriers	Digital Infrastructures in rural areas	ZALF & DLG	Policy case presented by project partner ZALF & DLG (DE)

This is outlined in the planned programme proposed by partner ZALF and DLG, but also in the other two existing examples collected, even if at different scales and with different features.

⁹⁵ Source: Opening Speech by European Commissioner P. Hogan at Cork 2.0 Conference on Rural Development, 5th September 2016, Cork. Available at the following [link](#).

⁹⁶ See chapter 3 "Policy Review" of this report.

⁹⁷ Cork Declaration 2.0, "A better life in rural areas", 5th September 2016, Cork. Available at the following [link](#).

⁹⁸ Euractiv article "Commission: The future relies on boosting "Smart Villages"", Hannah Black, 12/04/2017. Available online at the following [link](#).

In the case related to the expansion and upgrade of the transmission network in the **island of Samsø**⁹⁹ for reaching areas of the island that had no or only limited coverage, the initiative has been funded through a shared investment between the EAFRD (LEADER/ CLLD initiative), private capital and, at a small extent, Regional and National funds. As the case study points out, this is one example of how shared investments, grants and voluntary work can work together at the interest of an entire local community.

The **regional dimension** of the initiatives for broadening and improving the rural broadband comes out as one of the main features of the policy cases collected in this topic area through Smart-AKIS. This reflects the EU strategy in this area: **Smart Villages** cannot be done in isolation and should be embedded in the wider development strategies for regions and territories¹⁰⁰. At the same time, the coordination of the activities and initiatives launched at national and regional level emerges as another important component of such strategies, as demonstrated by the several and interlinked planned actions to promote Smart Villages undertaken by the European Commission. Among these, the **Smart Specialisation Platform for Agri-Food (S3P Agri-Food)**¹⁰¹ deserves an important mention since it summarizes the parallel need of bottom-up regional involvement and top-down European coordination and support.

4.3.3 Smart-AKIS lessons learnt and recommendations: Connectivity, complexity and compatibility issues for the adoption of Smart Farming Technologies

1. Ensure the back-up by policy makers and authorities of solutions proposed by different stakeholders in order to increase their outreach and social endorsement. This is the case of both:
 - Joint industry-led solutions, as for the **AEF initiative**.
 - Multi-stakeholder initiatives, such as the **European Code of Conduct on Agricultural Data Sharing by Contractual Agreement**¹⁰².

The Code of Conduct has been launched in April 2018 by a coalition of associations from the EU agri-food chain (in addition to the Smart-AKIS project partner CEMA, also: Copa and Cogeca, Fertilizers Europe, CEETAR, CEJA, ECPA, EFFAB, FEFAC, ESA). The Code promotes the benefits of sharing data and enables agri-business models, including agri-cooperatives and other agri-businesses, to swiftly move into an era of digitally enhanced farming. The Code sheds greater light on contractual relations and provides guidance on the use of agricultural data, particularly the rights to access and use the data. It aims to set transparent principles, clarifying responsibilities and creating trust among partners and sets out key guidelines for operators to follow, combined with a check list.

2. Develop and implement a coherent **strategy for rural connectivity** that involves different levels of implementation: regional, national and European. Such strategy could be built on the Smart Villages approach, making it concrete and applicable to the diversity of European regions and

⁹⁹ A Danish island of around 3.700 permanent residents. More information about this project are available at the ENRD database: https://enrd.ec.europa.eu/projects-practice/broadband-expansion-and-upgrading-island-samsø_en (last consultation 13/06/2018).

¹⁰⁰ European Commission, EU Actions for Smart Villages. Available online at the following [link](#)

¹⁰¹ Launched in 2016, the key objective of the S3P Agri-Food is to organise 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. It is based on smart specialisation priorities defined by regional and national governments. S3P Agri-Food, and particularly the commitment on High Tech Farming coordinated by Tuscany Region (Italy), is presented in this report as a policy case for Smart Farming Support Strategies (chapter 4.2.5).

¹⁰² Available at: http://cema-agri.org/sites/default/files/publications/EU_Code_2018_web_version.pdf

areas, and should ensure both the bottom-up regional involvement and the top-down European coordination and support. **Smart Villages** could represent, for instance, an ingredient of the strategy for attracting youth and newcomers in the agricultural sector.

3. At the European level, increase **public investments or public-private partnerships** such as the [Connecting Europe Facility \(CEF\)](#), the Investment Plan for Europe, ESIF and ERDF, ensuring broadband connectivity all over EU rural and agricultural areas are encouraged for full deployment of smart farming technologies.
4. At the national and regional level, a crosscheck of national initiatives for rural connectivity must be coordinated and **harmonization** must be sought as much as possible to minimize the number of technologies to be used. This should also help promoting **alternative solutions**, such as for the use of a combination of wired (fiber cable) and wireless solutions to extend the range of connectivity in remote areas.

4.4 An ecosystem for enhancing innovation in agriculture

4.4.1 The EU Strategy for rural and agriculture innovation – Policy Gaps

Different policies and EU funding programmes build the EU strategy for supporting rural and agriculture innovation in Europe (Chapter 4.3 - Policy Review of this report). The innovation process carried out in Smart-AKIS has provided examples and evidences of different bottlenecks and gaps hindering the development of an effective and sustainable ecosystem for enhancing innovation in agriculture and sustain rural development.

One of the most important barriers is possibly the one related to the red tape involved in the application of public grants programmes. As outlined also in paragraph 4.1 - The future of Smart Farming Technologies in the CAP after 2020, a key element of the future CAP is the simplification of current rules, as outlined by many practitioners, particularly farmers. Such observation could be extended well beyond the CAP in order to include different grant programmes. Not surprisingly, indeed, most of the efforts for updating such programmes, particularly concerning the reform of the EU R&D Programme, H2020, are directed towards a simplification of the participation in the programme, together with a reduction of the administrative costs to participants and help in preventing accounting errors¹⁰³. Furthermore, the need is to promote synergies within the existing funding framework at EU and national levels, harmonizing the administrative procedures and avoiding the duplication of tools.

As about the duplication of tools, in particular, a mention should be made to the need of rationalizing, reducing and reorganizing the existing websites and platforms devoted, in particular, to the monitoring and evaluation of the EU rural development policies. As an example, details of individual projects funded under the broader EU investment strategy can be found via different portals, such as the [European Network for Rural Development \(ENRD\)](#), the [European Innovation Partnership \(EIP\)](#) network and the [EU budget for results](#) website. All the information provided

¹⁰³ Reference: <http://ec.europa.eu/research/index.cfm?pg=newsalert&year=2017&na=na-280217>

through such platforms is surely useful, but the existence of different websites risk to confuse the users¹⁰⁴, thus missing its first aim, the promotion of knowledge exchange.

Simplification and modernization should go together, as also recently outlined by T. Haniotis, Director, Strategy and Policy Analysis, DG Agriculture, European Commission: “(...) *in the needs-based and evidence-based framework that will characterize the future CAP, simplification and modernization will either go together, or fail together. Information on the characteristics of modernization in the digital era and applied higher ambition in farming 4.0 are the elements that clearly need to be stressed.*”¹⁰⁵. This would mean that future policies, as well as the related funding programmes implemented to ensure their effectiveness, should be modernized and made “smarter”.

4.4.1 Smart-AKIS Solutions: a simpler, smarter and demand-side approach

The outcomes of the Smart-AKIS regional and transnational workshops show (Table 11), among others, that **high investment costs linked to the set up and running of SFTs remains one of the largest barriers for their widest adoption**. Moreover: “*The perception about the usefulness for farmers of Smart Farming Technologies is almost exclusively based on the economic performance of the farm, overlooking other relevant aspects such as the **environmental impact** that the use of such technologies can bring into the fold, or the impact on the work conditions for farm workers*”¹⁰⁶.

Table 11. A simpler, smarter and demand-side approach.

Barrier addressed	Proposal	Partner proposing the solution	Source
Economic barriers	Manure Policy: Flanders implementation of the nitrates directive (ND) and the national emission ceilings directive (NEC)	CEMA	Policy case presented by project partner CEMA (EU)
Economic barriers	Support of SFT adoption	ZALF & DLG	Policy case presented by project partner ZALF & DLG (DE)
Economic barriers	FP7 FRACTALS project	BIOS	Policy case presented by project partner BIOS (RS)
Economic barriers	H2020 KATANA project	BIOS	Policy case presented by project partner BIOS (RS)
Smart Farming Support Strategies	S3P Agri-Food – partnership on High Tech Farming	CEMA	Policy case presented by project partner CEMA (EU)

¹⁰⁴ For instance, the ENRD platform is thematic whilst the EU budget for results is organized geographically. Providing both types of information in one unique tool would surely give a more complete and comprehensive overview over the broader EU investment strategy for rural development.

¹⁰⁵ Haniotis T., CAP simplification made simple (sort of...), article available online on <https://www.linkedin.com/pulse/cap-simplification-made-simple-sort-tassos-haniotis/?published=t> (12/07/2018).

¹⁰⁶ Smart-AKIS deliverable D3.6 Policy Recommendations, page 20.

Smart-AKIS has thereby concluded that policy makers should support **demand-side policies** with stricter environmental and food safety regulations, as an opportunity for an increased adoption of SFTs, as these technologies will ease regulatory compliance: nutrient inputs, water and carbon footprint, systemic approach to food traceability following increasing social demands for more sophisticated and safer food market, etc. This might prove an additional added value for Smart Farming adoption besides the pure economic one.

A concrete example of such approach is the one provided by the policy case collected by Smart-AKIS partner CEMA on the **Flemish manure policy and related to the implementation of the nitrates directive (ND) and the national emission ceilings directive (NEC) in Flanders**. The policy case shows how Flanders managed to cut its ammonia emissions by half. Ammonia emissions from manure spreading only were cut by as much as 80% over the same period. This happened progressively through the implementation of the Nitrates and NEC Directives.

More specifically, this example demonstrates that support from national policies (and potentially others) can help addressing the “high investment cost” economic barrier, even without any additional funding provided through the measure. In this case, indeed, the provision of economic incentives is not needed because, in the end, even without such incentive, there is an advantage for the farmers: the cost of the investment is indeed lower considering that the farmers wouldn’t need the fertilizers anymore (that can be substituted by manure) and that they would now exactly know what they are putting in the soil.

Farmers therefore need to have an advantage from the regulation and such advantage needs to be visible. As highlighted in the German policy case on “**Support of SFT adoption**” presented by partner ZALF & DLG, farmers have to see the advantage of a new system. So far, the advantages of SFTs are not yet visible for a number of farmers. By offering benefits for farmers who use SFTs a new awareness of their advantages and their usability in practical farming will emerge and motivate for investing in further SFTs or the communication of its benefits. As a result, actual systems of subsidies and regulations should be adapted to encourage farmers in looking for information about and finally using SFTs. Some possible examples are the development of a “digital fund” for farmers to use those SFTs to increase farm sustainability and the inclusion of SFTs in new regulations on fertilizing and pest management (e.g. digital soil mapping considered in the nitrate directive for better knowledge of soil characteristics): this would represent a “smart” financial support by connecting subsidies directly related to SFTs to a specific use for sustainable crop management.

Promoting smart financial support for SFTs adoption and uptake is clearly a crucial challenge: as highlighted in the Smart-AKIS Recommendations and Timesheets (June 2018), funding smart farming investments remains a challenge in terms of available subsidies and financial instruments specifically tailored for investments in these technologies that entail a higher risk than other well-established machinery and equipment purchase or leasing. Fostering innovative funding schemes that are simpler, smarter and easier to reach should thereby be one of the main characteristics of the programmes and initiatives aiming at boosting smart farming in Europe.

To this extent, two relevant examples come from the Serbian policy hub that, through BIOS that is a Smart-AKIS partner, presented two concrete examples of innovative funding schemes funded by the

European Commission's R&D schemes (FP7 and H2020), but managed by intermediate organizations through Open Calls.

In particular, the **FRACTALS project**¹⁰⁷ (2014-2016) was funded through the Future Internet Public-Private Partnership (FI-PPP) programme, whose general aim was to place Europe in a better position towards capturing the opportunities arising from further digitalization in various economy sectors. FRACTALS addressed these challenges focusing, in particular, on agriculture. The main objective of the project was to support ICT SMEs and entrepreneurs in exploiting investments arising from the digitalisation and developing value added applications. The challenge was also to bridge the gap between the SMEs IT community and the community of farmers and relevant industrial value chain (agronomists, equipment vendors, agrochemicals, etc.). To do so, FRACTALS provided support to beneficiaries based on the results of the Open Call that addressed innovative projects proposed by innovative ICT SMEs operating in the agricultural sector.

Like in FRACTALS, SMEs are at the core of the second policy case presented by the Smart-AKIS Serbian partner BIOS¹⁰⁸, the **H2020 KATANA project**¹⁰⁹ (2016-2018). In this case, KATANA combines direct financial support to SMEs with tailored business support services and a technological framework of Large Scale Demonstrators (also developed by SMEs, partners in the KATANA consortium). Similarly as in FRACTALS, in the KATANA scheme, support to beneficiaries was also provided through the instrument of the Open Call. In this case, two Open Calls were launched: a first **"Call for Teams"** aiming at identifying the best teams across the value chain through an innovative peer-to-peer evaluation method; and a second **"Call for Products/Services"** with the objective of identifying products and services with high market potential.

In the same line, also the **Echord++ scheme**¹¹⁰ presents an effective approach, which – through intermediate organizations – allows the funding of smaller projects. Similarly as above, the pros of such approach, from a beneficiary's point of view¹¹¹, are related to reduced time allocated to the proposal development and project management, an easier possibility of access to the funding mechanism and more flexibility, also in terms of participating countries. Moreover, this would support EU-wide interaction while at the same time preventing smaller initiatives from being drowned by multi-national-multi-stakeholder-multi-annual projects efforts.

In the abovementioned experiences of innovative funding schemes, it is also worth highlighting that, particularly in the KATANA example, a novel crowdfunding-based scheme has been fostered. This was based on the ability to attract private funds as the main criterion for EC financial support: this way, KATANA motivates SMEs to seek for quick market validation and ensures that every euro provided as EC financial support will mobilize financial support from private investors. This observation, together with the combination of different types of support (not only direct financial investment, but also business support services) highlights the importance of a diversification of instruments and actors working together for reinforcing, flavouring, and fostering a favourable ecosystem for the realization of innovation. These are common elements also of the policy case

¹⁰⁷ <https://fractals-fp7.com/>

¹⁰⁸ In both the FRACTALS and the KATANA projects, BIOS is one of the projects' partners.

¹⁰⁹ <http://katanaproject.eu/>

¹¹⁰ <http://echord.eu/the-mission-from-lab-to-market/>

¹¹¹ Outcomes of the CEMA High Level Research Meeting held on the 22nd of December 2017.

related to the S3P Agri-Food, already presented in paragraph 4.2 of this report: the S3P Agri-Food orchestrates 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 specialization priorities through interregional cooperation. Even if the mechanism proposed by EC DG REGIO and managed by JRC has no direct funding, it relies on the commitment of Public Administrations which manage Structural Funds and have indicated priority areas in which they should be allocated. The EC supports the partnerships by assigning specific expertise to accompany them along in specific moments. These include for example:

- Organisation of specific workshops to identify common interests and discuss implementation actions;
- Support to partnerships in identifying strong and missing competences among the participating regions by combining existing EU analytical tools and if necessary supported by studies and specific surveys through experts fields;
- Organisation of partnering and matchmaking events for industrial partners aimed at discussing, facilitating and accelerating the development of joint industrial investment projects;
- Identification of a pipeline of promising pilot business cases at interregional level.

The Platform will also promote the complementarity of funding instruments in the support of an investment project pipeline. As explained in the policy case of the S3P Agri-Food – partnership on High Tech Farming: *The initiative has proved very useful and helped Public Administrations to rethink and adapt existing strategies in light of effective European value chains. The possibility of improving operations by pooling resources (not only financial) with other Administrations is at the core of the initiative, but it is still the most difficult part as the general standard approach is investing and spending money locally.*

Of course, pooling together resources and actors can be facilitated through a set of activities, included in the general definition of “exchange of practices and knowledge”. For instance, in the **Manure Policy: Flanders implementation of the nitrates directive (ND) and the national emission ceilings directive (NEC) policy case**, the Smart-AKIS project partner CEMA, who was/is not directly involved in the implementation of this initiative, nonetheless reports to have participated at the “Best-Practices to cut Ammonia Emissions World Café” organized by the European Environmental Bureau (EEB) on 29 February 2016¹¹². The event focused on best practices to reduce ammonia emissions from agriculture and potentials for the NEC Directive implementation: during the EEB World Café, *there was a German Lander who was originally against the measure but got inspired by this concrete successful example*¹¹³.

4.4.2 Smart-AKIS lessons learnt and recommendations: an effective ecosystem for enhancing innovation in agriculture

1. Enhance the role of cooperation and the involvement of all the relevant value chains actors through multi-actor projects. One of the main outcomes of Smart-AKIS is the proof of evidence of

¹¹² For more information: [CEMA Newsletter article](#), [European Environmental Agency webpage](#) and [European Environmental Bureau Report](#) (last consultation: 27/03/2018).

¹¹³ Please refer to annex number 1.

the role of the multi-actor interactive and collaborative approach in promoting both innovation-driven research and innovative business models for the uptake of SFTs¹¹⁴. In particular, in the **Smart-AKIS Ex-post study of successful innovation processes and best practices regarding SFT development**¹¹⁵, ZALF partner has identified 14 key actors involved in the innovation phases¹¹⁶ of the different case studies analyzed¹¹⁷ and with different functions. Some common trends have been also identified:

- In all case studies, farmers were involved in the innovation process during all phases¹¹⁸ with different functions. In several case studies, farmers were mentioned more than once in each phase;
- Advisors and professional associations both assumed different functions at different phases depending on the innovation;
- Funding organizations were key actors in several innovations, but were public (i.e. EU), private (i.e. trusts), or venture capital;
- A substantial difference occurs between innovative products cases and practices ones, in terms of innovation providers: in the first case, it was mainly the IT experts the responsible for developing the innovation, whereas in the case of innovative practices, such responsibility was mainly on agri-tech manufacturers and providers, who were providing the tools, the fields, or funds¹¹⁹;
- In the innovative practice cases, infrastructure made the technologies possible in the first place;
- Public authorities had the role of passing legislation that made the technology more relevant, and thereby fostered adoption;
- In all the cases, social interactions, including specifically cooperation and networking between actors was crucial to the success of the innovations presented in the report¹²⁰.

¹¹⁴ See Smart-AKIS Deliverable D3.6 Smart-AKIS Recommendations and Factsheets.

¹¹⁵ Kernecker M., Kraus T., Knierim A., Borges F., Wurbs A., Smart-AKIS Task 2.4 Report - Ex-post study of successful innovation processes and best practices regarding SFT development, Müncheberg, June 2018.

¹¹⁶ The activities and events that comprised the phases of an innovation process were allocated to three phases: the initiation phase, the implementation phase, and the diffusion phase. In the initiation phase, a problem is manifesting and an idea for an innovation is taken up, operationalized and potential partners are sought out. In the implementation phase, the plan turns into action. The innovation is now accessible to other stakeholders who consider themselves in a similar situation as the innovator. The innovation is at this point being published and marketed. Finally, in the diffusion phase, the innovation is accepted as a possible solution: this means that the critical phase has been overcome and the innovation is now public.

¹¹⁷ ZALF analysed six case studies provided by different Smart-AKIS partners on successful innovation processes and grouped them in two main categories: innovative products and innovative practices. For more information: Kernecker et al., 2018.

¹¹⁸ In the initiation phases, farmers were often collaborators, in the sense that they advised the innovator on which characteristics would be important for the innovation. In innovative products, farmers trained the innovators, in order for the innovators to understand farming. In some cases, they tested the innovations at the beginning. In several cases, farmers were the end-users. Kernecker et al., 2018.

¹¹⁹ In these cases, the manufacturers and providers had different functions, as they hosted or sponsored the demonstrations, acted as funding organizations, or provided technology for demonstrations. Manufacturers had to produce the technologies so that they were compatible with the practices, for example adapting tractor width. Manufacturers also functioned as sponsors of the technology adoption by providing the appropriate technology and fields for demonstrations. Kernecker et al., 2018.

¹²⁰ *Ibidem*.

Bridging together experiences from both Smart-AKIS Work Package 2 and 3, the following set of recommendations for the future of the **multi-actor approach**, as fostered by the Directorate for Agriculture of the European Commission and the EIP-AGRI, can be drawn:

- The **participation of farmers in multi-actor projects and actions should be reinforced**. This should include both the prevision of activities for facilitating their participation (hands-on demonstrations, such as field and cross-visits, demo-farms activities, etc.¹²¹) and their direct participation in projects following a multi-actor approach, such as for Thematic Networks, through mechanisms that facilitate their access to the funding (e.g. foreseen a pre-harvesting phase for the submission of proposals, as ongoing in the IoF2020 large scale project Open Call; keeping some budget for funding the proposals' preparation, as proposed during the Thematic Networks Coordination meeting¹²²). Despite farmers' recognized role in all the different phases of the innovation processes, indeed, Smart-AKIS has noticed that they systematically participated to a lower extent than other actors to the project's workshops and events;
- **Support the initiatives fostered by practitioners and multi-actor groups** and directed to address the existing barriers for agriculture innovation, such as for the EU Code of Conduct on Agricultural Data Sharing by Contractual Agreement and the AEF initiatives. As about these two initiatives, the reader can refer to paragraph 4.3 of this report;
- Reinforce the **key intermediary role of advisory services, and other interface and intermediary bodies acting as facilitators and brokers** for cooperation and innovation, as promoted by SCAR AKIS Strategic Working Group¹²³, building bridges between the needs, solutions, expectations and languages of research, industry and the farmer community, particularly in remote rural areas, where the internet connection is still lacking;
- Create **small networks of end-users at the local and regional AKIS scale**, interested in the particular research results and solutions of the Thematic Networks and multi-actor projects. These networks could be further supported by involving different actors, such as technology specialists, public organisations, technology centres, universities and public authorities (local, regional) that can provide impartial information;

Moreover, specifically concerning recommendations for **Thematic Networks**, such as Smart-AKIS:

- Request Thematic Networks and multi-actor projects to organize **multi-actor events and workshops**;
- Support **dissemination actions carried out by advisory services** as they are ultimately the closest actors to the farming community, thus mixing different types of approach for engaging with farmers: online and digital tools, but also direct contacts and peer-to-peer demonstration activities;
- Encourage the integration of **training activities** in terms of "facilitation" and "soft skills" in the Thematic Networks (and in multi-actor projects in general) and make the material available on the EIP-AGRI platform;
- **Avoid the duplication of platforms** in the different Thematic Networks funded.

¹²¹ See chapter 4.2 Lifelong learning, research and innovation as support strategies for boosting agricultural innovation of this report.

¹²² Smart-AKIS Deliverable D3.6 Smart-AKIS Recommendations and Factsheets.

¹²³ <https://scar-europe.org/>

- Encourage the **translation** of the relevant dissemination materials (targeting, in particular, farmers) contained in such joint platform(s) in the different EU languages¹²⁴.

2. Further structuring the EIP-AGRI ecosystem. In line with the Smart-AKIS Policy Recommendations Report, the EIP-AGRI ecosystem should be reinforced following the recommendations already provided in the previous Smart-AKIS deliverable, thus:

- Promote further **coordination of Thematic Networks**, among them but also with other multi-actor projects that focus on cross-cutting issues, especially those focusing on involving key-actors such as farmers and advisors through demonstration farms, peer-to-peer exchanges, advisory services, AKIS, etc. (PLAID¹²⁵, NEFERTITI¹²⁶, AgriLink¹²⁷, etc.);
- Set up permanent exchange mechanisms and channels among **Thematic Networks, the SCAR AKIS Strategic Working Group, DG Agri and EIP-AGRI Service-Point**;
- Empower **National Rural Networks (NRN)** and **National Contact Points (NCP)** as focal points of EIP-AGRI for the further coordination of the ecosystems at national and regional level, strengthening the links between Operational Groups and Thematic Networks, and clarifying the links between the EIP-AGRI platform and the **European Network for Rural Development (ENRD)** database.
- Evolve the EIP-AGRI platform as a **one-stop shop knowledge platform** for delivering to practitioners the wealth of practical information gathered from Operational Groups and Thematic Networks, thus avoiding the duplication of platforms;
- Keep and increase the budget devoted in Rural Development Programmes (RDPs) funded by EARDF for the **creation and support of Operational Groups** and further promote the inclusion of funding for cross-border Operational Groups;
- Create a **new funding measure** for cross-border Operational Groups, as mini-projects for co-creation, joint development and demonstration, with reduced red tape for farmers and advisors.

3. Promote and enhance synergies between programmes and funding schemes. In line with the Smart-AKIS Policy Recommendations Report and coherently with chapter 4.1 - The future of Smart Farming Technologies in the CAP after 2020 of this report, synergies between available programmes and funding schemes should be enhanced following the recommendations already provided in Smart-AKIS previous deliverable, thus:

- Facilitate synergies between the EIP-AGRI funding scheme and **European Territorial Cooperation (INTERREG) funds**, to increase territorial and cross-border cooperation and knowledge flows;

¹²⁴ Recommendations for Multi-actor projects and Thematic Networks are the same contained in the Smart-AKIS Deliverable D3.6 Smart-AKIS Recommendations and Factsheets. They are also coherent with the outcomes of the workshop on “The Role of Thematic Networks (TNs) in EU Agricultural Innovation” jointly organized by Thematic Networks’ leaders, the SWG Scar-AKIS, and the DG Agri on the 9th of March 2018 in Brussels. For more information about the event, please visit CEMA newsletter: <http://www.cema-agri.org/news/cema-presents-smart-akis-thematic-networks-workshop-eu-agricultural-innovation> (last consultation on 16/07/2018).

¹²⁵ <https://www.plaid-h2020.eu/>

¹²⁶ https://twitter.com/NEFERTITI_EU?lang=fr

¹²⁷ <https://www6.inra.fr/agrilink/THE-PROJECT>

- Disseminate a **mapping** of available funds and programmes considering farmers point of view in relation to their position all along the **research, innovation and market uptake of smart farming technologies value chain**.
- Simplify access to R&D and innovation funding through **reducing/removing red tape** for access to funding and reporting. Some proposals in this direction are to: (i) foreseen a pre-harvesting phase for the submission of proposals (as ongoing in the IoF2020 large scale project Open Call¹²⁸); keeping some budget for funding the proposals' preparation, as proposed during the Thematic Networks Coordination meeting¹²⁹; avoiding single-stage proposals and opting for more two (or even three) stages proposals¹³⁰;
- Create links with other programmes such as **Erasmus+**, for the mainstreaming of the end-user information into current and future education and training curricula;
- Close the gap between **agricultural research and rural development** and, in particular, establishing closer links the EIP-AGRI and ENRD in order to fully deploy the **Smart Villages Act** and benefit the whole farmers' and rural development communities;
- Promote a **Smallholders Farmers Act** at EU level mirroring the Smaller Business Act initiative for SMEs, with the goals of easing or reducing the regulatory burden within REFIT Commission's Regulatory Fitness and Performance (REFIT) programme, the red tape linked to CAP direct aid, the participation in agricultural research projects at different programmes, and access to financial instruments. This **overarching framework** might influence all programmes affecting agricultural research.

4. Promote a further inclusion of innovative financial instruments within the next generation of funded programmes, in order to increase the access to funding opportunities for the development of innovation-driven products and services. In particular, the experiences gathered through the Smart-AKIS policy cases collected in Serbia allow to highlight some additional lessons learnt:

- The importance of funding schemes directly targeting innovative SMEs in particular in the context of the digital economy: both FRACTALS and KATANA projects focused on innovative IT companies that are focused on agriculture, field that has full potential for digitization;
- The importance of having schemes that “bridge the gap” between different categories of stakeholders in the agri-food value chain: in both projects, the Open Calls are designed to involve entire value-chain, from research institutes and academia, through web entrepreneurs and IT companies to end-users (farmers) that will be using created solutions. It was proved that user-led innovation is more successful and has more impact both in industry as well as in end-users' environment;
- The combination of direct financial support to SMEs with tailor made business support services and a technological framework of Large Scale Demonstrators, in particular as for the KATANA project;
- The fact that such funding schemes have a simplified access for SMEs: in FP7 FRACTALS, a simple template that needed to be filled in (10 pages) was provided to the applicants. For the H2020 KATANA project, the responsible of the Open Calls (including BIOS) developed an application system where just 2-minute video presentation was required. More than 600

¹²⁸ For more information, please refer to: <https://www.iof2020.eu/open-call> (last consultation: 17/07/2018).

¹²⁹ For more information, please refer to: <https://ec.europa.eu/programmes/horizon2020/en/news/role-thematic-networks-eu-agricultural-innovation> (last consultation: 20/07/2018)

¹³⁰ This proposal has been advanced by CEMA High Level Group on Research during the meeting held on the 19/07/2018.

applications were received and, after peer-to-peer evaluation, the first 100 were payed to go to the boot-camp where they received a bouquet of entrepreneurial/business support services and matchmaking sessions where they were able to find complementary partner(s) to kick-off their idea to the market.

5. Policy briefs

Policy Brief 1

- a. Title: **Smart Agriculture for all farms**
- b. The body: The Common Agricultural Policy (CAP) should devote a specific percentage of the available budget to projects aimed at enhancing farm holdings' productivity, leveraging the potential of SFTs.
- c. Policy implications and Recommendations: As a key concept, a **Total Productivity Factor** could be used for allocating CAP funding in order to enhance the sustainable productivity of farm holdings.

The offered solutions should be **farmers-centered**. They should aim to **reward farmers**, e.g. through a **Sustainable Productivity Bonus**, and be adapted to the farm size:

- **Farms < 50ha** - dedicated subsidy to invest in basic SFTs, voucher for using contractual services, special voucher for buying small-scale communication technologies with agricultural applications, (smart phones, tablets, computers);
- **Farms 50-100ha** - possibility to decide if farmers want to go for the Sustainable Productivity Bonus or apply for a dedicated Smart Technologies subsidy or voucher (for investment or renting of services);
- **Farms >100 ha** - use the Sustainable Productivity Bonus, thus rewarding those farmers who are able to increase their productivity while strictly following the cross-compliance requirements.

Furthermore, according to the Smart-AKIS findings from Deliverable 2.2: "Report on farmers' needs, innovative ideas and interests", beside farm size and due to the specific conditions and compatibility and costs of the SFTs, **the dominant cropping system** should be also taken into account while recommending targeted support within the CAP.

- d. Conclusions:
 - The CAP after 2020 **improves access to Smart & Precision Agriculture Technologies** through e.g. a Sustainable Productivity Bonus which is adapted to the farm size and potentially to the dominant cropping system.
 - **Different SFTs are eligible for the Sustainable Productivity Bonus**, such as: tools to analyse Big Data; smart devices that generate useful data, facilitate data sharing; connecting devices/tools; integration of smart-phones, tablets, embedded computers with dedicated software and applications; unmanned systems like drones, robots, and highly automated machinery.
- e. Reference:
 - Dryancour G., Chairman, Public Policy Group (PPG), CEMA, Towards a New Strategic Agenda for the Common Agricultural Policy (CAP) after 2020 – CEMA Position Paper, Brussels, February 2015.

Policy brief 2

- a. Title: **Modernize and simplify the support for farm investment**
- b. The body: Since the reform of the Common Agricultural Policy (CAP), **Rural Development** is playing an increasing role in helping rural areas to meet the economic, social and environmental challenges of the 21st century. The CAP consists of two pillars. The “first pillar” includes direct payments whereas the “second pillar” concerns rural development policy.
The new legal framework points more clearly in which direction to boost growth, create jobs for rural areas in alignment with the Lisbon Strategy, and improve sustainability in line with the Göteborg sustainability goals.
- c. Policy implications and Recommendations:
- The CAP “second pillar” is crucial for promoting balanced territorial development of rural economies and sustaining a farming sector that is environmentally sound, as well as competitive and innovative;
 - The CAP “second” pillar should support farmers’ sustainable investments through schemes which can help them invest in new equipment and technologies, particularly when they are assessed to have a positive environmental impact;
 - The CAP after 2020 strategy should turn the policy (EAFRD and EAGF) into an opportunity making EU Agriculture smarter and greener, thus contributing to a more sustainable and competitive EU agriculture.
- d. Conclusions
- The CAP “second pillar” **supports farmers’ sustainable investments** through funding schemes that help them invest in new equipment and technologies;
 - Various funding mechanisms and bodies working at different levels (European, National and Regional) **join forces to work together** in order to achieve common objectives for the benefit of EU agriculture;
 - **Farmers’ have a positive experience** with the implementation of EU support measures and successful collaborative schemes between the public and the private sector;
 - **Investments** are stimulated in environmentally-friendly equipment and machinery aiming at attaining **competitiveness** and **sustainability** goals.

Policy brief 3

- a) Title: **Set the stage for the advisory of the future**
- b) The body: The rapid pace of innovation often prevents advisors to be adequately updated on the latest or more appropriate technologies available on the market. The new role of Advisory Services in the digital age was well recognized during the different Smart-AKIS workshops. The testimonials of advisers that participated and that are confronted daily with challenges related to the uptake of Smart Farming Technologies (SFTs), revealed the gap between the need for change and farmers' willingness to change, and the insufficient capacities of innovation agencies and advisory services to effectively support these changes.
- c) Policy implications and Recommendations:
- The training of advisers: promoting activities which are focused on the training of trainers, including vocational training, skills acquisition actions, demonstration activities and information actions;
 - The methodology and tools for such training: supporting all training and educational efforts with the latest digital and social media capabilities (videos, podcasts, Augmented Reality, Facebook, Twitter, serious games, etc.).
 - The "Agronomy First principle" approach, when integrating smart farming technologies into training and information.
- d) Conclusions:
- Overcoming currently existing bottlenecks in the different national and regional **Agriculture Knowledge and Innovation Systems (AKIS)** in Europe;
 - Improving the training of advisors, but also the **availability of updated tools and methodologies for supporting the technology transfer**;
 - **One-fix-for-all solutions** should be avoided and **tailored solutions** should be developed and applied to cope with differences between farms, countries and specialisation levels;
 - the **promotion of outdoors fairs and field demonstrations by advisors** of Smart Farming Technologies through Field Days and Demonstration Farms, jointly with industry and for the benefit of advisors and farmers.
- e) Reference:
- Knickel K., G. Brunori, S. Rand and J. Proost (2009). Towards a Better Conceptual Framework for Innovation Processes in Agriculture and Rural Development: From Linear Models to Systemic Approaches in The Journal of Agricultural Education and Extension. Vol. 15, No.2, 131-146, June 2009
 - Labarthe, P. and Laurent, C. (2013) Privatization of agricultural extension services in the EU: Towards a lack of adequate knowledge for small-scale farms? Food Policy, 38, 1, 240-252
 - PRO AKIS Prospects for Farmers' Support: Advisory Services in European AKIS <http://www.proakis.eu/> (last consultation 04/06/2018).

Policy brief 4

- a. Title: **Demonstrate and share the knowledge**
- b. The body: On farms, **data is collected, processed and analyzed** to take decisions related to cultures, nutrients, cycles or other strategic aspects of the agricultural practice. Farmers and/or farming managers unable to manage the data coming from Smart farming technologies (STFs) will likely take less favorable decisions leading to a loss in efficiency and ultimately a decrease in the overall competitiveness of their business, while having made large investments.

But besides the not optimal use of SFTs, a main **barrier identified for SFTs adoption** by farmers is the lack of information on the real-life profitability and/or sustainability of smart farming technologies. More in particular, they are interested in increased yield performance and the reduced use of inputs.

- c. Policy implications and Recommendations:
- Promote demonstration activities at the farm level aimed at showing the farmers in their own region/country how new smart technology or machinery perform;
 - Develop harmonised methodologies that provide representative findings on the performance of STFs, thus helping farmers to take their decision on using SFTs, particularly concerning yield performance and the use of inputs;
 - Promote tools that allow farmer experiences to be shared.
- d. Conclusions:
- Demonstration activities at farm level are a crucial part of the agricultural knowledge exchange for innovation, with the benefit of having the possibility of testing the SFT directly on the field; Demonstration farms are key examples of support strategies facilitating the adoption and uptake of SFTs;
 - More empirical based evidence about the economic benefits and environmental impacts of using SFTs will encourage farmers to invest in SFTs;
 - Farmer-to-farmer learning is a crucial example of knowledge exchange in agriculture that can help in the uptake of new farming technologies or practices.
- e. Reference:
- Adrian, A.M., Norwood, S.H., and Mask, P.L. 2005. Producers' perceptions and attitudes toward precision agriculture technologies. *Computers and Electronics in Agriculture*, 48:256-271.
 - Pierpaoli, E., Carli, G., Pignatti, E., and Canavari, M. 2013. Drivers of Precision Agriculture Technologies Adoption: A Literature Review. *Procedia Technology*, 8:61-69.

Policy brief 5

- a. **Title: Review and Update educational curricula**
- b. **The body:** At the **higher education level**, the curricula offered from academia is often addressing farming from the “botanic” or biological side only, leaving other equally important themes poorly addressed, if not substantially ignored. Although the University curricula evolved over the last decade, there is still room for further improvement, especially in the area of precision farming. In reality, farms increasingly became places where data needs to be collected, processed and analysed in order to take decisions about cultures, nutrients, cycles or other more strategic aspects of the agricultural practice.
- c. **Policy implications and Recommendations:** Keep agricultural studies curricula in University and Schools updated, mainstreaming well-established and upcoming smart farming technologies:
- **University programmes** need to reflect the changes required by the 21st century’s food security and productivity challenges, particularly in the field of precision farming.
 - **University curricula** evolved slowly in the last decade incorporating aspects such as value and supply chains, or general notions on the bio-economy. However, the “agricultural” curricula remain largely incomplete and would need to be re-designed;
 - **Educational programmes** need to be tailored to address the broadening range of educational needs since computer technologies in agriculture continue to deliver innovation in farming practice;
- d. **Conclusions:**
- **Closing the research and practice gap in agricultural data management** is crucial and should be considered in the planning of higher education didactical offer;
 - **Enhancing the farmers’ technical skills and competences**, since several studies indicated that farmers who do not adopt SFTs usually have insufficient skills and competences;
 - **Education** of the new generation of farmers for the challenges of the 21st century: given the new and severe challenges faced by the agricultural sector in the current globalised food markets, **managing data in agriculture** is becoming as important as agronomic knowledge and experience.
- e. **Reference:**
- Adrian, A.M., Norwood, S.H., and Mask, P.L. 2005. Producers’ perceptions and attitudes toward precision agriculture technologies. *Computers and Electronics in Agriculture*, 48:256-271.
 - Pierpaoli, E., Carli, G., Pignatti, E., and Canavari, M. 2013. Drivers of Precision Agriculture Technologies Adoption: A Literature Review. *Procedia Technology*, 8:61-69.

Policy brief 6

- a. Title: **Ensure rural broadband connectivity**
- b. The body: Considering the number of communication nodes and big data streams being from device to farm, device to cloud, cloud to cloud, Smart Farming Technologies depend on an **access to broadband and steady, high-quality internet connection**. Especially in rural areas, this access is lacking and if existing is not state of the art.
- c. Policy implications and Recommendations:
- Actual **lack of high-quality internet coverage** should be identified and solutions developed to close the gaps. Actions on regional and local level to insure appropriate infrastructure in rural areas appear to be crucial;
 - **Shared investments, grants and other initiatives** should work together for the interest of an entire local community;
 - Different levels of policies should **work together** for addressing the huge challenge represented by rural access to broadband, since each EU country and region are responsible for its own timetable for broadband roll-out;
 - **The regional dimension** of the initiatives for broadening and improving the rural broadband comes out as one of the main features of the policy cases collected in this topic area through Smart-AKIS.
 - Coordination and **harmonization of national initiatives for rural connectivity** to minimize the number of connection technologies and frequency bands to be used, thus to harmonize solutions proposed in different territories.
- d. Conclusions:
- **Increasing broadband network** in rural areas as one of the main priorities of Broadband Europe, promoting the European Commission's vision and actions to turn Europe into a Gigabit Society by 2025;
 - **Better access to broadband** for farmers to use new technologies and become more efficient. **Connectivity** is crucial and an adequate rural broadband will contribute to the successful adoption and uptake of SFTs;
 - Development and implementation of a coherent **strategy for rural connectivity** that involves different levels of implementation: regional, national and European.
- e. Reference:
- Opening Speech by European Commissioner P. Hogan at Cork 2.0 Conference on Rural Development, 5th September 2016, Cork. Available at the following [link](#).

Policy brief 7

a. Title: **Simplify, Innovate and Network the Funding Instruments**

b. The body: The EU strategy for supporting rural and agriculture innovation in Europe comprise numerous policies and EU research funding programmes. The analysis on the innovation process carried out in Smart-AKIS has provided examples and evidences of different bottlenecks and gaps hindering the development of an effective and sustainable ecosystem for enhancing innovation in agriculture and sustain rural development.

c. Policy implications and Recommendations:

- Enhance the role of **cooperation** and the **involvement** of all the relevant value chains actors through multi-actor projects: role of farmers, advisors, industry-led proposed solutions and multi-stakeholders initiatives;
- **Strengthen** and **reinforce** Thematic Networks;
- Further structuring the **EIP-AGRI ecosystem** following the recommendations provided in the Smart-AKIS deliverable 3.6: “Recommendations for mainstreaming Smart Farming in Europe;
- **Promote and enhance synergies** between programmes and funding schemes (mapping, synergies with INTERREG and Erasmus+, link the EIP-AGRI and ENRD, Smallholders Farmers Act);
- **Simplify access to R&D and innovation funding** by reducing/removing red tape for access to funding and reporting. Some proposals in this direction are to: **(i)** foresee a pre-harvesting phase for the submission of proposals; **(ii)** keep some budget to fund the proposals’ preparation; **(iii)** avoid single-stage proposals and opting for more stages proposals;
- Promote the further **inclusion of innovative financial instruments** (e.g. Future Internet Public-Private Partnership (FI-PPP) programme and crowdfunding-based scheme) to attract private funds as the main criterion for EC financial support.

d. Conclusions:

- **Complementarity of funding instruments** in the support of an investment project pipeline, pooling together resources and different actors facilitated through a set of activities;
- **Collaboration** between different actors, for instance public and private entities, in assembling Operational Groups and run innovation projects. Thematic Networks represent crucial examples of multi-actor approach;
- **Simplification** of the access to R&D and innovation funding and participation in the programme, together with a reduction of the administrative costs to participants.

6. Annex: Policy Cases collected

6.1. Template for Policy cases

1. Objectives

This survey aims at contributing to **D3.7. Report on identified policy gaps and policy briefs** (Leader: CEMA, M30): A review report for the identification of the policy gaps to be used as input to policy briefs. A series of 7 policy briefs will be developed in the form of crisp and focused two page documents concentrating each on two or three key messages which can be easily and quickly grasped by the target group in each case.

Policies will be reviewed in terms of their **encouragement – or discouragement – of innovation and use of SFT and the actual uptake of these innovations in practice**. Based on the findings, the project partners will seek to identify potential gaps and produce dedicated policy briefs with specific suggestions.

2. Target group:

2.1 This template targets **Project Partners** and, in particular, **Hubs' leaders**.

Each Hub Leader should collect at least one (and maximum three) example(s) of policy measures (one policy measure per template) and return this form filled (both part 1 and 2) to CEMA by the **30/04/2018**.

The template also include a **third part**, which is optional and, thus, not mandatory. Such third section implies to have some short discussions/ interviews with external experts and stakeholders (policy makers, policy implementation body, and beneficiaries of the measures, such as in particular farmers) that have/ had a role in the planning/ implementation/ evaluation of the selected policy measure(s).

We therefore encourage all partners, especially those with direct connection to one or more of such external stakeholders, to involve them in the survey in order to gather more and valuable information on the existing policy measures that have been supporting SFT adoption.

This template's first two sections can be autonomously filled and completed by Smart-AKIS project partners without involving any additional actors.

2.2 In order to complete the picture, CEMA also encourages that the selected **innovation cases (WP2)** could be part of this survey, therefore contributing to gathering information on existing measures encouraging innovation and the use/ uptake of SFTs (if any).

3. Template Structure

This template is organized in 3 parts:

- The **first** one collects general information about policies measures and initiatives that might be relevant for the Smart-AKIS project policy recommendations and briefs.
- The **second** one focuses on more detailed information about the measures above.

- The **third** section proposes some questions to be addressed to external experts and stakeholders (policy makers, policy implementation body, and beneficiaries of the measures, such as in particular farmers) that have/ had a role in the planning/ implementation/ evaluation of the selected policy measure. This section is optional. (See paragraph 2.1).

4. Practical Guidelines for Hub Leaders

- This template aims at gathering information mainly on policies measures and initiatives that, based on your experience, target challenges that can be addressed by SFTs, thus supporting, facilitating or boosting of:
 - Innovative practices in agriculture;
 - Environmental impact of farming practices (target inputs use, reduction of GHG emissions, including renewable energy, etc.);
 - Energy efficiency in agriculture;
 - Agriculture productivity and/ or competitiveness;
 - Smart Farming Technologies and equipment modernization;
 - SMEs, start-ups, new business models in rural areas;
 - Digitising European rural areas;
 - AKIS and strengthening collaboration between Academia, industry, and farmers;
 - Others.
- This template aims at gathering information mainly on policies measures and initiatives that are implemented at Regional and/or National level in the different territories covered by Smart-AKIS (question 3).
- Each hub leader, with the support of the relevant project partners, should identify 1 to 3 policies and/ or initiatives following this template. CEMA will check on the information, provide feedback and, if necessary, ask for additional data.
- You might focus either on successful stories (concrete examples of one/ more of such policy measures that have effectively addressed the challenges while supporting SFT adoption) or failure ones (policy measures that have failed addressing the challenges and/ or supporting SFT adoption), explaining the factors featuring “success” or “failure” (question 12).

5. Template

Part 1. General Information	
1. Partner information	<i>General partner information (Name and partner number).</i>
2. Policy measure name	
3. Region / country	
4. Identify level of policy implementation	Is the policy implemented at: <ul style="list-style-type: none"> • Regional level • National level • Other level (local, etc.) if any.
5. If relevant, indicate	Under which instrument is this policy/ initiative funded?

the funding source/ instrument and the name of the Programme	(i.e. European Agricultural Fund for Rural Development – EAFRD; National Programmes funded by the Ministry of Agriculture/ Industry, etc.; European Regional Development Fund – ERDF; etc.)
6. Main focus area	Please prioritize 1 to 3 main focus areas covered by this policy/ initiative choosing among the following: <ul style="list-style-type: none"> • Agriculture and Rural Development • Regional Development • Research & Innovation • Digitising Rural Economies • Space Technologies • Social Cohesion • Smart Specialization Strategy • Environment • Energy • Education and Skills Development • AKIS and strengthening collaboration between Academia, industry, and farmers • Transnational Cooperation • Support to industry / SMEs • Others (please indicate)
7. Year(s) of implementation	Please indicate starting and ending period (ongoing if relevant)
8. Body for the implementation of the policy	
9. Are you directly involved in the design and/or implementation of this measure? How?	
Part 2. Description and details of the policy / initiative	
10. Please detail main challenges (in terms of policy gaps) and objectives in relation to which this policy has been designed and/or implemented. (200- 250 words)	In this section you might describe the challenges (e.g. reducing environmental impact, supporting equipment modernization, etc.) that the selected measure targets. You should also describe the measures' objectives (both quantitative and qualitative, where relevant)
11. Description of the measure or initiative (350-500	In this section you might describe: <ul style="list-style-type: none"> • The core instruments and tools used/ promoted by the

words)	initiative, <ul style="list-style-type: none"> • The activities funded by the initiative, • The type of beneficiaries, • The funding mechanism (i.e. reimbursement, vouchers, public procurement, financing, percentage of funding, etc.) • Other relevant information about the policy/ initiative.
12. Relevance of this policy measures (150-500 words)	<p>Please explain why you have chosen to describe this specific policy measure, e.g. why you think this is a success story or, on the other hand, why you believe that this is a failure one.</p> <p><i>Example: For doing so, you might focus, in particular, on the contribution of the selected policy measure to the overcoming of one of the barriers identified by Smart-AKIS (Economic; Technical; Data-related; and Support-related).</i></p> <p><i>You can expose your personal opinion or point of view, make reference to contacts you had with other stakeholders or to other information/ knowledge you might have on this issue.</i></p>
13. Website (if any)	
14. Any additional support information (factsheets, videos, pictures, presentations, news, etc.)	<p><i>Please indicate eventual sources (online, publications, etc.) and/ or contacts you have involved to fill this template.</i></p>
Part 3 (optional). Interview with one (or more) expert(s)	
<p>In this OPTIONAL SECTION, you have the possibility of gathering more information about the selected policy measures, thus contacting and interviewing one (or more) expert(s). Experts can be both policy makers, policy implementation body, and beneficiaries of the measures (e.g. farmers) that have/ had a role in the planning/ implementation/ evaluation of the selected policy measures.</p> <p>The following questions should guide you in carrying out the interview(s), but you might decide to be more specific, in case this is deserved.</p> <p>If you are interviewing more than one expert, please copy this table as many times you need to collect a stakeholder's opinion.</p>	
15. Impact and Results (350-500 words)	<p>Was this initiative successful and, thus, has it effectively addressed the challenge(s) while supporting SFT adoption?</p> <p>a) If yes, please explain what are, in your opinion, the main factors determining the success of this measure. Please explain (350-500 words) i.e. matching between planned and achieved objectives; number of beneficiaries or funded innovation or actions; concrete demonstration of scalability; effective multi-actor cooperation; etc.</p> <p>b) If not, please explain what are, in your opinion, the main factors determining the failure of this measure, that is the reasons why</p>

	<p>the measure couldn't address the challenges and/ or support SFT adoption</p> <p>Please explain <i>(350-500 words)</i></p> <p>i.e. why it didn't meet the objectives or achieve to involve beneficiaries, etc.</p>
16. Who are the actors involved?	Please describe the extent to which this measure is supported by businesses (clusters) and/or academia and/or civil society and/or industry and/or advisors in your region or country.
17. Transnational cooperation and scalability <i>(100-150 words)</i>	<p>a) Are you aware of similar initiatives planned and/or implemented in other regions/ countries?</p> <p>b) Do you have any transnational or transregional cooperation on this measure?</p>
18. Any additional comments or support information (factsheets, videos, pictures, presentations, news, etc.)	
19. Sources	Please indicate eventual sources (online, publications, etc.) and/ or contacts you have involved to fill this optional section of the template.

6.2 List of Policy cases collected

Policy case 1. S3P Agri-Food – partnership on High Tech Farming (EU)

Part 1. General Information	
1. Partner and company information	CEMA P11
2. Policy measure name	Smart Specialisation Platform for Agri-Food (S3P Agri-Food) – partnership on High Tech Farming
3. Region / country	European Union
4. Identify level of policy implementation	<ul style="list-style-type: none"> European level
5. If relevant, indicate the funding source/ instrument and the name of the Programme	Under which instrument is this policy/ initiative funded? Initiative promoted by the European Commission, DG REGIO and Joint Research Centre. No direct funding provided but support by means of experts paid by EC.
6. Main focus area	Please prioritize 1 to 3 main focus areas covered by this policy/ initiative choosing among the following: <ul style="list-style-type: none"> Agriculture and Rural Development (2) Regional Development (3) Research & Innovation Digitising Rural Economies Space Technologies Social Cohesion Smart Specialization Strategy (1) Environment Energy Education and Skills Development AKIS and strengthening collaboration between Academia, industry, and farmers Transnational Cooperation Support to industry / SMEs Others (please indicate)
7. Year(s) of implementation	2016-ongoing
8. Body for the implementation of the policy	EU Regions – Coordination assured by Tuscany Region Tuscany Region represented by Fabio Boscaleri (Policy Officer in Brussels) leads one of the commitment focused on “ High Tech Farming ”
9. Are you directly involved in the design and/or	CEMA is not directly involved.

implementation of this measure? How?	
Part 2. Description and details of the policy / initiative	
10. Please detail main challenges (in terms of policy gaps) and objectives in relation to which this policy has been designed and/or implemented. (200-250 words)	<p>EU regions and member states need a support to implement more efficiently their smart specialisation strategies, particularly concerning the promotion of cooperation between different EU regions.</p> <p>The Smart Specialisation Platform for Agri-Food (S3P Agri-Food) established at EU level aims to accelerate the development of joint investment projects in the EU by encouraging and supporting interregional cooperation in thematic areas based on smart specialisation priorities defined by regional and national government linked to agriculture and food.</p> <p>Many EU Regions have addressed High Tech Farming as a priority/issue in their Smart Specialization Strategies.</p>
11. Description of the measure or initiative (350-500 words)	<p>The S3P Agri-Food orchestrates 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 Platform will also promote the complementarity of funding instruments in the support of an investment project pipeline.</p> <p>A dedicated partnership on High Tech Farming under the European S3 AGROFOOD Platform has been promoted by Tuscany Region to facilitate interregional and cross-border cooperation and projects, thus accelerating the uptake of SPF in European agricultural systems.</p> <p>Several EU Regions have expressed concrete interest in this partnership and, after the S3 Agrofood Platform kick-off event in Florence (6-7 December), they agree to focusing their joint work on the following four value chains: (i) Tree nursery, Viticulture, Fruits (relatively more intensive); (ii) Livestock outdoor; (iii) Arable, Cereals, vegetables (outdoor); (iv) Protected cultivation (different types of greenhouses, highly intensive).</p>
12. Relevance of this policy measures (150-500 words)	<p>Through different activities the European Commission will assist coordinating/lead region(s) in their work. These include for example:</p> <ul style="list-style-type: none"> • Organisation of specific workshops to identify common interests and discuss implementation actions. • Support to partnerships in identifying strong and missing competences among the participating regions by combining existing EU analytical tools and if necessary supported by studies and specific surveys through experts in the specific fields. • Organisation of partnering and matchmaking events for

	<p>industrial partners aimed to discuss, facilitate and accelerate the development of joint industrial investment projects.</p> <ul style="list-style-type: none"> • Identification of a pipeline of promising pilot business cases at interregional level. <p>In the long-term, the European Commission will also aim at facilitation of the financial engineering of specific investment projects.</p>
13. Website (if any)	http://s3platform.jrc.ec.europa.eu/high-tech-farming
14. Any additional support information (factsheets, videos, pictures, presentations, news, etc.)	<i>We were in contact with Fabio Boscaleri, Policy Officer, Brussels Office, Tuscany Region, who contributed to this section.</i>

Policy case 2. Manure Policy: Flanders implementation of the NEC and ND directives (Belgium)

Part 1. General Information	
1. Partner information	CEMA P11
2. Policy measure name	Manure Policy: Flanders implementation of the nitrates directive (ND) and the national emission ceilings directive (NEC)
3. Region / country	Flanders (BE) (This experience can be instructive for other EU regions with high livestock densities like Denmark, Netherlands, Brittany, Cataluña, the Po valley and the Northern part of Germany and Poland).
4. Identify level of policy implementation	<p><i>Is the policy implemented at:</i></p> <ul style="list-style-type: none"> • Regional level (implementation of EU Directive) • National level • <i>Other level (local, etc.) if any.</i>
5. If relevant, indicate the funding source/ instrument and the name of the Programme	<p><i>Under which instrument is this policy/ initiative funded? (i.e. European Agricultural Fund for Rural Development – EAFRD; National Programmes funded by the Ministry of Agriculture/ Industry, etc.; European Regional Development Fund – ERDF; etc.)</i></p> <p>Potentially, as outlined in the Directive (EU) 2016/2284, The Commission shall endeavour to facilitate access to existing Union funds (...) include present and future available funding under, inter alia: (a) the Rural Development Funds; (b) the Framework Programme for Research and Innovation; (c) the European Structural and Investment Funds, including relevant funding under the common agricultural policy; (d) instruments for the funding of environment and climate action such as the LIFE programme.</p>
6. Main focus area	Please prioritize 1 to 3 main focus areas covered by this policy/ initiative choosing among the following:

	<ul style="list-style-type: none"> • Agriculture and Rural Development (2) • Regional Development • Research & Innovation • Digitising Rural Economies • Space Technologies • Social Cohesion • Smart Specialization Strategy • Environment (1) • Energy • Education and Skills Development • AKIS and strengthening collaboration between Academia, industry, and farmers • Transnational Cooperation • Support to industry / SMEs • Others (please indicate): Public Health (3)
7. Year(s) of implementation	Ongoing
8. Body for the implementation of the policy	Flanders regional government implementing the EU Directive
9. Are you directly involved in the design and/or implementation of this measure? How?	No. CEMA participated at the Best-Practices to cut Ammonia Emissions World Café organized by the European Environmental Bureau (EEB) on the 29 February 2016. The event focused on best practices to reduce ammonia emissions from agriculture and potentials for the NEC Directive implementation.
Part 2. Description and details of the policy / initiative	
10. Please detail main challenges (in terms of policy gaps) and objectives in relation to which this policy has been designed and/or implemented. (200-250 words)	<p>The challenge is to reduce ammonia emissions from agriculture. Agriculture is responsible for over 90% of ammonia emissions in the EU. The main sources of these emissions are: (i) Chemical fertilizers, such as synthetic urea based fertilizers; (ii) Manure and slurry from livestock.</p> <p>Ammonia emissions cause significant damage to both human health and the environment, in particular, they are responsible for: (i) Adverse health impacts through the formation of secondary particulate matter (PM) especially in certain periods of the year; (ii) Eutrophication of soil and water which negatively impacts e.g. biodiversity and water quality and might be particularly dangerous, for instance, in areas closed to natural reserves.</p> <p>This is why the EC proposed to limit EU ammonia emissions by 2030 through its clean air policy package, which includes the revision of the NEC Directive.</p> <p>To achieve the new air policy targets for 2030, the proposed NEC</p>

	<p>Directive requires ammonia reductions of 27%. The new National Emissions Ceilings (NEC) Directive (2016/2284/EU) entered into force on 31 December 2016. Replacing earlier legislation, (Directive 2001/81/EC), the new NEC Directive sets 2020 and 2030 emission reduction commitments for five main air pollutants.</p> <p>The Directive provides a set of source measures to be taken into account by Member States when developing national programmes. Many of these are cost-effective even on rather small farms. Member States may also provide support by earmarking appropriate resources under the Rural Development Funds.</p> <p>In order to reduce emissions, Member States should consider supporting the shift of investments to clean and efficient technologies. Innovation can help to improve sustainability and to solve problems at source by improving sectoral responses to air quality challenges.</p>
<p>11. Description of the measure or initiative (350-500 words)</p>	<p>Since 1990s, Flanders managed to cut its ammonia emissions by half since. Ammonia emissions from manure spreading only were cut by as much as 80% over the same period. This happened progressively through the implementation of the Nitrates and NEC Directives.</p> <p>As for manure spreading:</p> <p>(i) During the 1990s, Flanders introduced maximum limits of application for manure (in kg), shortening of manure spreading periods, and a compulsory incorporation of manure within 24 hours.</p> <p>(ii) In the 2000s, the incorporation time limit became 4 hours on bare arable land, and injection/trailing shoes/hoses became mandatory.</p> <p>(iii) Since 2007, manure must be incorporated within 2 hours or injected on arable land.</p> <p>As for animal housing for pigs and poultry:</p> <p>Since 2004, low-emissions housing methods including building techniques and the use of chemical or biological air scrubbers have become compulsory for new stables and stables undergoing a thorough renovation. The reductions from animal housing techniques are less impressive than for manure spreading techniques because new rules take longer to take effect.</p> <p>The Flanders example teaches us three things:</p> <p>(i) Both the Nitrates and NEC Directives help to achieve significant reductions in ammonia emissions from farming practices - it is unlikely the outcomes would have been the same without such legislation in Flanders.</p> <p>(ii) Nitrogen is a precious farming resource and should be used in the most efficient way. When calculating the costs of measures, this should be taken into account as the benefits are big (e.g. savings due to less</p>

	<p>chemical inputs, such as mineral fertilizers).</p> <p>(iii) It is important to anticipate new legislation and set early policies, as legal policy can bring down ammonia emissions from agriculture quickly and considerably.</p>
12. Relevance of this policy measures (150-500 words)	<p>The application of this measure in Flanders has result in a shift of investment to clean and efficient technologies, as in the intentions of the EC. The most promising areas for ammonia emission reductions are, according to the UNECE (see bibliography):</p> <ul style="list-style-type: none"> ✓ Improved storage of manure; ✓ Improved application of urea fertilizer or substitution by ammonium nitrate; ✓ improved application of manure. <p>As about the latter, while traditional manure spreading techniques on the field result in the loss of more than two thirds of the applied ammonium and nitrogen in the form of undesirable ammonia emissions, direct manure injection can reduce such losses by well over 90%. In the 2013 impact assessment on improving air quality in Europe, the EC identified modern manure application machinery as the most cost-efficient solution to bring down ammonia emissions in the EU. Still, direct manure injection is not yet practiced widely in many EU Member States.</p> <p>At the 2016 EEB event, the Dutch company Veenhuis, presented its agricultural machines for improving the application of manure through slurry application, handling and distribution. Direct injection of manure in the soil results in 7 times less nitrogen loss compared to manure spreading.</p> <p>Investment for injection equipment is higher than that for traditional equipment. However, as experiences from the Flemish Region in Belgium (and including similar experiences in the Netherlands) have shown, injection services are often offered in a cost-efficient manner to smaller farmers by agricultural contractors.</p> <p>Machinery to inject manure into the ground is widely used in the Netherlands, Denmark and Flanders as a result of national policy limiting ammonia emissions.</p> <p>This example thereby demonstrates that support from national policies [and others, in case the mechanisms mentioned in the Directive (EU) 2016/2284 are implemented (Q5)] can help addressing the “high investment cost” economic barrier (even without any additional funding provided through the measure). In this case, indeed, the provision of economic incentives is not needed because, in the end, even without such incentive, there is an advantage for the farmers: the cost of the investment is indeed lower considering that the farmers wouldn’t need the fertilizers</p>

	<p>anymore (that can be substituted by manure) and that they would now exactly know what they are putting in the soil.</p> <p>Furthermore, exchange of practices and knowledge (e.g. from the NL to other high livestock densities EU regions) could help address the “Lack of demonstrations of SFT added value” technical barrier. During the EEB World Café, for instance, there was a German Lander who was originally against the measure, but got inspired by this concrete successful example. Scalability of such type of measure would be particularly interesting especially for regions with high livestock densities (e.g., Brittany, Catalunya, Po valley, North DE and PL).</p>
13. Website (if any)	<ul style="list-style-type: none"> • CEMA Newsletter article • European Environmental Agency webpage • European Environmental Bureau Report
14. Any additional support information (factsheets, videos, pictures, presentations, news, etc.)	<ul style="list-style-type: none"> ✓ CEMA Newsletter article, Yes we can – reduce ammonia emissions in European agriculture, March 2016: link ✓ Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions - a Clean Air Programme for Europe - COM(2013) 918 final ✓ Courtz J., Veenhuis Technical Director, presentation at the Best-Practices to cut Ammonia Emissions World Café, Brussels, 29/02/16 ✓ Directive (EU) 2016/2284 of the European Parliament and of the Council of 14 December 2016 on the reduction of national emissions of certain atmospheric pollutants, amending Directive 2003/35/EC and repealing Directive 2001/81/EC ✓ European Environmental Board (EEB), Clearing the air - A critical guide to the new national emission ceilings directive, Brussels, 02/2017 ✓ EEB, Client Earth, AirClim, Deutsche Umwelthilfe, Best-Practices to cut Ammonia Emissions Report from 29/02/16 World Café - online ✓ United Nation Economic & Social Council, Economic Commission for Europe (UNECE), Guidance document on preventing and abating ammonia emissions from agricultural sources. ECE/EB.AIR/120 07/02/2014 ✓ Van Grinsven H., Tiktak A., Rougoor C., Evaluation of the Dutch implementation of the nitrates directive, the water framework directive and the national emission ceilings directive, Wageningen Journal of Life Sciences 78 (2016) 69–84 - www.elsevier.com/locate/njas ✓ Von Schneidemesser E., Kutzner R. (IASS); Münster A., Staudt E., Saar D. (DUH); Schaap M. (TNO, FU Berlin); Banzhaf S. (FU Berlin), Mitigating Ammonia Emissions – critical to reducing PM exposure, Policy Brief, 2016

Policy case 3. Fund for the training of life entrepreneurs (VIVEA) (France)

Part 1. General Information	
1. Partner information	<i>FRcuma Ouest P12</i>
2. Policy measure name	Fund for the training of life entrepreneurs (VIVEA) - three-year strategic plan Fonds pour la formation des entrepreneurs du vivant (VIVEA) - plan stratégique triennal (2016-2018)
3. Region / country	France
4. Identify level of policy implementation	Regional level
5. If relevant, indicate the funding source/instrument and the name of the Programme	<ul style="list-style-type: none"> • Every year, farmers pay a training contribution (compulsory financial contribution) collected by the Social Agricultural Mutual. VIVEA manages and shares it. This contribution allows the associates to benefit from a total or partial assumption of your educational training expenses under certain conditions. • Other funding (European Agricultural Fund for Rural Development – EAFRD) could complete this policy.
6. Main focus area	<ul style="list-style-type: none"> • strategy and management • competitiveness of the farming systems • innovative production methods • efficiency and well-being at work
7. Year(s) of implementation	2016-2018
8. Body for the implementation of the policy	Fonds pour la formation des entrepreneurs du vivant (VIVEA) - Fund for the training of life entrepreneurs
9. Are you directly involved in the design and/or implementation of this measure? How?	Not directly. Nevertheless, to define training priorities, VIVEA works with all agricultural professional organizations (cuma included) and technical institutes. The skills to be acquired by agricultural entrepreneurs are thus identified.
Part 2. Description and details of the policy / initiative	
10. Please detail main challenges (in terms of policy gaps) and objectives in relation to which this policy has been designed and/or implemented. (200-250 words)	<p>Territorial and political context: a new geometry of regions (13 regions), the increasing weight of cities, the return of nature to the city and increased competition on land.</p> <p>technological context: technologies make it possible to move a course in the organization of the exploitation (robotization, precision agriculture thanks to digital, genomic, big data)</p> <p>Integrating the changes in these contexts, the VIVEA's new strategic plan confirms the importance of strategy and management of the farms while focusing on competitiveness, innovative production methods, efficiency and well-being at work.</p> <p>This strategic plan is VIVEA's new reference framework for financing</p>

	<p>training and launching all orientation and targeted training development initiatives: communication, mobilization of partners and prescribers, studies, experiments, launch of specific specifications ... is also the national coherence framework of the VIVEA committees to develop their territorial training development plans.</p>
<p>11. Description of the measure or initiative (350-500 words)</p>	<p>Identification of priority skills to be developed for Vivea's contributing farmers</p> <ul style="list-style-type: none"> ○ generic competence: to implement efficient production practices, preserving natural resources and limiting greenhouse gas emissions. ○ implement innovative technical itineraries and multi-performance production practices (technical, economic, environmental and social) ○ implement production systems and technical adaptations favouring ○ greater energy efficiency of companies and farm self-sufficiency ○ implement efficient livestock management combining sanitary prevention, good practices and animal welfare <p>The Vivea accredited training courses must foster innovation, support and secure the many changes in practices.</p> <p>Priority training modalities and mechanisms must address the following issues in particular:</p> <ul style="list-style-type: none"> ○ support innovation and changes in beneficiary practices ○ to innovate in training by the digital and to value time in face-to-face
<p>12. Relevance of this policy measures (150-500 words)</p>	<p>During Smart AKIS regional workshops, farmers requested impartial, non-commercial and independent expert advice and trainings for accompanying their purchase decision, equipment set-up's quality and conformity.</p> <p>For the moment, despite the political will, given the small number of trainers and training schemes, concerning SFTs that do not meet their audience, training courses have remained very underdeveloped.</p> <p>In order to develop such trainings, agricultural organizations (Cuma, Cooperatives), technical institutes and technical teachers are designing new training drafts. They are working together to adapt the trainings and its format regarding target profiles (direct online and modular training). Whereas it is also demanded that advisors are up-to-date in SFTs so that they can deliver subsequent information, support and training to farmers. Lifelong learning in SFTs is considered a must.</p>
<p>13. Website (if any)</p>	<p>https://www.vivea.fr/organismes-de-formation-et-partenaires/faq/</p>
<p>14. Any additional support</p>	<p>-</p>

information (factsheets, videos, pictures, presentations, news, etc.)	
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Policy case 4. Plan pour la Compétitivité et l'Adaptation des Exploitations agricoles (PCEA) (France)

Part 1. General Information	
1. Partner information	ACTA P5
2. Policy measure name	Plan for the Competitiveness and Adaptation of Farms - Plan pour la Compétitivité et l'Adaptation des Exploitations agricoles (PCEA) -
3. Region / country	France
4. Identify level of policy implementation	Regional level
5. If relevant, indicate the funding source/ instrument and the name of the Programme	<ul style="list-style-type: none"> - European Agricultural Fund for Rural Development – EAFRD - National Program funded by the French Ministry of Agriculture - Other funding (water agencies, other local funding) could complete this policy.
6. Main focus area	<ul style="list-style-type: none"> • Agricultural competitiveness • Environment • Energy
7. Year(s) of implementation	2015-2020
8. Body for the implementation of the policy	<ul style="list-style-type: none"> - French Ministry of Agriculture - French regions
9. Are you directly involved in the design and/or implementation of this measure? How?	<p>Not directly.</p> <p>Nevertheless, technical institutes could participate in the evaluation of equipment which could be funded by the policy. Equipment has to improve environmental impacts, health or working conditions.</p>
Part 2. Description and details of the policy / initiative	
10. Please detail main challenges (in terms of policy gaps) and objectives in relation to which this policy has been designed and/or implemented. (200-	<p>This plan will modernize production, innovate, combine economic, environmental, health and social services, and promote the installation of new farmers. This plan comes from strategic orientations shared by the upstream and downstream sectors, to prepare the future, despite a crisis context. 4 main priorities have been identified after many consultations between stakeholders:</p> <ul style="list-style-type: none"> ○ Breeding modernization is the first priority of the plan. Breeding needs significant investments for buildings, the improvement of working conditions, food autonomy for animals

250 words)	<ul style="list-style-type: none"> ○ Improving economic and environmental performances for vegetal productions through input control and protection of natural resources (soil erosion, water, biodiversity...). A special attention is given to some sectors: orchard innovation, investment in greenhouses, investment in the hemp, flax, potato starch and rice sectors to prevent their disappearance in favour of cereals ○ A priority to improve energy performance of agricultural farms and to reduce production costs. A special focus is given to methanization. ○ An horizontal priority is made by encouraging agro-ecological approaches
11. Description of the measure or initiative (350-500 words)	<p>All the following information could change depending on the region where the proposal is submitted.</p> <p>Eligible beneficiaries</p> <ul style="list-style-type: none"> - Any farm except equestrian whose investment improves performance and the sustainability of the operation in social, economic and environmental terms. - Structure that operates a farm: individual or corporation, CUMA, cooperative, group of farmers, GIE, GIEE... <p>Type of investment</p> <ul style="list-style-type: none"> - livestock building and equipment - protection of water and the environment - energy performance - improvement of economic competitiveness - improvement of working conditions - production of grass <p>Investment amount</p> <ul style="list-style-type: none"> - a lower threshold at 4000€ - a higher threshold at: <ul style="list-style-type: none"> - 300.000€ for a single farm - 400.000€ for collective investment - 500.000€ for a CUMA - 700.000€ for a GIEE <p>Funding rate</p> <ul style="list-style-type: none"> - 20% of the investment - +10% for young farmers - +10% for collective projects
12. Relevance of this policy measures (150-500 words)	<p>The PCAE is a good example of policy, which could foster the adoption of smart farming technologies. Here, we have a good articulation between farmers' needs, R&D knowledge and regional context.</p>

	<ul style="list-style-type: none"> ○ The biggest barrier to foster SFT adoption, revealed by Smart-AKIS, was the investment cost of SFTs. This policy help farmer to buy equipment when the demand is accepted by the region. ○ Research institute are helping the French Ministry of Agriculture to produce the list of equipment, which have a good environmental impact. The evaluation of equipment performances is impartial and done in real conditions of use. ○ Regions are picking, in the national list, equipment which could fit with the environmental priorities of the territory. <p>PCAE is fostering adoption of all technologies improving competitiveness, environmental impacts and energy use. SFTs are among them. So, it is important to prove how SFT use could improve farm performances.</p>
13. Website (if any)	http://agriculture.gouv.fr/plan-de-competitivite-et-dadaptation-des-exploitations-agricoles
14. Any additional support information (factsheets, videos, pictures, presentations, news, etc.)	-

Policy case 5. Digital Infrastructures in rural areas (Germany)

Part 1. General Information	
1. Partner information	ZALF P3 & DLG e.V. P6
2. Policy measure name	Create appropriate digital infrastructures
3. Region / country	Germany
4. Identify level of policy implementation	Is the policy implemented at: <ul style="list-style-type: none"> • National level
5. If relevant, indicate the funding source/ instrument and the name of the Programme	Under which instrument is this policy/ initiative funded? National Programme planned
6. Main focus area	<ul style="list-style-type: none"> • Agriculture and Rural Development • Digitising Rural Economies • Smart Specialization Strategy
7. Year(s) of implementation	Starting now. Ongoing maintenance and adoption to new technologies
8. Body for the implementation of	-

the policy	
9. Are you directly involved in the design and/or implementation of this measure? How?	no
Part 2. Description and details of the policy / initiative	
10. Please detail main challenges (in terms of policy gaps) and objectives in relation to which this policy has been designed and/or implemented. (200-250 words)	Up to now in most rural areas of Germany no appropriate network is available to transfer high rates of data and information quickly and without interruptions. Robotic systems, autonomous irrigation control etc. are dependent on sufficient and stabile net coverage to ensure safety and reliability of the systems. Due to the fact that agriculture is a critical branch regarding food safety a respective infrastructure must be provided.
11. Description of the measure or initiative (350-500 words)	Without appropriate infrastructure in rural areas, farming cannot benefit from new technologies. Data transfer must be made possible in medium to high transfer rates. Therefore 5G and/or fiber optics networks must be developed and installed, respectively, as a basis for the adoption of digitalization in practical farming. Actual lack of net coverage must be identified and solutions developed to close gaps.
12. Relevance of this policy measures (150-500 words)	Financial budget must be provided on regional basis to enable research and implementation of broad band networks in rural areas.
13. Website (if any)	-
14. Any additional support information (factsheets, videos, pictures, presentations, news, etc.)	-

Policy case 6. Digital technology in agricultural faculties, universities and technical colleges (Germany)

Part 1. General Information	
1. Partner information	ZALF P3 & DLG e.V. P7
2. Policy measure name	Introduce digital technology in courses and modules of agricultural faculties, universities and technical colleges
3. Region / country	Germany

4. Identify level of policy implementation	Is the policy implemented at: <ul style="list-style-type: none"> Federal states' level, as education is under federal authorities in Germany However, a framework initiative and accompanying monitoring and evaluation should be provided by the national level, e.g. the Federal ministry of Agriculture
5. If relevant, indicate the funding source/ instrument and the name of the Programme	-
6. Main focus area	<ul style="list-style-type: none"> Agriculture and Rural Development Social Cohesion Smart Specialization Strategy Education and Skills Development
7. Year(s) of implementation	<i>Not yet started</i>
8. Body for the implementation of the policy	-
9. Are you directly involved in the design and/or implementation of this measure? How?	No
Part 2. Description and details of the policy / initiative	
10. Please detail main challenges (in terms of policy gaps) and objectives in relation to which this policy has been designed and/or implemented. (200-250 words)	<p>Yet, the use and training on SFTs is hardly introduced in the education plan of agricultural faculties and similar bodies, or trainings for farmers. There is a lack of trainers and experienced teachers to meet this deficiency.</p> <p>By improving the education of young farmers about SFTs an early understanding, recognition of benefits and improved interest in and adoption of SFT could be enabled.</p>
11. Description of the measure or initiative (350-500 words)	<ul style="list-style-type: none"> developing new courses better education of trainers and teachers, facilitating schools and universities with suitable infrastructure,
12. Relevance of this policy measures (150-500 words)	<p>In the discussions through the RIWs in Germany we got aware that even schools and universities lack on specific knowledge about SFTs. If we cannot guarantee a sound education of agricultural junior staff we cannot expect SFTs to be introduced in practical farming.</p>
13. Website (if any)	

14. Any additional support information (factsheets, videos, pictures, presentations, news, etc.)	-
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Policy case 7. Agricultural SFT Assessment Authority (Germany)

Part 1. General Information	
1. Partner information	ZALF P3, DLG e.V. P7
2. Policy measure name	Agricultural SFT Assessment Authority
3. Region / country	Germany
4. Identify level of policy implementation	<ul style="list-style-type: none"> National
5. If relevant, indicate the funding source/ instrument and the name of the Programme	Public funds but also a mixture of public and private funds possible, organized as a foundation, preferably;
6. Main focus area	<ul style="list-style-type: none"> Research & Innovation Digitising Rural Economies Smart Specialization Strategy AKIS and strengthening collaboration between Academia, industry, and farmers Public transparency and trust into technologies
7. Year(s) of implementation	Not yet initiated
8. Body for the implementation of the policy	The best organisational form has to be identified, could be a public authority, a foundation (similar to 'Stiftung Warentest'), an independent research institute (similar to the institute of risk research) etc.
9. Are you directly involved in the design and/or implementation of this measure? How?	No
Part 2. Description and details of the policy / initiative	
10. Please detail main challenges (in terms of policy)	One major obstacle that prevents farmers from adopting an SFT is a lack of transparency and reliable information about the strengths and weaknesses of competing devices, tools and procedures. The fast

gaps) and objectives in relation to which this policy has been designed and/or implemented. (200-250 words)	rhythm of inventions, a lack of standards and quality measures and little interest of systems' compatibilities among the providers are major influencing factors. Thus, there is a huge need for reliable and user-friendly information that accompanies SFT developments and repeatedly describes real advancements and dismantles wrong pretensions.
11. Description of the measure or initiative (350-500 words)	The policy measure would lead to body which <ul style="list-style-type: none"> - Conducts or induces tests of agricultural SFTs - Engages in regular SFT assessments for the agricultural sector and - Makes this information accessible to any interested AKIS actor in an understandable way.
12. Relevance of this policy measures (150-500 words)	This measure would be relevant to all professional stakeholders in the sector but especially to farmers and to policy makers.
13. Website (if any)	-
14. Any additional support information (factsheets, videos, pictures, presentations, news, etc.)	-

Policy case 8. Support of SFT adoption (Germany)

Part 1. General Information	
1. Partner information	ZALF P3 & DLG e.V. P7
2. Policy measure name	Support of SFT adoption
3. Region / country	Germany
4. Identify level of policy implementation	Is the policy implemented at: <ul style="list-style-type: none"> • European level – GAK policy
5. If relevant, indicate the funding source/ instrument and the name of the Programme	<ul style="list-style-type: none"> • The national funds to be completed with actions implemented in pillar 2 of CAP • Other funds from BMEL or other ministries?
6. Main focus area	<ul style="list-style-type: none"> • Agriculture and Rural Development • Regional Development
7. Year(s) of implementation	
8. Body for the	European Commission, national government

implementation of the policy	
9. Are you directly involved in the design and/or implementation of this measure? How?	no
Part 2. Description and details of the policy / initiative	
10. Please detail main challenges (in terms of policy gaps) and objectives in relation to which this policy has been designed and/or implemented. (200-250 words)	<p>There is a huge number of SFTs available on the market. Yet, the adoption in practical farming does not meet this offer. There is a lack of acceptance at farmers' side to use SFTs in their daily work. They have not enough knowledge about each single technology, nor do they have experience in using it. There is not yet enough experience communicated to highlight the advantages of the systems.</p> <p>Tools must be found to make the use of SFTs more reasonably for farmers. Actual systems of subsidies and regulations should be adapted to motivate farmers in looking for information about and finally using SFTs.</p>
11. Description of the measure or initiative (350-500 words)	<p>In this section you might describe:</p> <ul style="list-style-type: none"> • including SFTs in new regulations on fertilizing, pest management. For example digital soil mapping considered in the nitrate directive for better knowledge of soil characteristics • which means an "intelligent" financial support by connecting subsidies directly related to SFTs for a specific use for sustainable crop management • developing a "digital fund" for farmers to use those SFTs to increase farm sustainability
12. Relevance of this policy measures (150-500 words)	<p>Farmers have to see the advantage of a new system. So far, the advantages of SFTs are not yet visible for a number of farmers. By offering benefits for farmer who use SFTs a new awareness of their advantages and their usability in practical farming will emerge and motivate for investing in further SFTs or the communication of its benefits.</p>
13. Website (if any)	
14. Any additional support information (factsheets, videos, pictures, presentations, news, etc.)	<p>http://www.fwi.co.uk/business/defra-makes-40m-available-farm-productivity-grants.htm</p> <p>As an example: competitive scheme announced by DEFRA in the UK: The government is inviting grant applications from farmers in England looking to improve productivity, or add value to meat, milk and fruit, by investing in new technology → opportunity for farmers and food processors to invest in the technology they need to boost productivity, competition and, of course, sustainability.</p>

	<p>Eligible projects - Under the improving productivity part of the scheme, the grants can be used to pay for:</p> <ul style="list-style-type: none"> • Robotic equipment including driverless vehicles, and robotic versions of harvesting, weeding, milking and slurry handling equipment • A heat distribution network and associated equipment for the use of renewable heat generated on the farm, such as in glasshouses, pig or poultry buildings and for crop drying. Costs can include pipework, heat exchangers and pumps – but not the heat source • Electrical battery storage systems to enable better use of renewable electricity produced on farm • Installation of wavelength-specific LED lighting to aid crop growth and pest • Low-emission precision slurry and digestate management equipment including deep or shallow injection, trailing shoe or dribble bar systems. Also, slurry/digestate umbilical systems, tankers and storage bags.
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Policy case 9. Greek RDP Measure 16 "Cooperation" (Greece)

Part 1. General Information	
1. Partner information	AUA P1 & CERTH P14
2. Policy measure name	Measure 16 "Cooperation"
3. Region / country	Greece
4. Identify level of policy implementation	<ul style="list-style-type: none"> • National Level
5. If relevant, indicate the funding source/ instrument and the name of the Programme	Rural Development Program of the Greek Ministry of Rural Development & Food
6. Main focus area	<ul style="list-style-type: none"> • Agriculture and Rural Development (1) • Research & Innovation (2) • AKIS and strengthening collaboration between Academia, industry, and farmers (3)
7. Year(s) of implementation	2018 – 2020 (with possible extension together with the rest of the 2014-2020 EU funding program)
8. Body for the implementation of the policy	Greek Ministry of Rural Development & Food

9. Are you directly involved in the design and/or implementation of this measure? How?	No
Part 2. Description and details of the policy / initiative	
10. Please detail main challenges (in terms of policy gaps) and objectives in relation to which this policy has been designed and/or implemented. (200-250 words)	<p>Measure 16 was designed in order to cover the gap of Innovation actions within the real agricultural community. Most national projects are funded from General Secretariat of Research & Technology and the partners are mainly research entities that are working on Research ideas that have low to medium TRL. With this action, the Ministry of Rural Development & Food is trying to shift projects to innovation actions where the agricultural community (including research entities) can work on ideas of high TRL to be implemented in real conditions and demonstrate the benefits of such ideas on Greek Agriculture.</p> <p>The measure (as you can see in the next section) is directed in two roots:</p> <ol style="list-style-type: none"> 1. Improving productivity and sustainability of agricultural systems 2. Protecting environment and adapting to climate change <p>Both directions are vital for Greek farming and they are connected directly to SFTs.</p> <p>The measure does not indicate the exact quantitative expected results, but in terms of qualitative results it is expected to optimize production methods with outcomes on higher and better yield, lower agricultural inputs (i.e. fertilizers, pesticides, etc.), natural resources preservation (water, soil), reduced labour with positive impact on the farmers' lives, increased income due to higher yield and reduced inputs. On sociological basis, agricultural community (farmers, advisors, innovation brokers, companies and research) will become more acquainted with the positive results of SFTs use in real conditions and farming will move to a new era.</p>
11. Description of the measure or initiative (350-500 words)	<p>Measure 16 of the Rural Development Program of the Greek Ministry of Rural Development & Food has two sub-measures divided into actions, as follows:</p> <p>A. Sub-Measure 16.1- 16.2 "Establishment and operation of European Innovation Partnership (EIP) Operational Groups (OG) for Productivity and Sustainability of Agriculture" of the Rural Development Program of Greece 2014-2020, which includes two Actions and can be funded with 53 mil euros:</p> <ul style="list-style-type: none"> • Action 1: Establishment of (potential) EIP OGs for Productivity and Sustainability of Agriculture • Action 2: Implementation of OG Projects on productivity and sustainability of agriculture

	<p>B. Sub-measure 16.1 -16.5 "Cooperation for Environmental Projects Environmental Practices and Actions for Climate Change" of the Rural Development Program of Greece 2014-2020, which includes two Actions and can be funded with 7 mil euros.:</p> <ul style="list-style-type: none"> • Action 1: Establishment of (potential) EIP OGs to promote actions that respect environmental protection and adaptation to climate change • Action 2: Implementation of OG projects to promote actions that respect environmental protection and adaptation to climate change. <p>The two Actions in both sub-measures correspond to two phases. The first phase / Action 1 relates to the actions undertaken by the potential OG to find other partners / members, while in the second phase / Action 2 the OG is already set up and implements the Operational Plan.</p> <p>The scope of the partnerships to be developed is the exploitation of new technologies, which may include, but are not limited to, the implementation of new, innovative processes in primary production of agricultural products and in the food sector, cultivation and production practices that contribute to environmental protection and adaptation to climate change. The actions that may be taken in the context of these partnerships may fall under:</p> <ul style="list-style-type: none"> • To produce safer and healthier foods for either the whole population or special categories. • To ensure the uniqueness of certified agricultural products. • The exploitation of by-products of agricultural and animal production for the production of animal feed. • To highlight the specific nutritional characteristics of agricultural products and their contribution to the adoption of healthy eating standards or food production that respond to special dietary needs. • Better integration into the food chain of Greek livestock products. • To reduce water consumption through the adoption of advanced irrigation systems and the adoption of precision agriculture. • Reducing the volume and composition of inputs (reduction of use of fertilizers, pesticides, adoption of new varieties that are better suited to local soil, hydrological and climatic conditions, use of RES for the substitution of fossil fuels, replacement of chemical fertilization). • The adoption of friendlier agricultural practices and the adoption of crops for the exploitation of poor organic matter and soil nutrients. <p>Financing either Action 1 or Action 2 is 100% and the total budget of</p>
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	each operation can be upgraded from 150.000 euros for one prefecture to 300.000 euros for all Greece and 450.000 euros for international cooperation.
12. Relevance of this policy measures (150-500 words)	<p>Measure 16 is a policy measure taken by the Greek state in order to initiate and incentivize the use of new technologies and practices in agricultural and livestock production. It is believed that such measure could take Greek farming to the next generation and will help the start of cooperation between public and private entities in assembling Operational Groups and run innovation projects in regional, national and international level. This measure is in a running process, so we cannot still say whether it will be successful or not, but it is expected to be a success story due to its structure (collaborative schemes) and the budget allocated (60 mil euros), in order to run innovation projects on specific production systems of high added value for Greece (e.g. olive groves, sheep and goat units), where high tech solutions could be tested and optimized to become the new normal in the country.</p> <p>Measure 16 will help significantly OGs to overcome high investment costs for SFTs to be purchased and will assist to showcase these technologies to other farmers in demo farms. It is an innovative funding instrument for farmers and other stakeholders. If the selected projects funds entities representing different products, then issues of compatibility, complexity and connectivity could be overcome.</p> <p>An important issue to be solved by Measure 16 projects is data ownership, security, sovereignty and reliability of data collection, something that is already a drawback for the farming community to adopt SFTs.</p> <p>Last but not least, OGs on training regarding specific subjects (e.g. spraying methods and machinery) will be assembled to cover lack of SFT knowledge from advisor services and farmers</p>
13. Website (if any)	http://www.agrotikianaptixi.gr
14. Any additional support information (factsheets, videos, pictures, presentations, news, etc.)	<i>We were in contact with the Ministry and more specifically Dr. Maria Tsara, Responsible for this section.</i>

Policy case 10. Greek RDP Measure 4 "Cooperation" (Greece)

Part 1. General Information	
1. Partner information	AUA P1 & CERTH P14
2. Policy measure	Measure 4

name	
3. Region / country	Greece
4. Identify level of policy implementation	<ul style="list-style-type: none"> • National level
5. If relevant, indicate the funding source/ instrument and the name of the Programme	Rural Development Program of the Greek Ministry of Rural Development & Food
6. Main focus area	<ul style="list-style-type: none"> • Agriculture and Rural Development (1) • Regional Development (2) • Support to industry / SMEs (3)
7. Year(s) of implementation	2018 – 2020 (with possible extension together with the rest of the 2014-2020 EU funding program)
8. Body for the implementation of the policy	Greek Ministry of Rural Development & Food
9. Are you directly involved in the design and/or implementation of this measure? How?	No
Part 2. Description and details of the policy / initiative	
10. Please detail main challenges (in terms of policy gaps) and objectives in relation to which this policy has been designed and/or implemented. (200-250 words)	<p>Measure 4 was designed to help farmers in Greece to optimize their farm infrastructure in terms of buildings and machinery. Since agricultural equipment in Greece is significantly old and outdated, this Measure will help on farm renovation in order to increase competitiveness in EU and global level. An indication of the machinery age is that tractors in Greece reach an average age of 25 years. Another challenge that this Measure is trying to cover is the inclusion of young farmers with an increase support rate to convince newcomers to invest and work in agriculture. It should be noted that for the first time, this Measure includes Smart Farming Technologies to be purchased by farmers and provide an extra motive to do so by applying bonus credit for applications that contain such technologies. Similar programs have been applied some years ago, but the time gap between them is significant in such way that farmers cannot modernize their farms in between because they always expect the next program to start. Regarding sub-measure 4.1.3., it is obvious that an attempt to increase environmental awareness in agricultural production is being done with special focus on increasing energy production from RES and waste management facilities (especially for livestock farms). In some cases, RES and waste treatment are combined, as in the case of Biogas facilities. Policies to convince farmers to shift to sustainable agricultural schemes</p>

	<p>have been applied for many years, but it has been seen that when combined with state funding they can be easier implemented.</p>
<p>11. Description of the measure or initiative (350-500 words)</p>	<p>Issued by the Ministry of Rural Development and Food, the sub-measure 4.1 "Support for investment in agricultural holdings" of the RDP 2014-2020 has two main. Actions:</p> <ol style="list-style-type: none"> 1. 4.1.1 "Implementation of investments contributing to the competitiveness of the holding" 2. 4.1.3 "Implementation of investments contributing to the use of RES and to the protection of the environment" <p>Increased support rates of 10 to 20% apply to young farmers, collective investment for mountainous and less-favored areas.</p> <p>Under Action 4.1.1, expenditure is supported for:</p> <ul style="list-style-type: none"> • Construction, extension, modernization of agricultural buildings and constructions. <p>Examples include livestock installations, beekeeping facilities, first-sale preparation facilities, warehouses and other storage areas, greenhouses, and any other building infrastructure and construction necessary for the normal operation of the farm.</p> <ul style="list-style-type: none"> • Purchase, transport and installation of new machinery and equipment. <p>For example, equipment that is incorporated into buildings, automotive machinery, machinery and equipment, meteorological warnings and plant protection network equipment, etc. are included.</p> <ul style="list-style-type: none"> • Purchase of new apiculture and floriculture. • Purchase, transport and installation of perennial non-herbaceous plantations which are not sown in the field. • Fencing and landscaping. • Purchase of computer equipment and farm management software. • General Expenditure, which includes any intangible costs directly related to the implementation of the Investment Improvement Plan and cannot be co-funded by other RDP measures. <p>Under Action 4.1.3, expenditure is supported for:</p> <ul style="list-style-type: none"> • Purchase, transport and installation of new waste management equipment on the holding. • Construction of waste, by-products and waste management facilities. • Purchase, transport and installation of new equipment for the production of energy from RES that are adapted to the farm's own energy consumption needs. • General Expenditure (as above). <p>Amount of eligible budget Action 4.1.1 For investments of natural and legal persons, a maximum eligible budget</p>

	<p>of up to EUR 200 000 is set. This budget can be increased:</p> <ul style="list-style-type: none"> • up to EUR 300 000, provided that the typical return on the holding, according to the latest Single Market Statement, amounts to at least 25% of the requested budget • up to EUR 500,000 for investment in livestock or greenhouse holdings of all types, provided that the typical return on the holding, according to the latest Single Market Statement, amounts to at least 25% of the requested budget. • For collective investment up to 500,000 euros, this budget may be increased up to EUR 1,000,000, provided that the turnover of the last closed use of the group is at least 25% of the requested budget. <p>Action 4.1.3 For investments by natural and legal persons, a maximum eligible budget of up to EUR 150 000 is set, with the exception of investment for the management of waste, by-products and waste from the holding for which the eligible budget is up to EUR 200 000. For collective investment up to 150,000 euros. This budget may amount to up to 500,000 euros, provided that the turnover of the last closed use of the group is at least 25% of the requested budget.</p> <p>The support can reach 40-85% of the total investment.</p>
12. Relevance of this policy measures (150-500 words)	<p>Measure 4 is simultaneously a success and failure story, because on the one hand it supports farmers to modernize their farm in terms of buildings and machinery, but on the other hand it stops farmers from investing (even if it is inevitable for the good operation of the farm) until this program starts. However, it has been seen that for farmers that take advantage of the Measure, there is an important improvement of their farm in terms of production levels, product quality, quality of living for the farmers and their personnel and environmental impact (locally and nationally).</p> <p>This Measure helps farmers to redirect from conventional practices to modern ones, as it covers an important percentage of the required investment (especially for SFTs, for which they do not have clear image of their capabilities and they do not trust). By purchasing such equipment through the Measure, the added value of such SFTs can be identified and their implementation can be increased on a higher pace, due to the phenomenon of mimetism between farmers. Another benefit that the Measure provide is that farmers need to get in touch with their advisors and discuss the applicability of the technologies available on their farms (working on the specifications and learning about what is out there that until now did not know) and also the training of farmers on new technologies by the companies providing the SFTs. This is another mean to transfer farmers (especially young ones) to the new era of Smart Farming.</p>

13. Website (if any)	http://www.agrotikianaptixi.gr/index.php?obj=cd3c3a903bfbc1a6
14. Any additional support information (factsheets, videos, pictures, presentations, news, etc.)	<i>We were in contact with the Ministry and more specifically Mr. Thymios Tsiatouras, Responsible for this section.</i>

Policy case 11. VAMIL (Netherlands)

Part 1. General Information	
1. Partner information	DELPHY P8
2. Policy measure name	VAMIL
3. Region / country	The Netherlands
4. Identify level of policy implementation	Is the policy implemented at: <ul style="list-style-type: none"> National level
5. If relevant, indicate the funding source/ instrument and the name of the Programme	VAMIL is a tax facility for farmers, national funding from the Dutch government.
6. Main focus area	Please prioritize 1 to 3 main focus areas covered by this policy/ initiative choosing among the following: <ul style="list-style-type: none"> Agriculture and Rural Development Environment Energy
7. Year(s) of implementation	Please indicate starting and ending period (ongoing if relevant) The program is already active for many years, every year the list with investments that qualify for subsidies is updated.
8. Body for the implementation of the policy	RVO, part of the Dutch government. Request for subsidies should be directed to and are handled by RVO.
9. Are you directly involved in the design and/or implementation of this measure? How?	No, we are not directly involved in this measure. On the other hand, everybody can suggest new equipment for subsidies, as far as they meet the selection criteria.
Part 2. Description and details of the policy / initiative	
10. Please detail main	VAMIL is an instrument from the Dutch government to stimulate sustainable developments in the Dutch economy. Farmers can get

<p>challenges (in terms of policy gaps) and objectives in relation to which this policy has been designed and/or implemented. (200-250 words)</p>	<p>investment subsidy for specific equipment that contributes to sustainable development. Subjects for subsidy contribute to:</p> <ul style="list-style-type: none"> • Circular economy • Agricultural production • Climate. <p>There are 2 options:</p> <ol style="list-style-type: none"> 1. Tax subsidy, a certain percentage of the investment is deductible from the taxes one has to pay. Percentage 13-36 %, depending on the type of investment 2. Voluntarily depreciation, in time and percentage. A farmer can choose the depreciation percentage (up to 75%) is a year of choice. <p><i>The Dutch government stimulates the investments in environmental friendly equipment and machinery</i></p> <p>In this section you might describe the challenges (e.g. reducing environmental impact, supporting equipment modernization, etc.) that the selected measure targets.</p> <p>You should also describe the measures' objectives (both quantitative and qualitative, where relevant)</p>
<p>11. Description of the measure or initiative (350-500 words)</p>	<p>In this section you might describe:</p> <ul style="list-style-type: none"> • The core instruments and tools used/ promoted by the initiative: tax instrument, by up to 36% of the investment deducted from farm income or by variable depreciation rate. • The activities funded by the initiative: no specific activities • The type of beneficiaries: farmers that invest in specific machines or equipment that is on the VAMIL list. • The funding mechanism (i.e. reimbursement, vouchers, public procurement, financing, percentage of funding, etc.). Tax deduction • Other relevant information about the policy/ initiative.
<p>12. Relevance of this policy measures (150-500 words)</p>	<p>This is an instrument from which farmers can profit directly, by paying fewer taxes. It stimulates investments in new equipment and machinery. The possibility/freedom to deduct the depreciation of the investment, up to 75%, in a year with a high farm income makes it interesting for farmers. The subsidy is for rather new equipment, for farmers an interesting option when they consider investing in new or other equipment or machines. The list with equipment is updated every year.</p>
<p>13. Website (if any)</p>	<p>https://www.rvo.nl/sites/default/files/2017/12/Milieulijst%202018.pdf</p>
<p>14. Any additional support information (factsheets, videos,</p>	<p><i>I used the information on the RVO website and the brochure that is available on the website mentioned above.</i></p> <p><i>I'm not aware of similar measures in other countries.</i></p>

pictures, presentations, news, etc.)	
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Policy case 12. FRACTALS (Serbia)

Part 1. General Information	
1. Partner information	<i>BIOS P4</i>
2. Policy measure name	FP7 FRACTALS project
3. Region / country	Serbia, Balkan region
4. Identify level of policy implementation	Is the policy implemented at: <ul style="list-style-type: none"> • Regional level • National level • Other level – International (special focus: Balkan region)
5. If relevant, indicate the funding source/ instrument and the name of the Programme	European Commission – DG CONNECT (call: FP7-2013-ICT-FI)
6. Main focus area	<ul style="list-style-type: none"> • Agriculture and Rural Development • AKIS and strengthening collaboration between Academia, industry, and farmers • Support to industry / SMEs •
7. Year(s) of implementation	2014-2016
8. Body for the implementation of the policy	Development Found of Vojvodina (DFV) form Novi Sad, Serbia was the project coordinator
9. Are you directly involved in the design and/or implementation of this measure? How?	Yes, BIOS was one of the project partners
Part 2. Description and details of the policy / initiative	
10. Please detail main challenges (in terms of policy gaps) and objectives in relation to which this policy has been designed and/or implemented. (200-	For years Internet has become a fundamental enabler of economic development and growth. Even though the Internet economy in the EU was projected to grow 7 times faster than overall EU GDP (Hoorens et al, 2012), Europe was lagging behind other countries in capturing its benefits. Europe has been slower than US, Korea, Japan to develop and capture full benefits of Internet-based innovation. The overall goal of the Future Internet Public-Private Partnership (FI-PPP) programme was to place Europe in a better position towards capturing the opportunities, in terms of both economic growth and

250 words)	<p>well-being that will arise as a result of further digitalization in various economy sectors. The purpose of Phase 3 was to capitalize on the abovementioned investments and developments by supporting ICT SMEs and entrepreneurs in exploiting those investments and developing value added applications. FRACTALS decided to be focused on agriculture since a significant challenge was faced when attempting to customize the open innovation methodology to an agricultural setting. The challenges arise from two different factors: (i) the methodology is mostly developed to address challenges in the software/digital services domain and requires certain level of familiarization with ICT, which is not always the case with farmers and (ii) The necessary condition for applying the open innovation methodology requires significant involvement of end-users, which has been proved challenging.</p> <p>In the FRACTALS context, the challenge was to bridge the gap between the SMEs IT community and the community of farmers and relevant industrial value chain (agronomists, equipment vendors, agrochemicals, etc.).</p>
11. Description of the measure or initiative (350-500 words)	<p>FRACTALS provided support to beneficiaries based on the results of the Open Call. The Open Call was designed on following rules:</p> <ol style="list-style-type: none"> 1) Compliance with the requirements of 1.8 Objective of FI-PPP Call, 2) Transparency, equal treatment of applicants and quick delivery of services, 3) Appeal to SMEs of the ICT Sector, in terms of flexibility and short time-to-project 4) Adequate assurance that sub-projects' funding will be spent by beneficiaries in the most appropriate way. 5) The new applications/services to be funded will be based on the use of appropriate GEs that will be an essential integrated part of the end product. <p>Under the framework described above, the basic features of the open call are as follows:</p> <p>Eligible beneficiaries: Companies and natural persons that comply with the Commission Recommendation for Small and Medium-sized Enterprises (SMEs) 2003/361/EC and are active in the field of ICT and internet based business. The above definition covers both established and start-up companies and natural persons/professionals in the ICT sector. Applicants established in Member States or associated countries were eligible in this call.</p> <p>Eligible projects: Projects had to ensure that the applications will be built on FI-WARE Generic Enablers. All applications must integrate a number of GEs as they are specified by FI-WARE. FRACTALS fully relied on the FIspace platform to develop the required Apps and Services for the total duration of the project. FRACTALS required the hosting of the FIspace platform and the technical support by the FIspace consortium for the total duration of the FRACTALS project. With</p>

	<p>respect to thematic focus, the FRACTALS covered applications related to the Agricultural Sector (enhancing productivity on the farm, accessing markets and value chains, improving public service provision in the agricultural sector)</p> <p>Eligible cost categories and reimbursement rates: In accordance of the FP7 Rules and taking into account that the beneficiaries of FRACTALS sub-projects will be SMEs and Web entrepreneurs, the eligible cost categories and corresponding reimbursement rates are presented in the table below:</p> <table><tr><th></th><th>RTD</th><th>Dissemination</th><th>Management</th></tr><tr><td>1. Personnel costs</td><td></td><td></td><td></td></tr><tr><td>2. Other direct costs</td><td></td><td></td><td></td></tr><tr><td>3. Total direct costs (Sum of row 1 and 2)</td><td></td><td></td><td></td></tr><tr><td>4. Indirect costs</td><td colspan="3">60% x 3</td></tr><tr><td>5. Total costs (Sum of row 3 and 4)</td><td></td><td></td><td></td></tr><tr><td>6. Requested EC contribution</td><td>75% x 5</td><td colspan="2">100% x 5</td></tr></table> <p>Sub-projects' duration: Sub-projects were expected to last from 4 to 9 months, according to the amount of technical effort needed, beneficiaries resources to be committed and beneficiaries preference.</p> <p>Sub-projects' Payment Modalities: Beneficiaries might opt for pre-financing up to the amount of 50% of the total funding. In that case they needed to provide a bank guarantee covering the full amount of pre-financing. The other option was to be fully reimbursed on the basis of real costs, as presented in their financial.</p> <p>Evaluation criteria: The evaluation of all proposals was based upon a set of evaluation criteria designed to assess proposals under a holistic view, while at the same time being clear and transparent and easy for reviewers to assess. These criteria are the following:</p> <ol style="list-style-type: none">1. Experience and technical capacity of the applicant,2. Integration with FI-PPP technologies,3. Technological excellence,4. Quality of the implementation plan,5. Ability to provide significant value to end-users,6. Measures to engage end-users in validation through Open Innovation,7. Market potential		RTD	Dissemination	Management	1. Personnel costs				2. Other direct costs				3. Total direct costs (Sum of row 1 and 2)				4. Indirect costs	60% x 3			5. Total costs (Sum of row 3 and 4)				6. Requested EC contribution	75% x 5	100% x 5	
	RTD	Dissemination	Management																										
1. Personnel costs																													
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4. Indirect costs	60% x 3																												
5. Total costs (Sum of row 3 and 4)																													
6. Requested EC contribution	75% x 5	100% x 5																											
12. Relevance of this policy measures (150-500 words)	<p>Europe has always been investing in various forms of interventions aiming to narrow the gap between poor and rich countries. Investments in information technology have already yielded, resulting in a very smooth European integration of Baltic countries¹³¹, and have created a paradigm for overcoming the crisis through tech-enabled start-up entrepreneurship¹³², even in countries with very difficult circumstances, such as Greece. Also, Europe has to ensure long-term food security for a very demanding in quality terms</p>																												

¹³¹ Grigas et al (2013), The Baltic States In The EU: Yesterday, Today And Tomorrow, The Jacques Delors Institute

¹³² Greece's Startups on the Rise, MIT Technology Review, 2015

	<p>(96% of EU citizens say that quality is important to them when buying food, Special Eurobarometer 389), yet aging population¹³³. ICT is a powerful driver that has already started to transform the entire agri-food domain into smart webs of connected objects that are context-sensitive and can be identified, sensed and controlled remotely. However, there is a significant difference in the levels of ICT adoption by farmers between USA and Europe. While in USA the percentage of farmers applying some kind of advanced ICT ranges from 20%-80%¹³⁴, in European countries the percentage of farmers applying ICT ranges from 0%-24%^{135,136}.</p> <p>For Europe to catch up with global competitors, it becomes necessary to invest in a smart way, and to combine priorities to maximize impact. This combination is what made FRACTALS a smart investment for European taxpayers. It simultaneously helped associated countries to bridge the gaps with Europe through implementation of FIWARE technologies, while at the same time contributed to safe and adequate food for the future generations of all Europeans. When considering West Balkans region, investing in advanced technologies for the agrifood sector is a necessary condition to unlock the potential of the area and diminish the sharp differences that exist today to the rest of Europe.</p> <p>Another important aspect of FRACTALS project was active involvement of SME sector.</p> <p>FRACTALS project was the connecting link in the value chain and the scientific enabler of the European “ICT for Agrifood” cluster by:</p> <ul style="list-style-type: none"> • Promoting the use of advanced ICT solutions to farmers • Encouraging the European ICT sector to move towards a paradigm-shift
13. Website (if any)	https://fractals-fp7.com/
14. Any additional support information (factsheets, videos, pictures, presentations, news, etc.)	https://fractals-fp7.com/index.php/stories-from-our-teams

¹³³ Population ageing in Europe: facts, implications and policies, Directorate-General for Research and Innovation, 2014

¹³⁴ Winstead, A., Shannon H. Norwood, S.H., Adoption and Use of Precision Agriculture Technologies by Practitioners, 2010, Auburn University Working Paper

¹³⁵ Reichardt, M., Jürgens C., Adoption and future perspective of precision farming in Germany: results of several surveys among different agricultural target groups, Precision Agriculture, 2009, 10, 1, 73-94

¹³⁶ Lawson, L. G., Pedersen, S.M., Sorensen, C.G., Pesonen, L., Fountas, S., Werner, A., Oudshoorn, F. W., Herold, L., Chatzinikos, T., Kirketerp, I. M., Blackmore, S., A four nation survey of farm information management and advanced farming systems: A descriptive analysis of survey responses. Computers and Electronics in Agriculture, 2011, 77, 7-20.

Policy case 13. KATANA (Serbia)

Part 1. General Information	
1. Partner information	BIOS P4
2. Policy measure name	H2020 KATANA
3. Region / country	Serbia, Balkan region
4. Identify level of policy implementation	Is the policy implemented at: <ul style="list-style-type: none"> • Regional level • National level • Other level (local, etc.) if any – international
5. If relevant, indicate the funding source/ instrument and the name of the Programme	European Commission, H2020 program, call: INNOSUP-1-2015: Cluster facilitated projects for new industrial value chains
6. Main focus area	<ul style="list-style-type: none"> • Agriculture and Rural Development • Research & Innovation • Support to industry / SMEs
7. Year(s) of implementation	2016-2018
8. Body for the implementation of the policy	bwcon GmbH from Germany is the coordinator of the project.
9. Are you directly involved in the design and/or implementation of this measure? How?	Yes, BIOS is project partner.
Part 2. Description and details of the policy / initiative	
10. Please detail main challenges (in terms of policy gaps) and objectives in relation to which this policy has been designed and/or implemented. (200-250 words)	<p>The supply of agrifood products is of vital importance to feed Europe in a healthy way, while Europe has also an important role in feeding the rest of the world - EU is the world's largest food and drink exporter with a share of EU exports to world markets of 16.17% in 2012 (UNC 2012). Totally exposed to global competition but at the same time bound to the geographical origins of production, the European agrifood sector is currently facing a number of high-impact trends, simultaneously reflecting evolution in the technology landscape and consumers' perceptions:</p> <p>Growing attention for impact of food on health: consumers are increasingly aware that there is a strong relation between food consumption and so-called diseases of civilization - obesity and food allergies.</p>

	<p>Breakthrough of eCommerce and mobile marketing in agrifood products: the positive experiences in web-shops and mobile marketing apps for various consumer goods are now also transferred to agrifood products.</p> <p>Increasing interest in ‘local’ as opposed to the dominance of ‘global’: last decade food culture has clearly grown in importance. Sustainability aspects are much discussed, by chefs as well as large segments of consumers and NGOs.</p> <p>Sustainable agrifood supply chains are becoming ‘license to deliver’: Conventional intensive agriculture is blamed for misuse of inputs resulting in severe environmental impact (contamination of river basins, soil degradation etc.). Society doesn’t accept the extremely high environmental footprint of food products. Consequently, there are a lot of initiatives to reduce the environmental impact of agrifood supply chains, e.g. Sustainable Agriculture.</p>						
11. Description of the measure or initiative (350-500 words)	<p>KATANA foresees a funnel approach implemented through 2 Open Calls. The first “Call for Teams” aims to identify the best teams across the value chain through an innovative peer-to-peer evaluation method. Through this process 100 beneficiaries (SMEs or individual entrepreneurs) from all over Europe will be selected. These beneficiaries will receive small direct financial support (2k EUR) aiming to cover their travel costs but most important, they will receive a bouquet of supporting services (Matchmaking facility, Comprehensive on-line training program and 3-days on-site bootcamp). The purpose of these services is two-fold: (i) to support SMEs and entrepreneurs in defining and fine-tuning their ideas, (ii) to bring them in contact with the other KATANA beneficiaries.</p> <p>The second “Call for Products/Services” aims to identify products and services with high market potential. Cross-border (from different eligible countries) and/or cross-sectoral (from different sectors) consortia of 2-4 members each are invited to participate in the second call, providing that at least one (or more of the partners in each consortium will be among the winners/beneficiaries of the 1st stage KATANA call and has successfully participated in the KATANA training program. In the 2nd stage, consortia apply by preparing a Reward Crowdfunding Campaign. The winners will be the first 10 consortia that will raise the biggest amounts of funds through crowdfunding. Those winners will receive 100k per consortium. On the top of that they will receive 2nd stage support services (Investment readiness program, Coaching and Export promotion services) but also an access to the KATANA Equity Crowdfunding platform in order to raise additionally 100k each from private investors to support their expansion.</p> <table><tr><th colspan="2">Open Call 1</th><th>Open Call 2</th></tr><tr><td>Eligible beneficiaries</td><td>Natural persons and companies that</td><td>Additional criteria: 1. Consortia of 2-4 partners.</td></tr></table>	Open Call 1		Open Call 2	Eligible beneficiaries	Natural persons and companies that	Additional criteria: 1. Consortia of 2-4 partners.
Open Call 1		Open Call 2					
Eligible beneficiaries	Natural persons and companies that	Additional criteria: 1. Consortia of 2-4 partners.					

		comply with the Commission Recommendation for Small and Medium-sized Enterprises (SMEs) 2003/361/EC ¹³⁷	where at least one of the partners is a successful beneficiary from the Open Call 1, 2. Each consortium must propose a product/service using at least one of the three LSD platforms.
	Sectors	ICT and internet based business companies; companies from agrifood value chain and companies active in emerging industries	Consortium can be: - From same sector, but different countries (Cross-border), - From different sectors but the same country (cross-sectoral), or - Both from different sectors and different countries.
	Application type	A short pitch video	Reward Campaign Crowdfunding
	Duration of the Open Call (months)	3	5
	Evaluation process	p2p community evaluation	Ability to attract funds on Reward Crowdfunding platform
	Evaluation criteria	Three criteria: 1. Previous experience and current activities (weight 30%), 2. Understanding of the dynamics across the value chain (weight 32.5%), 3. Vision for new products/ services (weight 37.5%).	The amount of financial support collected from supporters/ early adopters through the KATANA reward crowdfunding platform.
	Number of beneficiaries	100	10
	Financial	2k EUR	100k EUR (max. 50k EUR per

¹³⁷ <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2003:124:0036:0041:en:PDF>

	Support		applicant, min. 20k EUR per applicant)
	Payment modality	M10 bank transfer	M18, Advance payment M24, Interim payment M30, final payment bank transfer
12. Relevance of this policy measures (150-500 words)	<p>Crucial sector Agrifood sector has a massive economic, social, and environmental footprint - the 4.5 trillion euros global industry represents 10% of consumer spending, 40% of employment, and 30% of greenhouse-gas emissions, while Europe is the top global exporter, with 7 out of the top 10 agriculture exporting countries being EU members. In Europe SMEs generate the sector's 51.6% turnover and accounts for the 64.3% of its employment.</p> <p>Systemic approach KATANA combines direct financial support to SMEs with tailored made business support services and a powerful technological framework of Large Scale Demonstrators (also developed by SMEs, partners in KATANA consortium). This holistic approach aims to contribute towards a symbiotic agrifood ecosystem that fully exploits the potential of emerging industries towards a new European agrifood economy.</p> <p>Value for money/ Leverage of private funds By employing a novel crowdfunding-based scheme, where ability to attract private funds is the main criterion for EC financial support, KATANA motivates SMEs to seek for quick market validation and ensures that every euro provided as EC financial support will mobilize financial support from private investors to result in three (3) euros of total funding (3x leverage).</p> <p>Compliance with Smart Specialization Strategies (S3) ICT, agriculture and food production are among the top innovation priorities of European regions. KATANA provides a replicable model to accelerate the adoption of advanced technologies in a diverse set of 7 European Regions.</p> <p>Stellar implementation KATANA assembles leading European clusters, innovative SMEs, an RTD organization with</p>		

	<p>team</p> <p>proven track record in the field and a crowdfunding platform. Consortium members have jointly delivered successful projects in the past and are well connected with the European investors' community. 77% of the budget goes to SMEs (either partners or beneficiaries), 49% of project team members are women.</p>
13. Website (if any)	http://katanaproject.eu/
14. Any additional support information (factsheets, videos, pictures, presentations, news, etc.)	Crowdfunding platform: https://katanareward.opencircleproject.com/

Policy case 14. RTK Stations network to support GPS development in Navarra (Spain)

Part 1. General Information	
1. Partner information	INTIA P6
2. Policy measure name	RTK Stations network to support GPS development in Navarra
3. Region / country	
4. Identify level of policy implementation	<p>Is the policy implemented at:</p> <ul style="list-style-type: none"> • Regional level
5. If relevant, indicate the funding source/ instrument and the name of the Programme	Public 100% funded from the Government of Navarre.
6. Main focus area	<p>Please prioritize 1 to 3 main focus areas covered by this policy/ initiative choosing among the following:</p> <ul style="list-style-type: none"> • Agriculture and Rural Development • Regional Development • Space Technologies
7. Year(s) of implementation	The RTK stations were implemented and put in service on 2008 year.
8. Body for the implementation of the policy	Department of Public Works of the Government of Navarre
9. Are you directly involved in the	INTIA was a support that played an interesting role in this process, mostly as representative of the potential uses in the close future of the

design and/or implementation of this measure? How?	GPS in Agriculture.
Part 2. Description and details of the policy / initiative	
10. Please detail main challenges (in terms of policy gaps) and objectives in relation to which this policy has been designed and/or implemented. (200-250 words)	The release of global positioning technology (GPS), used by the American army, opened a lot of possibilities also in agriculture. The machinery companies initially developed simple handy guidance systems but soon, automatic systems appeared that directly handled the direction of the tractor. It was the support to new technological uses in precision agriculture in the region.
11. Description of the measure or initiative (350-500 words)	<p>The Government of Navarre decided to install 8 RTK Stations to improve the GPS signal to be used by different types of users, including farmers. Then, the improvement of the accuracy in the positioning that the RTK network supposed was a very important trigger to overcome the existing barriers.</p> <p>At the same time, equipment were becoming cheaper and the offers are reaching more professional users in the agricultural sector. The implementation of a network of RTK stations in Navarra had a decisive influence on the process because it allowed obtaining a sufficient precision for any work in a comfortable and cheap way. The subsidies that the Government of Navarre gave to the farmers for the purchase of these machines (among others) were also a very important reason to explain the quick implementation of this technology.</p>
12. Relevance of this policy measures (150-500 words)	<p>Finally, farmers begin to see themselves the advantages of manual and automatic guidance in their work on the farm and the possibilities to use it their farms for precision agriculture in the use of pesticides, fertilisers, etc. The role of RTK Stations continues being significant in the use of GPS in agriculture.</p> <p>Key attributes of the success of this policy case:</p> <ul style="list-style-type: none"> • The element that has favoured the most is the practicality, the profitability and the advantages of the Guidance system itself. • The role of facilitator and broker innovation carried out by INTIA, also with a specific contribution in training and dissemination. • The network of RTK stations of the Government of Navarra that allows for free to improve positioning accuracy • The progressive improvement of the technology and

	<p>accessibility through the machinery manufacturers</p> <ul style="list-style-type: none"> • The biggest barrier was and remains, the cost • The subsidies of the Government of Navarre to the innovative machinery introduction, specifically to the installation of GPS on the tractor (previously, the improvements in the farm were financed in a general way) • Companies have also evolved in the provision of advisory services and support for the implementation.
13. Website (if any)	-
14. Any additional support information (factsheets, videos, pictures, presentations, news, etc.)	-

Policy case 15. Agricultural and Horticultural Development Board (AHDB) – a statutory levy funded body (UK)

Part 1. General Information	
1. Partner information	DTA Ltd P13
2. Policy measure name	Agricultural and Horticultural Development Board (AHDB) – a statutory levy funded body.
3. Region / country	UK
4. Identify level of policy implementation	The AHDB is implemented generally throughout UK although there are separate bodies for Welsh and Scottish meat.
5. If relevant, indicate the funding source/ instrument and the name of the Programme	<p>The AHDB is a statutory levy board, funded by farmers, growers and others in the production and supply chain and managed as an independent organisation (independent of both commercial industry and of Government).</p> <p>Details at: https://ahdb.org.uk/about/</p>

6. Main focus area	<p>AHDB has 4 priority areas:</p> <ol style="list-style-type: none"> 1. Inspiring British farming and growing to be more competitive and resilient 2. Accelerating innovation and productivity growth through coordinated R&D and knowledge exchange 3. Helping the industry understand and deliver what consumers will trust and buy 4. Delivering thought leadership and horizon scanning. <p>Some examples of the sort of work they do:</p> <ul style="list-style-type: none"> • Deliver extensive research and development programmes which are delivering scientifically-robust and commercially useful outcomes for the levy payers; • Undertake efficient farm-level knowledge transfer programmes based on evidence both from third party science and their own R&D aimed at improving efficiency, productivity and sustainability; • They also ensure that proper account is taken of Government priorities for agriculture and the agri-food industry, where appropriate.
7. Year(s) of implementation	Formed in 2008 from combining several levy funded bodies it is an ongoing organisation.
8. Body for the implementation of the policy	The AHDB is not funded by Government. It plays a vital role in improving farm business efficiency and competitiveness in most aspects of agricultural production in activities which most individual farm businesses could not afford to do themselves. The Members of the Board (Governing Body) include farmers, and a wide variety of people with interest in rural sector and its politics. The Chairman is a former President of the National Farmers' Union
9. Are you directly involved in the design and/or implementation of this measure? How?	No.

Part 2. Description and details of the policy / initiative

10. Please detail main challenges (in terms of policy gaps) and objectives in relation to which this policy has been	<p>The AHDB Strategy Update (June 2017) [https://ahdb.org.uk/documents/CorporateStrategy_updateJune2017.pdf]</p> <p>currently states:</p> <p><i>“Brexit, technological innovation and the changing habits of British shoppers are just the latest changes impacting British agriculture and horticulture. The whole industry will need to up its game to meet these challenges”.</i></p> <p>The Strategy Update (2017) includes six Technical Themes including to “Drive precision technology into practice” and “Manage resources efficiently and sustainably”. The aim is to accelerate innovation and productivity growth through coordinated Research and Development and Knowledge Exchange.</p>
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designed and/or implemented. (200-250 words)	
11. Description of the measure or initiative (350-500 words)	<p>The following two points are just relevant examples of the work undertaken by AHDB.</p> <p>1) About 10 years ago the Home Grown Cereals Authority (a predecessor to one of the current AHDB sectors) developed a Knowledge Transfer program “Be Precise”, following research by agricultural consultants, The Arable Group, to help farmers know where to start with Precision Farming. A series of talks and publications based on the research report were presented to farmers and growers to help answer the question “where do I start?”. An example of such a talk by Ian Beecher-Jones can be found on the link https://farmnw.co.uk/factsheets/precision farming where do i start. Much of the program was also to help farmers determine whether Precision Agriculture, particularly related to arable crops, would be cost-effective for a particular farm bearing in mind the size, cropping system, existing machinery and more. The idea of cost-benefit modelling is widely regarded as a valuable tool. Indeed “a <i>precision farming calculator</i> at the European level” was one of 10 recommendations in the 2014 JRC report to the European Parliament (link below). A further recommendation, ideally undertaken before producing the precision farming calculator, was to undertake research and further studies to improve the knowledge and cost-benefit aspects of precision agriculture. Available via http://www.europarl.europa.eu/RegData/etudes/note/join/2014/529049/IPOL-AGRI NT%282014%29529049 EN.pdf</p> <p>2) The AHDB does fund research in various topics but it also has a major program of Knowledge Exchange including Monitor Farms (owned and operated by commercial farmers and open to farmer visits and discussions for three years), FarmBench (a tool to enable farmers to benchmark their costs) and Strategic Farms (run for six years to allow independent demonstration of research across a full rotation and demonstrate new ways in a commercial setting and, by using to full cost-benefit analyses, they can help farmers assess changing their own systems). https://cereals.ahdb.org.uk/get-involved.aspx</p>
12. Relevance of this policy measures (150-500 words)	<p>AHDB is a large organisation funded predominantly by farmers and growers. These funds are used for a wide variety of topics that individual farmers could not justify doing themselves and includes developing and understanding markets for products, applied research and, perhaps of great interest to projects such as Smart AKIS, passing on knowledge, whether from research or from farmers’ experiences to other farmers to encourage a reliable and quicker uptake of knowledge, including that required for Smart Farming.</p>

	The sort of barriers that were mentioned in the First regional workshop were often those that AHDB is well aware of and strives, for instance through the Monitor and Strategic Farms and the new FarmBench tool, to encourage farmers to consider and pass on experiences; whether good or bad.
13. Website (if any)	Homepage https://ahdb.org.uk/ but see next section for more ideas.
14. Any additional support information (factsheets, videos, pictures, presentations, news, etc.)	<p>There are many websites throughout the AHDB family and considerable time is needed to determine where to find suitable links and information. The information is generally available under the six production sectors, as well as geographically and by topic. However the Monitor Farms where farmers can meet and discuss experiences are an important route to understanding what knowledge is available along with contact with the regional Knowledge Exchange Managers.</p> <p>Starting with the homepage https://ahdb.org.uk/ and knowing some of the people involved (Regional Knowledge Exchange Managers, Senior Resource Management Scientist, Knowledge Exchange Director etc) it is possible, with Google, to track down relevant, and important elements of what is available within the AHDB organisation.</p> <p>“Be Precise” Precision Farming presentation series https://farmnw.co.uk/factsheets/precision_farming_where_do_i_start Monitor and Strategic farms in Cereals sector: https://cereals.ahdb.org.uk/get-involved.aspx and Frambench tool: https://cereals.ahdb.org.uk/get-involved/farmbench.aspx A search in Horticulture – Research – keyword “precision” gives this example of recent results https://horticulture.ahdb.org.uk/search/node/precision%20type%3Aresearch_project</p>

Policy case 16. RDP for England: LEADER Funding (UK)

Part 1. General Information	
1. Partner information	DTA Ltd P13
2. Policy measure name	Rural Development Programme for England: LEADER Funding
3. Region / country	England
4. Identify level of policy	LEADER funding is delivered via LEADER LAGs (Local Action Groups) and is available to local businesses, communities, farmers, foresters and land managers.

implementa tion	
5. If relevant, indicate the funding source/ instrument and the name of the Programme	A total of £138 million is available in England between 2015 and 2020 under the scheme. LEADER is part of the RDPE (Liaison Entre Actions de Développement de l'Économie Rurale). A LAG is made up of people from the local community and the local public and private sector.
6. Main focus area	<p>There are six priority areas but these effectively all fall within:</p> <ol style="list-style-type: none"> 1) Agriculture and Rural Development. 2) Support to industry / SMEs <p>"Each LAG decides which projects they will fund in their area. This depends on their priorities, but all projects must support one or more of the 6 LEADER priorities. These are to:</p> <ul style="list-style-type: none"> • support micro and small businesses and farm diversification • boost rural tourism • increase farm productivity • increase forestry productivity • provide rural services • provide cultural and heritage activities"
7. Year(s) of implementa tion	2015-2020
8. Body for the implementa tion of the policy	Applications are made to the Local Action Group (nominally 77 in England)
9. Are you directly involved in the design and/or implementa tion of this measure? How?	No.
Part 2. Description and details of the policy / initiative	
10. Please detail main challenge s (in terms of policy	The six priorities indicate the challenges and objectives that the LAGs will consider but each of the 77 LAGs determine their own specific priorities which will be based upon tackling the greatest challenges for that Local Area and tackling policy gaps and objectives that the LAG considers important for that area and/or is not well supported by other policies whether national or regional.

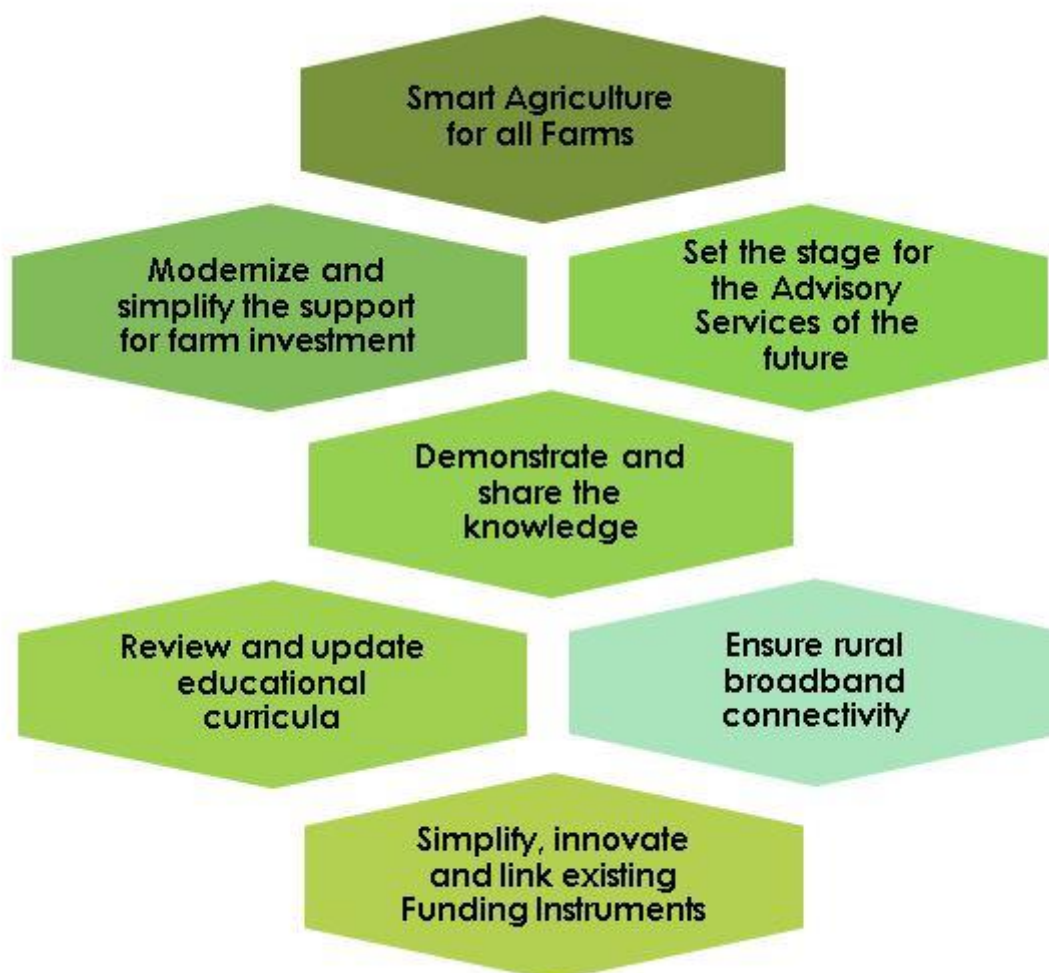
gaps) and objective s in relation to which this policy has been designed and/or implemen ted. (200- 250 words)	
11. Descripti on of the measure or initiative (350-500 words)	The measure is operated by a Local Action Group formed of people from the local community and the local public and private sector. Each LAG decides which topics, and hence, projects, have priority and may be funded in their area. More information, application process, past projects, LAG members and the application process are via the website or contact details for each LAG.
12. Relevance of this policy measures (150-500 words)	Although this is a wide and localized tool it does offer funding for Agriculture and Rural Development and support to industry / SMEs. This includes farmers and an example of the LEADER funding being applied to SFT is supporting the purchase of tractor mounted sensors to enable variable application of nitrogen fertilizer e.g. Yara N-Sensor.
13. Website (if any)	Initially https://www.gov.uk/guidance/rural-development-programme-for-england-leader-funding and then for more information to the 77 LAGs via links to pdf documents.
14. Any additional support informati on (factsheet s, videos, pictures, presentati ons, news, etc.)	<p>Map of approved LEADER Groups https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/587817/leader-funding-map.pdf</p> <p>List of approved LEADER groups https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/651345/leader-local-action-groups-2017.pdf</p> <p>Of interest is that the LAGs are included on the interactive map which can be explored for various geographical, environmental and other tools relating to natural environment, agriculture and more: www.magic.gov.uk</p> <p>An example of a specific LAG funding is for “The Beds & Hunts Claylands and Greensand Ridge” (http://bedsrcc.org.uk/wp-content/uploads/2018/03/folded-leaflet.pdf) which has priorities for: -Increasing the availability of local produce</p>

	<p>-Improving the identity of the region for tourism -Increasing the availability of local services and jobs.</p> <p>A farm was awarded c. £32,600 for a Direct Drill under Priority 1 to increase farm productivity.</p> <p>The project successfully adopted a sustainable zero tillage system whereby seeds are drilled into standing cover crops with strategically placed fertiliser and pesticide. This has resulted in increased soil health and more efficient and therefore reduced use of water and chemical inputs.</p> <p>This zero tillage system allowed Whitbread farms to maintain a good yield despite a dry spring perfectly meeting the Priority 1 aim of increasing agricultural productivity and made the farm more environmentally friendly in the process.</p>
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6.3. Policy Briefs for Dissemination

Smart-AKIS

Policy Briefs for mainstreaming Smart Farming in the new CAP



Smart-AKIS Policy Briefs

Who?

Smart-AKIS is the Thematic Network focusing on Smart Farming running from 2016 to 2018. During this time, Smart-AKIS has researched farmers' interests and needs *vis-à-vis* Smart Farming, disseminated Smart Farming technologies (SFTs) through an online platform, and involved more than 900 stakeholders in 7 EU countries. You can read about the Network's activity in www.smart-akis.com. This has allowed us to pool together a wealth of information and insights, leading to a number of recommendations for increasing the adoption of Smart Farming in Europe.

What?

Smart-AKIS has conducted a thorough review of current EU policies impacting on Smart Farming adoption, including the current and future Common Agricultural policy (CAP). This **Policy Review**, together with the outcomes of the regional innovation workshops of Smart-AKIS, has been used to identify several **Policy Gaps** which should be addressed by the future Common Agricultural Policy, such as:

- Cutting red tape;
- Stimulating innovation;
- Meeting the sustainability goals (emission limits);
- Sustainable production (producing more and better with less);
- Improving social health and vitality in rural areas;
- Adapting smart farming schemes to the farm scale.

Smart-AKIS also proposes a number of **Policy Solutions** to overcome these gaps by providing examples of good practices already available at European level. They are extracted from **Policy Cases** assessed by Smart-AKIS. The Policy solutions include the following:

- Supporting farmers investment in SFTs through the CAP Second Pillar;
- Within SFTs, support Precision Agriculture tailored to farm size;
- Improve farmer's digital capabilities through lifelong learning, education and training together with demonstrations;
- Research and innovation as support strategies for boosting agricultural innovation, emphasizing the importance of advisers.

The **Smart-AKIS vision** for the new CAP after 2020 should be to turn the policy (EAFRD - European Agricultural Fund for Rural Development and EAGF - European Agricultural Guarantee Fund) into an opportunity to make EU agriculture smarter and greener, thereby contributing to a more sustainable and competitive EU agriculture. In this sense, EU policy makers are called to promote and realize a holistic approach aiming at:

- Promoting solutions that are farmers-centred and that reward farmers;
- Rewarding farmers also means rewarding their environmental performance and supporting demand-side policies with stricter environmental and food safety regulations;
- Simplifying and improving the aid programmes management.

The Policy Review, Policy Gaps, Policy Solutions and Policy Cases are described in a publication available at the Smart-AKIS website. With 7 **Policy Briefs**, this documents sums up the main challenges and recommendations.

PB1. Smart Agriculture for all Farms

What is the challenge?

The Common Agricultural Policy (CAP) should devote a specific percentage of the available budget to projects aimed at enhancing farm holdings' productivity.

Policy Recommendations

As a key concept, a **Total Productivity Factor** could be used for allocating CAP funding in order to enhance the sustainable productivity of farm holdings.

The offered solutions should be **farmers-centered**. They should aim to **reward farmers**, e.g. through a **Sustainable Productivity Bonus**, and be adapted to the farm size:

- **Farms <50ha** – dedicated subsidy to invest in basic SFTs, voucher for using contractual services, special voucher for buying small-scale communication technologies with agricultural applications e.g. smart phones, tablets or computers;
- **Farms 50-100ha** – possibility to decide if farmers want to go for the Sustainable Productivity Bonus or apply for a dedicated Smart Technologies subsidy or voucher (for investment or renting of services);
- **Farms >100ha** – use the Sustainable Productivity Bonus, thus rewarding those farmers who are able to increase their productivity while strictly following the cross-compliance requirements.

Furthermore, according to the Smart-AKIS findings from Deliverable 2.2: “Report on farmers’ needs, innovative ideas and interests”, beside farm size and due to the specific conditions and compatibility and costs of the SFTs, **the dominant cropping system** should be also taken into account while recommending targeted support within the CAP.

Expected impact

- The CAP after 2020 **improves access to Smart & Precision Agriculture Technologies** through e.g. a Sustainable Productivity Bonus which is adapted to the farm size and potentially to the dominant cropping system.
- **Different SFTs are eligible for the Sustainable Productivity Bonus**, such as: tools to analyze Big Data; smart devices that generate useful data, facilitate data sharing; connecting devices/tools; integration of smart-phones, tablets, embedded computers with dedicated software and applications; unmanned systems like drones, robots, and highly automated machinery.

PB2. Modernize and simplify the support for farm investment

What is the challenge?

Since the reform of the Common Agricultural Policy (CAP), **Rural Development** is playing an increasing role in helping rural areas to meet the economic, social and environmental challenges of the 21st century. The CAP consists of two pillars. The “first pillar” includes direct payments whereas the “second pillar” concerns rural development policy.

The new legal framework points more clearly in which direction to boost growth, create jobs for rural areas in alignment with the Lisbon Strategy, and improve sustainability in line with the Göteborg sustainability goals.

Policy Recommendations

- The CAP “second pillar” is crucial for **promoting** balanced territorial development of rural economies and sustaining a farming sector that is environmentally sound, as well as competitive and innovative;
- The CAP “second” pillar should **support** farmers’ sustainable investments through schemes which can help them invest in new equipment and technologies, particularly when they are assessed to have a positive environmental impact;
- **The CAP after 2020 strategy** should turn the policy (EAFRD and EAGF) into an opportunity making EU Agriculture smarter and greener, thus **contributing to a more sustainable and competitive EU agriculture**.

Expected impact

- The CAP “second pillar” **supports farmers’ sustainable investments** through funding schemes that help them invest in new equipment and technologies;
- Various funding mechanisms and bodies working at different levels (European, National and Regional) **join forces to work together** in order to achieve common objectives for the benefit of EU agriculture;
- **Farmers’ have a positive experience** with the implementation of EU support measures and successful collaborative schemes between the public and the private sector;
- **Investments** are stimulated in environmentally-friendly equipment and machinery aiming at attaining **competitiveness** and **sustainability goals**.

PB3. Set the stage for the Advisory Services of the future

What is the challenge?

The rapid pace of innovation often prevents advisors to be adequately updated on the latest or more appropriate technologies available on the market. The new role of **Advisory Services** in the digital age was well recognized during the different Smart-AKIS workshops. The testimonials of advisers that participated and that are confronted daily with challenges related to the uptake of Smart Farming Technologies (SFTs), revealed the gap between the need for change and farmers' willingness to change, and the insufficient capacities of innovation agencies and advisory services to effectively support these changes.

Policy Recommendations

- **The training of advisers:** promoting activities which are focused on the training of trainers, including vocational training, skills acquisition actions, demonstration activities and information actions;
- **The methodology and tools for such training:** supporting all training and educational efforts with the latest digital and social media capabilities (videos, podcasts, Augmented Reality, Facebook, Twitter, serious games, etc.);
- **The “Agronomy First principle” approach,** when integrating smart farming technologies into training and information.

Expected impact

- Overcoming currently existing bottlenecks in the different national and regional **Agriculture Knowledge and Innovation Systems (AKIS)** in Europe;
- Improving the training of advisors, but also the **availability of updated tools and methodologies for supporting the technology transfer**;
- **One-fix-for-all solutions** should be avoided and **tailored solutions** should be developed and applied to cope with differences between farms, countries and specialisation levels;
- the **promotion of outdoors fairs and field demonstrations by advisors** of Smart Farming Technologies through Field Days and Demonstration Farms, jointly with industry and for the benefit of advisors and farmers.

PB4. Demonstrate and share the knowledge

What is the challenge?

On farms, **data is collected, processed and analyzed** to take decisions related to cultures, nutrients, cycles or other strategic aspects of the agricultural practice. Farmers and/or farming managers unable to manage the data coming from Smart farming technologies (SFTs) will likely take less favorable decisions leading to a loss in efficiency and ultimately a decrease in the overall competitiveness of their business, while having made large investments.

But besides the not optimal use of SFTs, a main **barrier identified for SFTs adoption** by farmers is the lack of information on the real-life profitability and/or sustainability of smart farming technologies. More in particular, they are interested in increased yield performance and the reduced use of inputs.

Policy Recommendations

- **Promote demonstration activities** at the farm level aimed at showing the farmers in their own region/country how new smart technology or machinery perform;
- Develop **harmonised methodologies** that provide representative findings on the performance of SFTs, thus helping farmers to take their decision on using SFTs, particularly concerning yield performance and the use of inputs;
- Promote tools that allow farmer **experiences** to be shared.

Expected impact

- **Demonstration activities at farm level** are a crucial part of the agricultural knowledge exchange for innovation, with the benefit of having the possibility of testing the SFT directly on the field; **Demonstration farms** are key examples of support strategies facilitating the adoption and uptake of SFTs;
- More empirical based evidence about the economic benefits and environmental impacts of using SFTs will encourage farmers to **invest in SFTs**;
- **Farmer-to-farmer** learning is a crucial example of **knowledge exchange** in agriculture that can help in the uptake of new farming technologies or practices.

PB5. Review and update educational curricula

What is the challenge?

At the **higher education level**, the curricula offered from academia is often addressing farming from the “botanic” or biological side only, leaving other equally important themes poorly addressed, if not substantially ignored. Although the University curricula evolved over the last decade, there is still room for further improvement, especially in the area of precision farming. In reality, farms increasingly became places where data needs to be collected, processed and analyzed in order to take decisions about cultures, nutrients, cycles or other more strategic aspects of the agricultural practice.

Policy Recommendations

Keep agricultural studies curricula in University and Schools updated, mainstreaming well-established and upcoming smart farming technologies:

- **University programmes** need to reflect the changes required by the 21st century’s food security and productivity challenges, particularly in the field of precision farming;
- **University curricula** evolved slowly in the last decade incorporating aspects such as value and supply chains, or general notions on the bio-economy. However, the “agricultural” curricula remain largely incomplete and would need to be re-designed;
- **Educational programmes** need to be tailored to address the broadening range of educational needs since computer technologies in agriculture continue to deliver innovation in farming practice.

Expected impact

- **Closing the research and practice gap in agricultural data management** is crucial and should be considered in the planning of higher education didactical offer;
- **Enhancing the farmers’ technical skills and competences**, since several studies indicated that farmers who do not adopt SFTs usually have insufficient skills and competences;
- **Education** of the new generation of farmers for the challenges of the 21st century: given the new and severe challenges faced by the agricultural sector in the current globalised food markets, **managing data in agriculture** is becoming as important as agronomic knowledge and experience.

PB6. Ensure rural broadband connectivity

What is the challenge?

Considering the number of communication nodes and big data streams being from device to farm, device to cloud, cloud to cloud, Smart Farming Technologies depend on an **access to broadband** and **steady, high-quality internet connection**. Especially in rural areas, this access is lacking and if existing is not state of the art.

Policy Recommendations

- Actual **lack of high-quality internet coverage** should be identified and solutions developed to close the gaps. Actions on regional and local level to insure appropriate infrastructure in rural areas appear to be crucial;
- **Shared investments, grants and other initiatives** should work together for the interest of an entire local community;
- Different levels of policies should **work together** for addressing the huge challenge represented by rural access to broadband, since each EU country and region are responsible for its own timetable for broadband roll-out;
- **The regional dimension** of the initiatives for broadening and improving the rural broadband comes out as one of the main features of the policy cases collected in this topic area through Smart-AKIS.
- Coordination and **harmonization of national initiatives for rural connectivity** to minimize the number of connection technologies and frequency bands to be used, thus to harmonize solutions proposed in different territories.

Expected impact

- **Increasing broadband network** in rural areas as one of the main priorities of Broadband Europe, promoting the European Commission's vision and actions to turn Europe into a Gigabit Society by 2025;
- **Better access to broadband** for farmers to use new technologies and become more efficient. **Connectivity** is crucial and an adequate rural broadband will contribute to the successful adoption and uptake of SFTs;
- Development and implementation of a coherent **strategy for rural connectivity** that involves different levels of implementation: regional, national and European.

PB7. Simplify, innovate and link existing Funding Instruments

What is the challenge?

The EU strategy for supporting rural and agriculture innovation in Europe comprise numerous policies and EU research funding programmes. The analysis on the innovation process carried out in Smart-AKIS has provided examples and evidences of different bottlenecks and gaps hindering the development of an effective and sustainable ecosystem for enhancing innovation in agriculture and sustain rural development.

Policy Recommendations

- Enhance the role of **cooperation** and the **involvement** of all the relevant value chains actors through multi-actor projects: role of farmers, advisors, industry-led proposed solutions and multi-stakeholders initiatives;
- **Strengthen** and **reinforce** Thematic Networks;
- Further structuring the **EIP-AGRI ecosystem** following the recommendations provided in the Smart-AKIS deliverable 3.6: “Recommendations for mainstreaming Smart Farming in Europe;
- **Promote and enhance synergies** between programmes and funding schemes (mapping, synergies with INTERREG and Erasmus+, link the EIP-AGRI and ENRD, Smallholders Farmers Act);
- **Simplify access to R&D and innovation funding** by reducing/removing red tape for access to funding and reporting. Some proposals in this direction are to: **(i)** foresee a pre-harvesting phase for the submission of proposals; **(ii)** keep some budget to fund the proposals’ preparation; **(iii)** avoid single-stage proposals and opting for more stages proposals;
- Promote the further **inclusion of innovative financial instruments** (e.g. Future Internet Public-Private Partnership (FI-PPP) programme and crowdfunding-based scheme) to attract private funds as the main criterion for EC financial support.

Expected impact

- **Complementarity of funding instruments** in the support of an investment project pipeline, pooling together resources and different actors facilitated through a set of activities;
- **Collaboration** between different actors, for instance public and private entities, in assembling Operational Groups and run innovation projects. Thematic Networks represent crucial examples of multi-actor approach;
- **Simplification** of the access to R&D and innovation funding and participation in the programme, together with a reduction of the administrative costs to participants.

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