

OPEN INNOVATION PLATFORM FOR SMART AGRICULTURE

**RALUCA SFIRU¹, VERGIL MURARU¹,
SEBASTIAN MURARU¹, PAULA CONDRUZ¹,
CORNELIA MURARU-IONEL¹**

¹The National Institute of Research – Development for Machines and Installations designed to Agriculture and Food Industry – INMA

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ABSTRACT

The paper presented the importance of innovation platforms and especially those intended for the agriculture domain. The structure and architecture of digital tools for an online platform such as "OPEN INNOVATION ECOSYSTEM" or "OPEN INNOVATION 2.0" for trading the demand and supply of research-development-innovation in agriculture and related fields will be detailed. The concept of the innovation platform was used in the field of agriculture to allow research, learning and interactions between stakeholders and to jointly exploit opportunities and address solutions that lead to promoting innovation in agriculture, from idea to production and capitalization of goods.

INTRODUCTION

An **innovation system** has three elements:

- 1) Individuals and the organization involved in the production, dissemination and use of knowledge
- 2) Learning is interactive when organizations are involved in these processes resulting new processes and products
- 3) Institutions (norms, conventions and rules) determine how these interactions take place. The concept of innovation systems is the study of how societies use knowledge, generate and modify it. The innovation system is at sectoral or national level.

An **agricultural innovation system** is a way of collaborating which brings together several institutions (organizations) working to change the management, technology and institutions in agriculture.

The system may include traditional sources of innovation, modern actors (advanced research institutes and agricultural research institutes), private organizations (multinational enterprises, national and local companies), entrepreneurs and agro-industrial firms, civil society organizations (NGOs, farmers' organizations) and institutional

actions (rules, laws, regulations) which influences how innovations are developed and delivered. In fig. 1 is the scheme of a typical national agricultural innovation system framework.

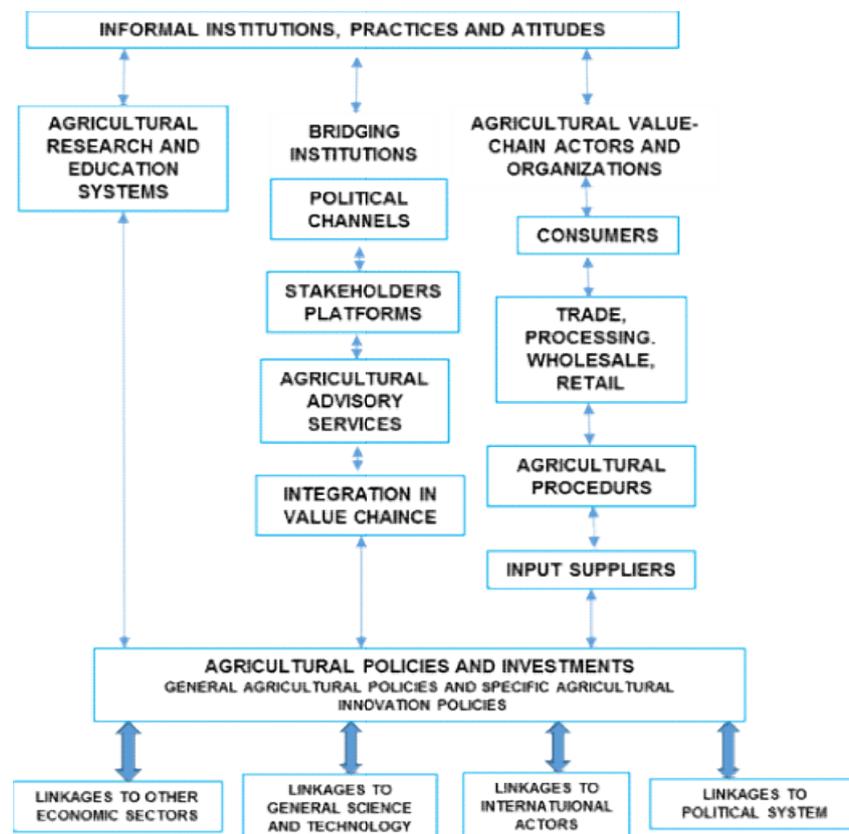


Fig. 1. A typical national agricultural innovation system framework

Source: World Bank (2007), (Anandajayasekeram, 2011)

MATERIAL AND METHOD

An innovation platform is a common space where ideas are analyzed, there are collaboration and learning for innovation. An innovation system in the field of agriculture is focused on the application of inventions in order to obtain social, economic and environmental gains. It is important to recognize institutional, organizational and technological inventions. Only part of the innovation system is agricultural research and technological

development. Major implications for the functioning, organization and management of the research system and the way researchers work have the transition from highlighting research as a central point to a single important component of the innovation system. Reinventing R&D in an open innovation ecosystem and increasing success rates in an increasingly competitive marketplace require implementing significant steps—both perceived and tangible. (*Traitler et al., 2011*). Several stakeholders come together in the private or public sector ecosystem. Those include corporations, important research institutes, international organizations and start-ups that incubate the application of sustainable and innovative results.

The platform brings together the agricultural sectors and operators who intend to make a digital change to help farmers. The digital platform for agriculture allows changing the experience. New activities and experiments are taking place in various sectors and thus digital and innovative models appear. The main obstacles to the implementation of the digitization process in the agro-food sector are lack of expertise, high costs or incompatibility with the field of activity. (*Muraru et al., 2019*).

This approach is certainly becoming of major interest in the political and economic context of the European Union.

Thus, the digitization policy of agriculture becomes a priority which is the basis of the digital platform.

The creation of a new agriculture through the digital transformation of agriculture in the European Community is necessary to solve the major economic, climate and environmental problems and to bring together all the agriculture of the EU states.

In this context, the concept of '**smart agriculture**' appears, which means managing agriculture on a new basis, using digital technology to manage the agricultural resources and optimize agricultural practices and contributions in the complex process of agriculture.

The defining factor in intelligent agriculture is the indefinite decision-making process, by using at the same time the knowledge and data coming from different sources and devices. This defines an optimized process using technology.

The human factor is essential in this process: the center for the whole action is represented by the farmer. This process is advised during the activity by the **innovation brokers** which put him in touch with a devices ecosystem that generates knowledge and shares it, brings experts, etc.

It is essential to promote the **smart agriculture** approaches, to ensure that it is inclusive, people-centered, and holistic and to enable the creation and develop new agricultural entrepreneurship, based on smart decisions.

Smart Farming allows the farmer to become an active consumer of data, to obtain cheap final products. In the context of **smart agriculture**, the farmer can make informed technical decisions and business decisions following the receipt of scientific advice and information in accordance with the market (<http://csabooster.climate-kic.org/>).

The agriculture platform is based on several important principles:

- Sharing best practices and experience between agronomists, farmers, researchers and the related industry ("multi-actor" approach). All this activity takes place with respect for the confidentiality of specific information contained in the Digital Agriculture Platform.
- Maintaining a permanent collaboration between participants, IT networks and researchers with the farmer's network;
- Identifying the elements/factors that influence the concrete implementation knowing the local and/or sectoral specifics and their approach;
- Development of thematic studies and own analyzes. These aim to maintain the activity between the members of the platform.
- Periodic exchanges for the evaluation of technical solutions and results taking into account the social, economic and environmental aspects.
- Openness to digitizing European agriculture to bring together the agricultural sectors and achieve the goal of creating economic and environmental performance.
- Modifying the legislative field by analyzing specific proposals and actions.

The realization of the pilot projects allows the promotion of intelligent agricultural practices and the dissemination of the obtained results. The purpose of the Digital Platform for Agriculture is to develop pilot projects for each agricultural sector, gain experience, and gather relevant results to demonstrate the effectiveness of digitalization agriculture.

It is important that within the digital platform for agriculture, the agricultural sectors in the EU do not correspond to a specific digitization model. Because it benefits from the implications of

digitizing the systems, depending on their specifics, the farmer will choose his own solution, convenient and optimal for his case.

Through the specific activity, the digital platform for agriculture aims the transition of the EU agricultural sectors to results in economy and environment. Without political orientation, the digital platform for agriculture is a place to debate issues, ideas, events and publications. Experts in the field and not only, are found in a common space and participate together in finding optimal solutions. They become visible in the space of the digital platform.

At present, the agri-food sectors must take into account the major demands of our days:

- Keeping rural areas alive and viable, through the existence and development of a profitable agricultural activity in all rural areas in the EU. It promoted an ambitious, sustainable and coherent vision of rural economies.
- Obtaining and supplying safe and quality food, not only to European citizens but also to world markets
- Fight against climate change and the risks associated with the spread of disease through better environmental management.

To achieve these goals, it is time for a major investment in innovation and research. The investment in genetics also intervenes at this moment, all this leads to the development of a concrete approach based on science. The mentality must be changed and take into account the scientific results. Smart and precision agriculture together with policies in the field facilitates the transition of EU agriculture to modern and ecological agriculture. It is important to focus on all policy areas that impact rural business, with a strong emphasis on agriculture and food policies, and especially the Common Agricultural Policy which is the main public lever to act at the European level.

Some digital platforms do not accept individuals as members. Only governmental or institutional organizations, companies, universities, media, business, and trade organizations can participate in the work. Membership gives access to the work of the think tank, to all the staff of the member organizations, and a wide range of publications, events and workshops.

In fig. 2 is the working scheme of a digital platform in the field of agriculture.

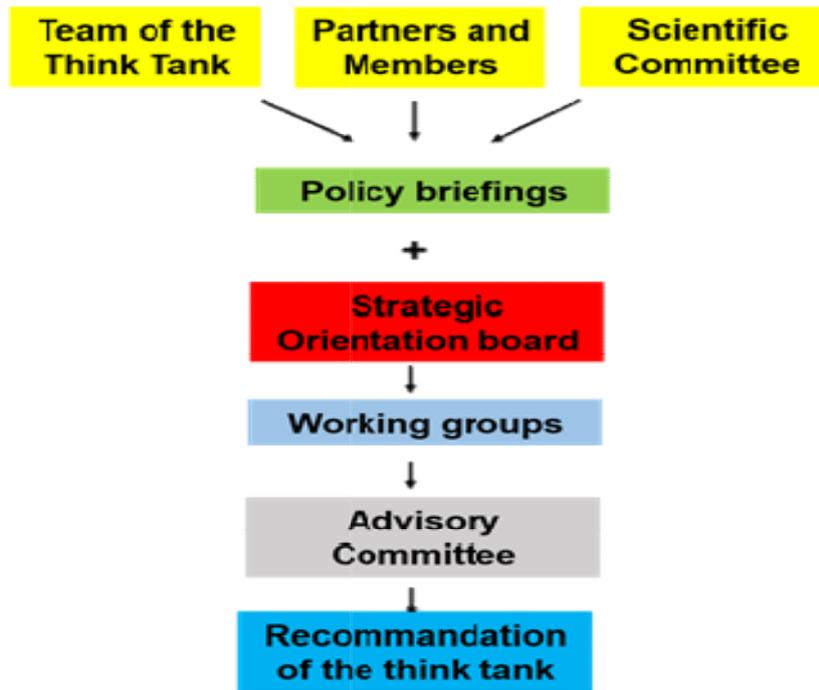


Fig. 2. Working scheme of a digital platform in the field of agriculture

The digital platform develops its expertise and capacity to work on new themes with one-off partnerships or with long-term partners. It organizes regular meetings and tailor-made workshops with partners who contribute to set up the research agenda of the working group.

The working group is open to a few individual honorary members recognized for their contribution and their career in the political or economic world. Honorary members participate in strategic seminars and contribute by bringing their global knowledge of European institutions, political priorities and economic challenges.

The use of high-level scientific technology allows the optimization of water consumption, providing information and recommendations regarding the need for pesticides, disease control and optimal harvesting time. All this information is important in the context of climate change and the high food needs due to the increase the population.

The field of agriculture is placed in a network made up of the biosphere, technology, society and economy. Ecosystems provide essential services that have the role of improving agricultural

production. Some examples would be the prevention of soil erosion, improved pollination, reduction of soil and water pollution (surface and groundwater), improving soil fertility. Agriculture is fully dependent on these natural, ecological and biological systems, their condition over time and the context of the interaction of these systems (<https://bigdata.cgiar.org/about-the-platform/>).

The increase of the population number and the economic context has resulted in the acceleration of the agricultural productions with consequences and risks generated by major imbalances within the ecosystems. Destroyed genetic diversity, homogenized landscapes, massive erosions with accelerated loss of land and water are all direct effects of extremely efficient productivity. If a single component of the ecosystem benefits by increased efficiency, the theory shows that the whole system is more fragile, with the risk of total failure.

RESULTS

The European Innovation Partnership for Agricultural productivity and Sustainability (EIP-AGRI) has been launched in 2012 to contribute to the European Union's strategy 'Europe 2020' for smart, sustainable and inclusive growth. This strategy sets the strengthening of research and innovation as one of its five main objectives and supports a new interactive approach to innovation: European Innovation Partnerships (<https://ec.europa.eu/eip/agriculture/en/about>).

Innovation under the EIP-AGRI may be technological, non-technological, organizational or social, and based on new or traditional practices. A new idea can be a new product, practice, service, production process or a new way of organizing things, etc. Such a new idea turns into an innovation only if it is widely adopted and proves its usefulness in practice. One can only determine afterward whether a new idea has led to real innovation. The two policies complement each other: Rural Development Programs are normally applied within a specific program region, and research policy must go beyond this scale by co-funding innovative actions at cross-border or EU-level.

EIP-AGRI Operational Groups can be funded under the RDPs and are project based. They tackle a certain (practical) problem or opportunity which may lead to innovation and contribute to achieving the program's objectives. The EU member states or regions decide on the precise conditions to support innovation projects through their Rural Development Programs, which operate in a given region or

country. EIP Operational Groups can benefit from an increased EU co-financing rate. Each Operational Group is project oriented and composed of those key actors (such as farmers, advisers, researchers, businesses, NGOs, etc.) that are in the best position to realize the project's goals, to share implementation experiences and disseminate the outcomes broadly. The Operational Group approach makes the best use of different types of knowledge (practical, scientific, technical, organizational, etc.) interactively.

Operational Groups can use support to develop new products, practices, processes and technologies in the agriculture, food and forestry sectors. Further possible areas of action include joint work processes, short supply chains, joint climate change actions, collective environmental projects, etc. Support can cover the funding of the Operational Group project, but also to help set up operational group projects. Innovation brokers can help to develop a rough new idea into an innovation group ready to start a project. Bringing the right partners together and making clear agreements on the concrete work plan and cooperation arrangements is key for the future success of Operational group projects.

Innovation Support Services and brokering will play a crucial role in getting many worthwhile projects off the ground. Innovation Support Services can take the lead in facilitating initiatives that connect actors with an interest in, and ideas on, finding an innovative solution to a shared problem.

CONCLUSIONS

In a changing world, the EU's economy needs innovation to become smarter, more sustainable, and more inclusive. Along with its growth strategy EU 2020, the EU has launched the Innovation union, an initiative aimed to help all EU countries to provide their citizens with a more competitive economy, more and better jobs and a better quality of life.

An 'innovation support service' is a broader term that covers various tasks that support innovation. Aside from providing innovation brokering before, and facilitation during the project, innovation support services may also help to promote innovation and innovation-funding formats, organize brainstorming events and animation of thematic or cross-sectoral groups. They may also coordinate projects, and support the broad dissemination of innovative project results. Some innovation support services use thematic groups or networks which may focus on specific challenges

for a particular sector to deal with. Others invite knowledgeable stakeholders and interested parties to incentivize brainstorming on topics that may have innovation potential. The main conclusion is that the agricultural innovation systems perspective provides a comprehensive view on actors and factors that co-determine innovation, and in this sense allows understanding the complexity of agricultural innovation (Klerkx *et al.*, 2012).

All organizations that support innovation and innovation brokers must have a permanent connection with the field of agriculture and a thorough knowledge of this field. Must have modern and developed communication conditions and skills for communication and interface. It can result in added value, especially in the case of a broad approach, in all directions trying to overcome the existing levels of specialized disciplines, old initiatives and approaches. This can lead to the mixing of several ideas, habits, etc. from different places or groups of people and can lead to more innovative results. Network innovation includes the brightest minds, the most dynamic companies, the most strategic thinkers and the most forward-thinking cities and public authorities committed to climate action and deep decarbonisation through innovation. It includes SMEs and larger corporations, start-ups, graduate students, researchers, scientists, cities, public authorities, NGOs and more.

Innovation in the field of agriculture leads to:

- Collaboration of educational institutions, research, authorities, environmental organizations, farmers and agronomists in online platforms

- Large-scale use of precision agriculture with results in reduced carbon emissions, preservation of relief by avoiding soil erosion, water consumption management (irrigation regulation based on information about soil water needs and depending on weather data), quantity regulation of pesticides and fertilizers, efficient pest control, finding the optimal harvest time

- Research in the field of genetics to adapt the varieties according to climate, soil, etc.

Problems in the field of agriculture are among the most important and current, innovations in this field being a permanent concern within the EU.

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BIBLIOGRAPHY

1. Anandajayasekeram, P., *The Role of Agricultural R&D within the Agricultural Innovation Systems Framework*, ASTI/FPRI-FARA, Conference/Accra, Ghana – 2011;
2. Klerkx, L., van Mierlo, B., Leeuwis, C., *Farming Systems Research into the 21st Century: The New Dynamic* (book), Evolution of systems approaches to agricultural innovation: concepts, analysis and interventions (chapter), pp. 457–483 - 2012.
3. Muraru, V., Cristea, O.D., Muraru, S.L., Dulgheru, A., Berevoianu, B., *Open Innovation in Agro-Food Clusters in Romania*, Proceedings of „6th International Multidisciplinary Scientific Conference on Social Sciences & Art SGEM 2019”, Albena, Bulgaria, pp. 685 – 682, vol. 6, Issue 2 - 2019;
4. Traitler, H., Watzke, H.J., Saguy, I.S., *Reinventing R&D in an Open Innovation Ecosystem*, Journal of Food Science, pp. R62–R68, vol. 76, Issue2 – 2011;
5. *** Climate - Smart agriculture, <http://csabooster.climate-kic.org/>
6. *** Platform for big data in agriculture, <https://bigdata.cgiar.org/about-the-platform/>
7. *** The agricultural European Innovation Partnership (EIP-AGRI), <https://ec.europa.eu/eip/agriculture/en/about>