BRIEFING

European Parliament

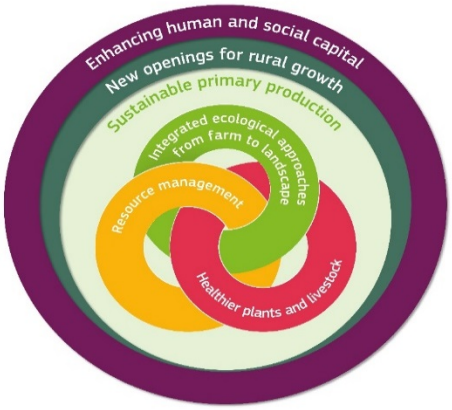
EU agricultural research and innovation

SUMMARY

The European Union's long-term strategy for agricultural research and innovation was published in January 2016 following a year-long process of development, which included targeted consultations. Based on five priority areas, the strategy guides the programming of its main research and innovation programme – Horizon 2020 – not only for 2018 to 2020 but also for the period beyond 2020, to be covered by Horizon Europe.

In light of discussions on the future of the common agricultural policy (CAP), the role of innovation in agriculture is examined, including the potential contribution that research and innovation can make to agriculture, the agri-food sector, rural areas and the challenges they face. These are set against changing global trends in public expenditure on agricultural research and development. These trends point to a relatively flat pattern of expenditure over the years 2012 to 2016 for the EU. In global terms, the structure of public agricultural expenditure is changing, with historically richer countries ceding ground to those with rapidly rising per capita incomes.

In considering the EU's long-term strategy for agricultural research and innovation, the links between the CAP and the EU's research and innovation policies are identified. Evaluation evidence from a range of sources on the actual or potential impact of investment in agricultural research and innovation point to a link between such investment and productivity growth in agriculture, the potential for multi-dimensional impacts, and the potential offered by the Commission's current approach to agricultural research and innovation through the European innovation partnership operational groups for agriculture (EIP-AGRI).



In this Briefing

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Background

In a press release dated 1 June 2018 setting out proposals for the multi-annual financial framework (MFF) for the 2021 to 2027 period, the Commission stated that a budget of €10 billion will be set aside for research and innovation projects in food, agriculture, rural development and the bio-economy, within its Horizon Europe research and innovation programme for the 2021 to 2027 period. Prior to this, on 2 May 2018, Commissioner Phil Hogan had announced in his speech to the 2018 agri-research conference 'Innovating for the future of farming and rural communities' that the College of Commissioners had finalised the next MFF proposals and that the amount proposed was provided for under Horizon Europe.

Set within this context, the role of innovation in agriculture is examined alongside recent trends in agricultural research and development, including different models of innovation. The EU's long-term strategy for agriculture research and innovation, which was published as a final paper in June 2016, is examined. Consideration is given to the impact of agricultural research in general and the EU's strategy in particular. This analysis is set within the context of ongoing discussions on the legislative proposals for the CAP post 2020 and under the next MFF.

Role of innovation in agriculture

In its communication on the CAP post 2020, the Commission recognises the role of research and innovation. It considers them to be 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 communication acknowledges that 'the uptake of new technologies in farming remains below expectations and is unevenly spread throughout the EU' with a particular need to address small and medium sized farms' access to technology. Moreover, the Commission considers that support for knowledge, innovation and technology will be crucial to 'future-proofing'. In its subsequent impact assessment on the CAP post-2020 legislative proposals, the Commission considers that innovations are needed to serve a multi-functional EU agriculture and that 'bridging the gap between research and farming practice is key'. Broadening this out to the wider external policy and research community, there is recognition that more research and innovation investments are needed if the sustainability challenges facing agriculture, such as those suggested in Box 1, are to be addressed.

Box 1 – Five major challenges facing agriculture, agri-food and rural areas

Food and nutrition security: the world's population is expected to reach 10.5 billion by 2100 with demand for food probably exceeding the growth in population.

Climate change: rising temperatures and changes in weather patterns combine to impact on food production and food safety.

Environment and biodiversity: the intensive use of soils and monocultures without proper soil management leads to problems such as deletion of organic matter, over-compacting and erosion.

Maintaining a healthy lifestyle: a number of chronic diseases such as type 2 diabetes, cardiovascular diseases and obesity are linked to food intake and lifestyle.

Rural areas can face a range of challenges reflecting trends in demographics, increasing urbanisation, increasing farm size and rural depopulation.

Data source: EPRS adaptation from Cécile Détang-Dessendre, Floor Geerling-Eiff, Hervé Guyomard and Krijn Poppe, EU Agriculture and innovation: What role for the CAP?, INRA and Wageningen University and Research, 2018.

The paper that Box 1 draws on explains that these major challenges are all reasons for public intervention. Drawn up by Wageningen University & Research (WUR) and the Institut National de la Recherche Agronomique (INRA), the paper analyses the extent to which innovation could help to

address these challenges including how the CAP could support this innovation. Drawing further on this research, the potential contributions that innovation can offer in response to such challenges are illustrated in Box 2.

Box 2 – Indicative list of potential contributions innovation can make to five major challenges facing agriculture agri-food and rural areas

Challenge	Potential contributions of innovation
Food and nutrition security	New plant breeding techniques including greater use of existing genetic resources and breeding; animal breeding; drought resistant crops; reduction of food waste
Climate change	Use of big data leading to precision farming; new farming systems; ecological approaches including use of eco-system services
Environment biodiversity	Precision farming; ecological approaches such as eco-system services; collaboration of farmers with new business models
Healthy lifestyle	More sustainable consumption patterns; food traceability; school fruit schemes, smart cities; urban and peri-urban farming
Rural areas and territorial cohesion	European innovation partnerships on agricultural sustainability and productivity (EIP-AGRI); rural development programmes; urban and peri-urban farming, social innovation; SMART villages; digital connectivity; LEADER type developments; bio economy actions

Source: EPRS adaptation from C. Détang-Dessendre, F. Geerling-Eiff, H. Guyomard and K. Poppe, EU agriculture and Innovation: What role for the CAP?, INRA and Wageningen University and Research, 2018.

Though the list of potential contributions identified in Box 1 is not an exhaustive one, they all draw on a range of innovation areas. For example, information and communication technologies and the provision of data have the potential to make farming more climate-smart as well as improve food traceability and help consumers opt for healthier diets. Though the EIP-AGRI is allocated only to rural areas in the table, it can contribute to the other challenges identified above.

Within the research literature, there is recognition that investment in research and development is a primary driver of productivity growth in agriculture. An assessment of agricultural research funding trends in high-income OECD countries published in May 2018 confirms in empirical terms that public and private investments in agricultural research and development (R&D) have been the primary drivers of long-term agricultural productivity growth. This productivity growth in agriculture has raised the competitiveness of the sector, enabling countries to expand output. The same empirical research has shown that the value of the productivity improvements over the period 1974 to 2013 exceeded the cost of the R&D by a factor of at least 10 and that those countries that invested more in R&D generally achieved greater productivity growth.

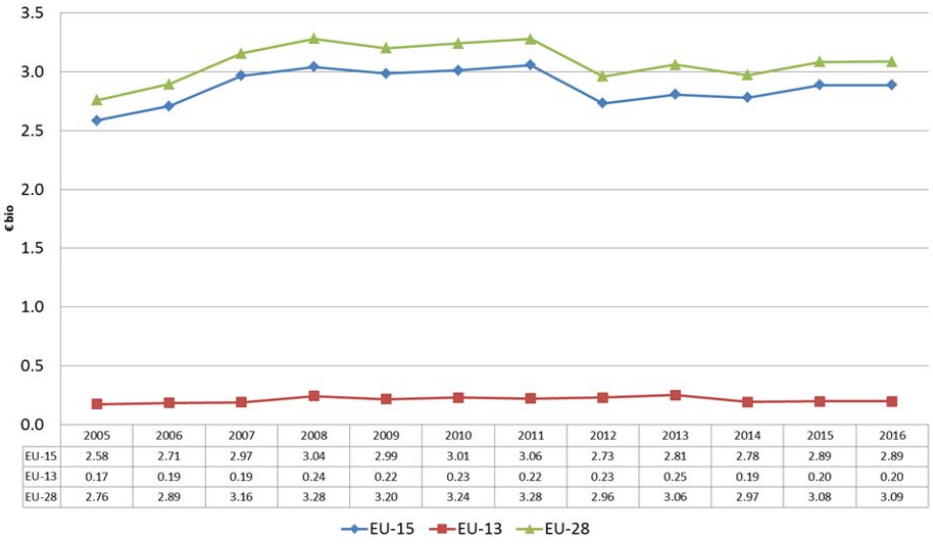
Key features and trends in agricultural research and innovation

Set within this context, there are a number of key features and trends in agricultural research and development that have implications for policy. As part of its exercise on the modernisation and simplification of the CAP, the Commission provided an analysis of the main economic challenges facing EU agriculture. It notes that years of low investment in research and development coupled in some Member States with very weak agricultural knowledge and innovation systems (AKIS) have led to 'sub-optimal productivity growth rates'. It notes that EU agricultural productivity growth is slowing down – averaging 0.8 % per annum compared to 1 % per annum between 1995 and 2006. Gross fixed capital formation (i.e. investments) in agriculture decreased by an average annual rate of -2.1 % between 2008 and 2014. In a number of Member States, net investments per farm were

negative between 2010 and 2013. Moreover, the Commission quotes a study of 821 farms in eight Member States published in 2016, which shows that innovators were few and far between in the EU's farm sector. It found that on average, around 41 % of farms surveyed had introduced new products and processes within the previous three years. With the exception of Finland, most farms tended to innovate in processes that were not new to the market. Large and more specialised farms were more likely to adapt and introduce changes in their operations than smaller farms. The Commission also suggests that small- and medium-sized farms face a technology gap. This is further aggravated by low levels of connectivity in rural areas.

Figures from the Commission show that in 2014, 1.8 % of agricultural gross value added for the EU-28 was spent on agricultural R&D, compared to 2.4 % in 2009. Eurostat data summarised in Figure 1 shows public investments in agricultural research for the EU-15, EU-13 and EU 28. They show that over the five years from 2012 to 2016 the pattern of expenditure was relatively flat.

Figure 1 – Public investments in agricultural R&D (€ billion)



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
EU-15	2.58	2.71	2.97	3.04	2.99	3.01	3.06	2.73	2.81	2.78	2.89	2.89
EU-13	0.17	0.19	0.19	0.24	0.22	0.23	0.22	0.23	0.25	0.19	0.20	0.20
EU-28	2.76	2.89	3.16	3.28	3.20	3.24	3.28	2.96	3.06	2.97	3.08	3.09

Source: Eurostat, GBAORD data.

The analysis that follows reflects findings from the study quoted earlier on agricultural research funding trends in high-income OECD countries as well as other research sources (Pardey et al, 2013; Coca et al, 2017). Combining them, the following observations can be made.

- Pardey notes that for much of the world, 'the greatest part of the agricultural R&D effort that will drive farm productivity growth in the coming decades has been and will continue to be in the public domain'.[1]
- A 'seismic shift' has occurred in the global pattern of public agricultural R&D spending over the past 50 years. In 1960, high-income countries accounted for 56 % of the world's total. By 2009, that share had dropped to 48 %. In the case of the USA, it accounted for 21 % of the total in 1960, but just 13 % in 2009. Pardey (et al) suggests that if such trends continue, the US position will continue to shrink. Heisey and Fuglie note that the US has lost its position as top global performer of public agricultural R&D, falling behind China in 2009 through to at least 2013.
- Aggregate public spending on agricultural R&D in high-income OECD countries has fallen in real terms (adjusted for inflation) since at least 2009 (Heisey & Fuglie, 2018).
- Total public R&D in these OECD countries began growing at a slower rate or even fell in some cases following the global recession of 2008 to 2009.
- Agriculture commands a relatively high share of total public R&D spending, representing about 5.5 % of total public R&D expenditures during the 2009 to 2013

period and ranging from 1.7 % for Luxembourg to 8 % for France and 15.9 % for New Zealand.

- As countries get richer, agriculture's share of total public R&D has fallen over time. (For all high-income OECD countries in the study, the share of public R&D devoted to agriculture fell from just over 9 % in 1981 to 5.2 % in 2013).

Pardey et al note that these trends represent a significant change in the geo-economic order of public agricultural R&D investments where the historically richer countries are ceding ground to those with rapidly rising per capita incomes.

EU strategy for agricultural research and innovation

The process for developing the European Commission's long-term strategy for EU agriculture research and innovation was launched in Milan in June 2015 and subsequently discussed at the conference Designing the path: a strategic approach to EU agricultural research and innovation, in January 2016. The outcome of a year-long process to develop this strategic approach took the form of a final paper that set out the priority areas for agricultural research and innovation along with details of how the strategy was to be implemented. The European Commission took stock of the implementation of the strategy at a conference in May 2018 AgriResearch: innovating for the future of farming and rural communities.

The strategy identifies **five priority areas** for research and innovation, namely:

1. **resource management** – notably soil, water, nutrients and genetic resources, where the aim is to strike a balance between productivity and environmental goals in agriculture through efficient resource use;
2. **healthier plants and animals** – involving research on tools to prevent and control plants and diseases and a holistic one health approach;
3. **integrated ecological approaches** – for example, research into better use of ecosystem services instead of external inputs and developing specific farming systems such as organic and mixed farming systems;
4. **new openings for rural growth** – involving the deployment of new business models, circular value chains and digital transformation to sustain and boost rural economies;
5. **enhancing the human and social capital and rural areas** through innovation networks, advisory services and demonstration sites in rural areas.

In terms of implementation issues, **six key features** were identified at the time namely:

I. being **strategic** in the design and management of EU programmes, structuring the action in the long run to ensure consistency and impact;
II. encouraging **synergies** between Member States and the EU framework programme for research and innovation (Horizon 2020 is the current one, Horizon Europe will be the next framework programme from 2021 to 2027);
III. increasing **international cooperation** to pool existing expertise and capacities;
IV. providing more space for **new approaches**, especially through initiatives that trigger bottom up innovation;
V. developing greater synergies between the public and private sectors with a focus on the **implementation of research** by boosting demand-driven innovation, via the pursuit of an **interactive innovation model** through a process of 'genuine co-creation of knowledge' (see explanatory note in Box 2);
VI. in Horizon 2020, making the interactive innovation model operational through a **multi-actor approach** in which all actors in the knowledge and innovation system work to co-create solutions.

Box 2 – Interactive innovation model

The '**interactive innovation model**' that is applied in EIP-AGRI activities differs from the '**linear innovation model**'. In the case of the latter, innovation is presented as a **linear process** in which technological change is closely dependent on and generated by prior scientific knowledge. In a linear approach, new knowledge is developed through research, distributed through advisory and education services and then implemented by farmers.

In contrast, in '**interactive intervention**', the building blocks for innovation are expected to come from science or from practice and intermediaries, including farmers, advisors, NGOs, businesses as actors in a bottom-up process. As discussed below, operational groups (OGs) under the EIPs are designed to support this bottom-up type of knowledge and innovation co-creation.

Data source: C. Détang-Dessendre, F. Geerling-Eiff, H. Guyomard and K. Poppe, EU Agriculture and innovation: What role for the CAP?, INRA and WUR, 2018.

Taken together, this represents a new approach to EU research and innovation involving the European innovation partnership on agricultural sustainability and productivity (EIP-AGRI) that was established by the European Commission in 2012. It brings together innovation actors such as farmers, advisors, researchers, businesses and NGOs, etc. in an effort to build bridges between research and practice. In this case, it is about creating synergies between existing CAP policies for agriculture and rural development and the Commission's research innovation policy under Horizon 2020. The EIP-AGRI integrates different funding sources, involving EU rural development programme funding (in the case of operational groups) and Horizon 2020 (for multi-actor projects). The EIP-AGRI has compiled a guidance note that lists nine categories of EU funding programmes directly linked to innovation in agriculture, food and forestry.

In terms of its role as a strategic framework document, the strategy recognises the long-term challenges facing EU agriculture as outlined above. It offers guidance on the direction of travel for the EU's agricultural research and innovation policy. Its acts as a guide to the programming of each call for applications made in respect of the EU Horizon 2020 programme, thereby contributing to continuity in implementation. The intention is to offer flexibility in its implementation so that subsequent calls can be amended or adjusted to ensure consistency with the strategic framework while making room for new needs. Significantly, the approach involves two EU policy areas that have legal and financial implications – namely the CAP and the Horizon 2020 framework programme for research and innovation. By embedding the framework within the Directorate General for Agriculture and Rural Development (DG AGRI), there is a recognition of the interconnected nature of policymaking for agriculture as it interfaces with so many other policy fields (see Figure 2).[2]

The CAP contributes to the framework as it provides funding for nearly **900 EIP-AGRI OGs** (as of November 2018) under the CAP's rural development programmes as well as support for advisory services. The OGs are expected to rise to 3 200 by the end of 2020. Though labelled 'operational groups', they can be considered '**multi-actor innovation projects at the local level**'. Through the EIP mechanism, innovation is therefore embedded in the rural development pillar of the CAP.

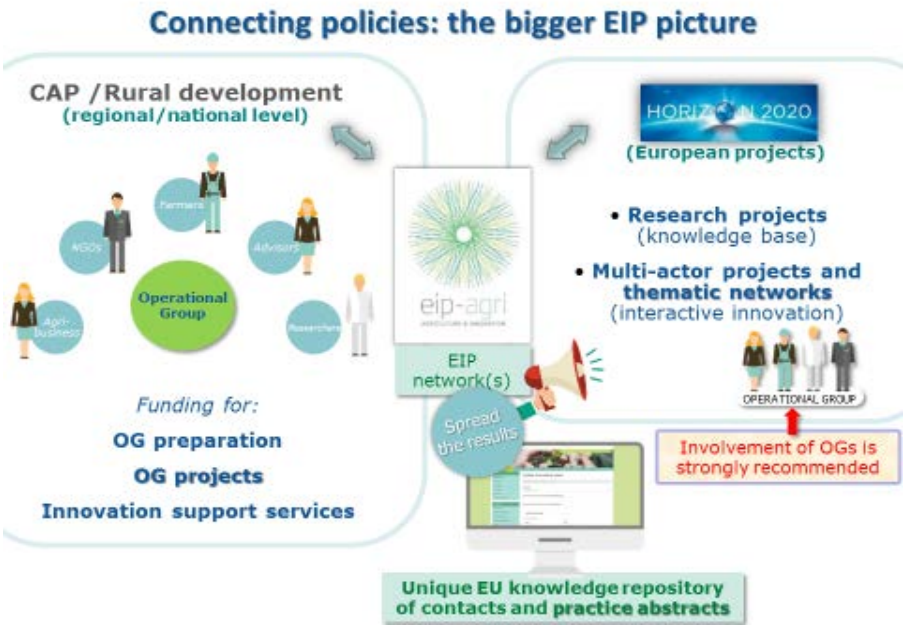
Horizon 2020 also contributes to the EIP-AGRI with European multi-actor projects that will represent around two thirds of the budget allocated to collaborative projects relating to agriculture, forestry and rural development, namely €1 billion and around 180 projects, of which 106 have already started. Some of these multi-actor projects are thematic networks which contribute to the circulation and exploitation of knowledge already available on specific themes.

Both OGs and Horizon 2020 multi-actor projects have an obligation to report on results so as to make generated knowledge accessible to others via the EIP-AGRI website and to open up cooperation possibilities between actors working on similar themes. Networking activities organised by the EIP-AGRI Service Point in relation with national rural networks complete the framework. Main activities include the organisation of focus groups (multi-actor expert groups

dealing with specific topics) as well as networking events and publications that favour connections between projects. The synergies that these arrangements allow for are shown in Figure 3.

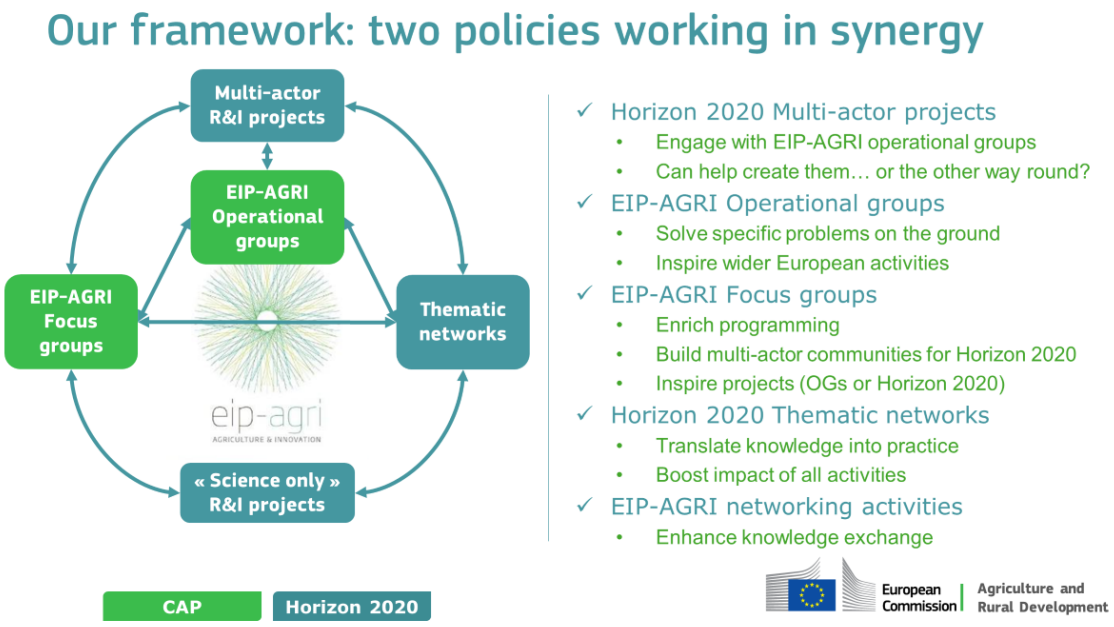
Horizon 2020 also makes provision for: international cooperation of a bilateral nature (as with China) and multi-lateral nature (such as international research consortium Star-Idaz on animal health).

Figure 2 – Diagram explaining the strategic approach to EU agricultural research and innovation showing connections between the CAP and the EU's research and innovation.



Source: European Commission, 2018.

Figure 3 – Illustration of the synergies between the policy tools and how they interact



Source: European Commission.

Evaluating the impact of agri-research and innovation

Support for research and innovation has to compete for funds alongside other policy fields outside agriculture. In light of the Commission's strategic framework for agricultural research and innovation, evidence on the impact of such support can help to inform the decision-making process. Evaluating the impact of research on agriculture is a challenging task. There is the inevitable time lag between undertaking the research and its impact in practice.

Mention has already been made of the link between investment in agricultural R&D and productivity growth in agriculture. The Coca et al study (see Main references) on the relationship between innovation and agricultural performance at the level of all 28 EU Member States using data from Eurostat for 2006, 2010 and 2014 shows that agriculture has seen performance gains especially in those countries that have high rates of investment in R&D and in farmers' education such as Belgium, Luxembourg, the Netherlands, and Sweden (Coca et al, 2018). This study also shows that 'an increase in the R&D expenditure ratio by one unit will get an increase of 21.5 % in the standard output hectare' (Coca op.cit., p.108). Overall this study confirms that there is a strong correlation between a country's agricultural performance and its innovative capacity in the field. Increasing R&D spending favours the growth of agriculture's performance.

Further sources of evaluative evidence on the impact of investment in agricultural research and innovation include:

(1) work undertaken by the National Institute for Agricultural Research (INRA) in France involving its ASIRPA project, which sought to analyse the impacts of publicly funded agricultural research, published in June 2014;

(2) the findings of the IMPRESA project funded under the seventh framework programme between 2013 and 2016, which sought to measure and assess the socio-economic impacts of agricultural research in Europe;

(3) the interim evaluation of Horizon 2020 – Societal Challenge (2) published in 2017; and

(4) DG AGRI's external evaluation study of the implementation of the EIP for agricultural productivity and sustainability, published in November 2016.

They convey a number of findings.

(1) The INRA research shows that '...the impact pathways for agricultural research are long: on average, 19 years elapse between the beginning of a project and the manifestation of its impacts...' Impact can also be multidimensional in nature involving both environmental and economic benefits. The ASIRPA project found that 70 % of the 30 case studies it evaluated had a multi-dimensional impact. In one case concerning research into scrapie, a disease affecting sheep and goats, the impacts covered five categories of impact namely: economic, environmental, policy, public health, and regional/social. Estimated internal rates of return were gauged at between 7 and 15 % (with a time lag of research effect on productivity of around nine years – shorter than other estimates in previous studies).

(2) A policy brief from the IMPRESA project[3] examined the differences between private and public research expenditures in impact terms. Private research mainly affected improved and consolidated output, while public research had more complex ways of making an impact that improve competitiveness and quality of life. It found that productivity was less of an objective of public research, with more emphasis being placed on the sustainability of farming systems or food quality.

Research expenditures were found to be 'poorly distributed spatially'. Eastern EU countries had disproportionately high shares of total EU agricultural labour and utilised agricultural area, yet spent only 6 % of total public budget allocations for research. This finding reflects the view that variations exist in the capacity of different Member States to take forward research and to absorb research

findings. This point was well illustrated in the study on the relationship between innovation and agricultural performance across all 28 Member States referred to earlier, which found that in countries such as Denmark, Belgium, the Netherlands and Finland, the R&D expenditure represented more than 10 % of the gross value added of the agricultural sector (Coca et al, 2018, p. 104). The lowest rates were recorded in 2014 by Romania (0.56 %), Bulgaria (0.96 %) and Slovakia (1.12 %) with negative effects on farm development and competitiveness.

(3) The interim evaluation of Horizon 2020 – Societal Challenge 2 programme (Food security, sustainable agriculture and forestry, marine, maritime and inland water research and the bioeconomy) was published in 2017. It noted that an important development in the programme has been 'a stronger involvement and greater coordination with relevant DGs, including co-management with DG AGRI'. It noted that overall, the Directorate General for Research and Innovation (DG RTD) and DG AGRI 'have successfully established management capabilities which have maintained coherence'. In addition to this shared management of agricultural research between RTD and DG AGRI, two significant changes in this programme were noted, namely:

- an increased relevance of research for farmers and farm-related value chains most notably through the development of the multi-actor approach in almost all projects under 'agriculture' alongside a set of challenging and innovative research targets;
- the development of links to and support of the EIP-AGRI. In this case, the programme interacts with the EIP-AGRI by developing programme plans involving EIP-AGRI focus groups, which bring stakeholders and sectoral experts together to discuss future research and innovation needs, and through the use of EIP-AGRI to deliver research results for specific groups of research users especially farmers, where there is more emphasis on applied agricultural research.

The potential benefits of the projects funded at the time of the evaluation were also highlighted. For example, 75 % of the projects funded were expected to contribute to sustainable and resilient production and consumption systems, 50 % to food security, and 29 % to empowering rural areas. Several economic and societal benefits are expected to be derived from the majority of phase I proposals such as: fruit tree yields improved by 20 %; reduced fertiliser and water use in agriculture; the elimination of biological contamination in stored grains and a reduction in pesticide usage.

(4) DG AGRI's external evaluation study on the implementation of the EIP-AGRI contains a number of key observations on the utility and potential offered by the EIP.

- The EIP's bottom-up and farmer-led approach is considered to be **truly distinctive and highly appreciated by stakeholders**.
- The vast majority of rural development programmes (RDPs) took account of the EIP devoting substantial resources to it – 'unusual for a new measure', demonstrating that Member States and regions are willing to prioritise these needs. The evaluation concluded that it is highly likely that the OGs formed will lead to **a large number of innovative solutions** to practical agricultural and forestry problems.
- The **flexibility** of the EIP allows it to tackle the differences that exist in terms of agricultural context and innovation infrastructure.
- The EIP was judged to have **got off to a good start**, representing a major change in how agricultural innovation is organised both at EU level and in most Member States. The EIP network was seen as facilitating the **exchange of expertise and good practices**.

Overall, the pan-European approach of the EIP and the ability to share lessons and form partnerships across countries and regions were identified in the evaluation as distinctive and potentially powerful aspects of the initiative. Subsequent to this evaluation, other commentators, whilst welcoming this instrument, feel that it is not yet sufficiently mature but that it should be scaled up as there is still only a 'tiny fraction of the target group of professional farmers actively engaged in the EIP-AGRI' (WUR/INRA). There is also huge variability in the number of operational groups both between and within countries. They vary from a few units in countries such as Lithuania (7) and Slovenia (9) to 305

in France, 60 in the Netherlands, 435 in Greece, 735 in Italy and 852 in Spain. Within France, there are 65 groups in the Rhône-Alpes region but only two in Champagne-Ardennes. The same commentators consider that this success is uneven and that innovation 'does not disseminate sufficiently outside the operational groups already in place'. Although the EIP-AGRI's bottom-up approach is valued by farmers and rural development agencies, focusing as it does on real problems or opportunities that farmers face, the WUR/INRA policy brief observes that 'stakeholder satisfaction is an important but insufficient metric for gauging its success in developing innovations'. Projects also vary in size where projects are less numerous, they are also in general much bigger in budget, scope and activities. Managing authorities have made different choices as to how they wanted to use the scheme. This variability in implementation is allowed because the EU framework has been built to be as flexible as possible where flexibility is considered a key component of innovation friendliness.

Research and innovation in the CAP post 2020

Making the link with the role that the CAP has to play in realising the Juncker priorities, the Commission's communication on the future of food and farming identifies the need to bring 'research and innovation out of the lab and onto the fields and markets'. In making this case, the Commission identifies the contribution that research and innovation can offer through possible efficiency gains, thereby reducing the environment- and climate-related impact of farming and lowering costs for farmers. It considers that access to 'sound, relevant and new knowledge is very patchy around the EU. This impedes the performance of certain CAP instruments'. As a result, it considers it crucial that support for knowledge, innovation and technology become a core component of the new CAP. Knowledge and innovation are seen by the Commission as being 'essential' for a smart, resilient and sustainable agricultural sector.

Though the Horizon 2020 programme accounts for most EU agricultural R&I, the Commission's 'interactive innovation model' is applied through the EIP-AGRI, which relies on local OGs implemented through the EU-funded Member State rural development programmes. The Commission's communication recognises that the EIP-AGRI 'has proven (its) value in mobilising the agricultural sector for innovation'. It considers that the role of the farm advisor stands out as particularly important. This analysis has implications for all those involved in drawing up the new CAP strategic plans as proposed in the communication and as put forward in the legislative proposal that sets out the rules on support for these plans to be drawn up by Member States. In its communication, the Commission indicates that a modern CAP should support plans for the strengthening of agricultural knowledge and innovation systems (AKIS) by making them a condition for the approval of CAP strategic plans. In short, each country's CAP strategic plan will need to include a section on how to stimulate knowledge exchange and innovation such as advisory services, training, research, rural networks, pilot projects, EIP-AGRI operational groups and how to fund and connect them and all actors involved in the production, sharing and use of knowledge.

European Parliament

The role played by research and innovation in promoting agricultural productivity and in addressing the challenges facing agriculture and rural development has been the subject of several own-initiative reports within the current Parliament. These include:

- an own-initiative report on technological solutions for sustainable agriculture in the EU, of June 2016 (Rapporteur: Anthea McIntyre, ECR, United Kingdom). This emphasised the need to improve the translation of research into practice by encouraging cooperation between scientists and farmers; and
- an own-initiative report enhancing innovation and economic development in future European farm management (Rapporteur: Jan Huitema, ALDE, The Netherlands). This urged the Commission to ensure that innovation was explicitly considered in any future CAP, with more recognition given to young farmers.

In response to the Commission's communication 'The future of food and farming', Parliament passed a resolution in plenary on 30 May 2018 setting out its priorities for CAP reform. In it, Parliament considers that in order to meet both existing and new challenges regarding food security for European agriculture, the next MFF needs to increase or maintain the agricultural budget in constant euros. In relation to agricultural research and innovation, Parliament has called on the Commission to stimulate the development and uptake of innovative technologies for all farm types. In this resolution, Parliament is recognising that 'more must be done to develop the research capacity and infrastructure necessary to translate the results of research into food and farming …'.

On 22 October 2018, the AGRI committee adopted two opinions to the Committee on Industry, Research and Energy (ITRE), one on the Commission's proposal for a regulation establishing Horizon Europe and the other on its proposals on the specific programme implementing it (Rapporteur, Elsi Katainen, ALDE, Finland). The adopted opinion included an amendment to add the term 'agriculture' to the title of the cluster on 'Food and natural resources'. The opinion on the regulation stressed that the proposed allocation of €10 billion to this cluster should be maintained and that, if the overall budget of Horizon Europe was to be increased, the funding for this cluster should increase proportionally.

Outlook

The Commission's proposals for the MFF for the 2021 to 2027 period included a budget of €10 billion (at current prices) for research and innovation projects in food, agriculture, rural development and the bio-economy (Horizon Europe). This would represent a doubling of resources as regards the scope of the current Horizon 2020 societal challenge 2 (which also includes marine research, fisheries). Such an increase is contingent on the outcome of the current discussions over the size and breakdown of the budget for Horizon Europe in the context of any agreement on the MFF for the 2021 to 2027 period.

The outlook for the EU's agricultural research and innovation agenda will also depend on how some of the issues outlined in this briefing are addressed in the period beyond 2020 by Member States. They concern for example how agriculture and the agri-food system will respond to challenges such as food security and climate change, as well as the issue of sustainable development, and at the same time address the issue of productivity. Findings from a range of sources have provided evidence on the relationship between innovation and the performance of agriculture. At the level of all 28 Member States, it confirms that there is a strong correlation between a country's agricultural performance and its innovative capacity. Some suggest the need for continuous innovation to achieve the sustainable development of agriculture if the goal is to achieve higher agricultural production and to reduce the impact on the environment (Coca, 2018). Evidence also points to differences both within and across Member States in terms of levels of agricultural research expenditure. Research on the impact of agricultural research indicates how it can have a multi-dimensional impact delivering both economic and environmental benefits.

The debate on the future of agricultural research and innovation has to be set within the context of the current debate on the future of the CAP post 2020. Some (WUR/INRA) have argued that investing in agricultural research and innovation would help to enhance the innovation competences of agricultural entrepreneurs – which, it is argued is likely to lead to a reduction in dependency on subsidies – which would be to the advantage of both EU and Member State budgets. Given the positive findings from the early evaluation of the EIP-AGRI's bottom-up and farmer-led approach to innovation and the role of OGs, including their focus on real problems and opportunities, the same researchers make the argument for an increased CAP budget targeted on innovation involving an innovation system in each Member State, as well as for the establishment of more public-private partnerships in the form of 'living labs' in which any development is co-constructed with real users in a real life environment.

There are many issues raised by the strategy for agricultural research and innovation, not least, the question of generational renewal. Evidence from an analysis of different adoption rates of five types of agricultural innovation across eight Member States showed that farms with younger farm holders were in general more likely to innovate while older farmers were shown to have on average a lower level of education implying that they were less likely to innovate.

Looking to the future, it remains to be seen how the obligation to draw up the new CAP strategic plans to cover the post 2020 period will be used as an opportunity by Member States to take forward and promote agricultural research and innovation including efforts to stimulate knowledge exchange and innovation.

MAIN REFERENCES

Coca O., Ştefan G. and Mironiuc M., 'Empirical evidences regarding the relationship between innovation and performance in the agriculture of the European Union', *Scientific Papers: Management, Economic Engineering in Agriculture and Rural Development*, Vol. 17, Issue 1, 2017.

Hersey P. and Fuglie K., Agricultural research investment and policy reform in high-income countries, Economic research report No 249, Economic Research Service, U.S. Department of Agriculture, May 2018.

Monke J., Agricultural research: background and issues, Congressional Research Service Report prepared for Members and Committees of Congress, 6 October 2016.

Pardey P. G., Alston J.M. and Chan-Kang C., 'Public agricultural R&D over the past half century: an emerging new world order', *Agricultural Economics*, Vol. 44 (2013) supplement, pp.103-113.

Van Der Meulen H., Van Asseldonk M. and Lan G.E., 'The state of innovation in European agriculture: Innovators are few and far between', *Studies in Agricultural Economics*, Vol. 118, 2016, pp. 172-174.

ENDNOTES

[1] Pardey et al, p.106.

[2] Further information on agricultural research and innovation is available through a series of AgriResearch factsheets.

[3] This project provides an appraisal of data availability in 19 EU country reports and Switzerland. A comprehensive series of reports, working papers and policy briefings are available from the project website.

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