The Impact of Research on EU Agriculture
impresa

Factors Fostering the Effectiveness and Performance of Agricultural Research

This Policy Brief identifies factors that facilitate or limit the effectiveness and performance of scientific research on agriculture (SRA) in terms of innovation and desired changes. Findings and the ensuing recommendations are based on an investigation of research-based innovations in six regional case studies with a Participatory Impact Pathway assessment approach. Institutional and policy frameworks have played important roles as either enabling or hindering factors. They were particularly important in raising funding for research as well as enabling product registration and marketing innovations. Policy recommendations focus on strengthening agricultural innovation support, engaging with the private sector, coordination of research and innovation policy, and better access to research data.

Innovation system in the agricultural sector – complex and diverse

The innovation system in the agricultural sector is, in many respects, more complex as compared to other sectors investigated within the innovation literature. This complexity is due to the fact that the development and adoption of new products and techniques are not exclusively derived from research outputs and outcomes, but also from other and external activities. This distinctiveness can be explained by the intrinsic characteristics of the agricultural sector, like the large number of relatively small farm businesses, a dependence on the primary resources of land, soil, and water; the nature of the goods produced; complex interactions under socio-ecological systems; and the strategic and geopolitical dimensions of food. Furthermore, there is a wide divergence between individual innovation capacities of the farmers.

Innovation processes require interactions between different technical, commercial and institutional spheres, as illustrated in Figure 1. When a concrete technical change emerges (such as a new product or new technique), market access is subsequently needed to 'push' the adoption (e.g. the transition to organic farming is driven by the demand). At the same time, institutional acknowledgements, in the form of public financial supports or official recognitions ('official authorisation'), are generally indispensable to allow for the adoption of agricultural innovations.

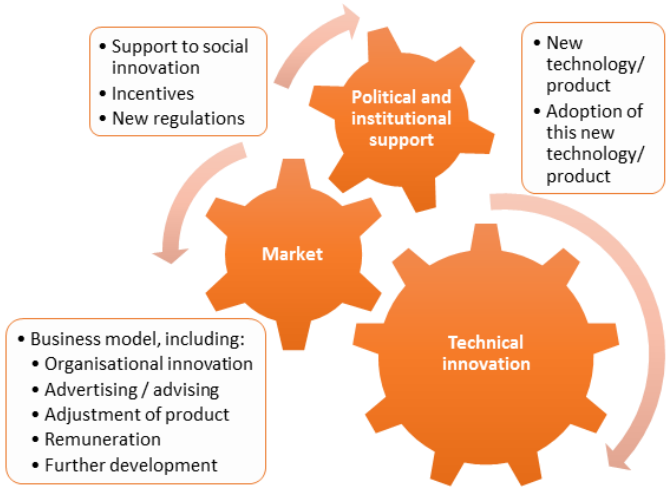

Fig. 1 Innovation process interlinked with institutional, market and technical spheres

The impact pathway approach

In IMPRESA we used the Participatory Impact Pathway Analysis (PIPA) in six case studies of applied agricultural research (in five countries); complemented by some additional methods that have helped to understand the role of research in achieving impacts. The aims were to develop and test a robust methodology of qualitative assessment of research impact, alongside revealing complementary findings to the quantitative assessments carried out in the project on the contribution of SRA in innovation and impacts in the agricultural sector. The nature of the cases was quite different: while cases 1-3 focus on system development, cases 4-6 focus on the development of products and tools.

The application of the impact pathway approach in the six case studies provided insights on enabling and hindering factors for the social, economic and institutional dimensions and concerning particularly the role of capacity building in brokerage and diffusion of innovation.

Role of research in agricultural innovation processes

The assessment of the six case studies has shown that research contributes to innovation in various ways: by producing specific and relevant outputs; by supporting the development of actors' innovation capacities (e.g. through training beneficiaries on the use of new techniques); or by promoting users' ability to adapt an innovation (e.g. a technology) to future and different usage. In innovation processes, the capacity to develop new products (or new production methods, organisation or marketing), as well as the expertise related to their utilisation, create a path towards desired effects (impact).

SRA impact pathways in different contexts of six regional case studies

The construction of impact pathways confirmed that the main elements of the agricultural innovation system are the environment, financial and human resources, farming techniques and products, as well as individual actors (including researchers) and institutional actors. They are linked with markets, regulations and policies. All of these elements usually influence the structure and characteristics of the impact pathway. Diffusion (including adoption) of an innovation depends on several factors including technical aspects, market opportunities, as well as institutional changes and supports. Although clear social, economic and environmental benefits ensue from public funding of these activities, obstacles at various points along the process can diminish or delay the full potential from being realised.

The main types and levels of impacts in the six case studies conducted were quite different (see box on next page): In some cases, the effects were unintended or unexpected, and sometimes also negative.

Shortcomings of advisory services in innovation support

Advisory or extension services can play a significant role in building productive relationships between agricultural science and the farming community. We found, however, that they can be less than adequate or even have economic interests, which diverge from innovation adoption. Still, the comparative analysis of the cases highlights the importance of innovators and the function of 'innovation brokers'. The innovations investigated often originated from a small number of professionally and socially motivated people who shared common values.

Significant role of the private sector

In most case studies, initial research was made possible through substantial public funding, channelled through universities and public research institutions. Correspondingly, the private sector contributed funding at later stages, when potential profitability for both companies and farmers was realised. In the gap between the initial research and the commercialisation phase, easy access to targeted follow-up public (or private-public) funding opportunities would promote continuation and further development of innovations.

Main types and level of impact in cases, at farm level (FL) and territory level (TL)

1. Organic production in Camargue (FR)
FL: Increase in incomes on crop production (high); decrease in the use of pesticides (high); decrease in the use of nitrogen (moderate).
TL: Rise of the organic rice surface (low); reduction of the use of pesticides (moderate).

2. IPM in olive production in Canino (IT)
FL: Decrease in the use of pesticides (high); and increase in incomes (high).
TL: Improved organisational capacities (high).

3. On-farm biogas in Tuscany (IT)
FL: Income diversification (high); improved soil quality (low).
TL: Maintenance of rural viability, i.e. farms, labour, areas (moderate); less agri-food waste (moderate).

4. Dairy cow fertility index (UK)
FL: Reduced calving interval (high); improved animal health and welfare (high).
TL: Increase the intensity of dairy system (moderate); reduced GHG (low); decreased macroeconomic cost of infertility; proof of concept (high).

5. Optical crop sensor in arable production (DE)
FL: Adaptation of nitrogen to actual needs (high); higher net income of users (moderate).
TL: Reduction of inputs in the ecosystem (moderate); creation of jobs (moderate).

6. Varroa control product in beekeeping (BG)
FL: Reduction of pesticides used (high); lowered bee mortality resulting in higher income (high).
TL: Increasing conversion to organic beekeeping (low).

Institutional and policy frameworks – enabling and hindering factors

Both enabling and hindering factors were identified in the six case studies. These elements were not always directly linked to the research, but sometimes associated with key actors' capacities contributing to the development of innovations. These factors are sometimes internal, since they can influence the strength or the quality and intensity of linkages between pathway elements (e.g. trust). Other external influencing factors are unrelated to the research intervention, and can be changes in conditions of the political framework such as CAP payments, energy policy, or pressure on actors (e.g. a change of state of a natural resource or a new market opportunity).

These institutional and policy frameworks have played important roles as either enabling or hindering factors. They were particularly important for research funding, product registration and marketing innovations to promote their diffusion. For example, registration of innovations as patents or trademarks has been an enabling factor in some cases. However, regulatory bodies may also hinder diffusion when the result is a lengthy and costly process.

Recommendations for policy makers

Innovation theory suggests that, while impacts of research and innovation cannot entirely be driven by policies and regulations, the latter play a crucial role in creating a favourable environment for the former, in contributing to capacity building and facilitating access to funding. Recommendations to policy makers at the European and national government levels, overleaf, are focused on four key areas.

POLICY RECOMMENDATIONS for fostering the effectiveness and performance of agricultural research

Strengthening agricultural innovation support

- ***Strengthen agricultural extension and advisory services as educators, knowledge hubs and innovation facilitators***: Encourage researchers to get feedback from advisors (public and private); and ensure long-term perspective (essential for development of trust relationships with farmers).
- ***Engage key actors in research, innovation and experimentation***: Changing roles in different phases: initiation, implementation, diffusion of innovation.
- ***Coordinate and improve effectiveness of support instruments for capacity building, networking and funding of innovation brokers***: Provision of tools for networking and brokerage; framework for interaction and networking.

Engaging with private sector through governance arrangements

- ***Develop a code of practice for public-private interactions in the research and innovation system:*** Assure the public welfare interest, provide equitable gains for private companies, and ensure transparency in order to maintain trust.
- ***Identify 'honest innovation brokers':*** These (independent and professional) brokers ensure that relationships function in the public interest, and are able to act at the interface between sectors in order to link their interests in a way that fosters innovation.

Strengthening research and innovation policy

- ***Integrate research and innovation support instruments***: Overcome the gap between initial research and the commercialisation phase.
- ***Coordinate innovation support instruments with agricultural policies***: In particular with regional and Rural Development Programmes.
- ***Include stakeholders in research programming and evaluation***: To be involved selectively and strategically in the initial phase.

Strengthening availability and access to research data

- ***Improve availability and access to research data for assessment of impacts:*** Standardised structured framework for collecting and making information available from all stages of research implementation; consider existing initiatives (CERIF criteria, CIARD, EU-COM [C(2012) 4890 final] recommendations).

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CONTACT Professor Peter Midmore
Aberystwyth University
Email: pxm@aber.ac.uk
Aberystwyth, SY23 3AL Phone: +44 (0)1970 62 2251

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