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Implementation of the Agricultural European Innovation Partnership (EIP-AGRI): state of play and indications for the new 2021-2027 programming period in Italy, Albania, and Montenegro

Cooperating for innovation in agriculture

Policy paper

Damiano Petruzzella CIHEAM Bari, Italy, petruzzella@iamb.it
Vincenzo Fucilli Università di Bari, Italy, vincenzo.fucilli@uniba.it
Serenella Puliga MIPAAF, Italy, s.puliga@politicheagricole.it
Anna Vagnozzi CREA, Italy, anna.vagnozzi@crea.gov.it

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Strengthening and empowering cross-border innovation networks
through **F**ertilization **I**nnovation **L**abs in **A**gro-food for improving the connection between research and SMEs (EIP approach)

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Foreword

Business innovation and competitiveness, especially of farms, are the two fundamental economic development criticalities in Italy, Albania, and Montenegro's cooperation area. Failing to innovate, no business competitiveness improvement based on matching the three sustainable development (environment, social and economic) dimensions oriented to Sustainable Development Goals - SDGs – of the UN Agenda 2030 is possible.
Unfortunately, the European business innovation level, particularly in the Italy, Albania and Montenegro cooperation area, is quite critical, as demonstrated by various international studies.
According to the Global Innovation Index, Italy ranks 28 at the international level, Albania ranks 83, and Montenegro 49 (GEI, 2018). According to the Global Entrepreneurship Index (measuring individual countries' entrepreneurial development across the world), Italy ranks 42 worldwide, Albania ranks 83, and Montenegro 60 (GEI, 2018).
This scenario calls for targeted policies and actions that may raise the innovation level with resulting employment and economic development.

In response to the above criticality, in the latest 2014-20 programming period, the European Union has introduced a new tool for agriculture: the European Innovation Partnership - EIP-AGRI - to foster business modernization in the EU and candidate countries, for the sake of brevity referred to as IPA Countries concerning the *ad hoc* EU Pre-Accession Instrument.
The European Innovation Partnership "Agricultural Productivity and Sustainability" EIP-AGRI, promoted by the European Union for the 2014-20 programming period, extends up to 2022. It aims to strengthen competitiveness for sustainable management of the agricultural and forest systems, ensuring a stable supply of food, feed, and biomaterials developing its work in harmony with the essential natural resources on which farming depends.
EIP-AGRI is a new approach for research and innovation, identifies responses to challenges and simultaneously focuses on social benefits and modernization of the economy. For each sector, EIP involves all the parties interested in cooperation, mostly between the productive system and research.

FILA project "Strengthening and empowering cross-border innovation networks through Fertilization Innovation Labs in Agri-food for improving the connection between research and SMEs (EIP approach) – FILA," supported by the Interreg IPA-CBC instrument, is established and implemented to support the EIP-AGRI implementation process in Italy, Albania, and Montenegro, and especially to strengthen the currently weak collaboration between businesses and research.
The project objective has been pursued through the creation of 3 local “laboratories” relating to the agri-foods sector - ‘Fertilization and Innovation Labs (FILA Labs) - at Valenzano (Italy), Korçë (Albania), and Nikšić (Montenegro).

In the framework of FILA project, the participatory analysis of innovation experiences (especially the Operational Groups for Innovation – EIP-AGRI, established in Italy, and the confrontation among stakeholders (businesses, researchers, innovation brokers, etc.) have highlighted criticalities and weaknesses of the innovation system. It also underlined positive

elements and strengths that, if adequately supported, may ensure a higher innovation level to businesses.
In this study, a process of analysis was performed to listen to various experiences and develop ideas and suggestions for implementing the 2021-27 programming instruments, being aware that strengthening businesses-research cooperation locally and internationally is the only way to contribute to improving the agricultural innovation level.

Introduction

The European Innovation Partnership 'Agricultural Productivity and Sustainability' - EIP-AGRI - was launched by the European Commission Communication of 2012[1] to revitalize the research-innovation relationship. It aims to involve the whole research and innovation chain, coordinating and rationalizing the existing initiatives and instruments useful for innovation, identifying implementation instruments in rural development and research policies.
EIP-AGRI has its roots in the more general initiative of the European Innovation Partnership (EIP), a form to create relationships between all the concerned parties, it was promoted by the European Union strategy "Europe 2020" of 2010 that highlighted three key attributes characterizing the European action for development in the ended last decade: smart, sustainable, and inclusive growth. The first one of these three attributes refers to the important commitment of promotion of knowledge and innovation that the European Union made to citizens and businesses.
The EIP formula goals are:

- "*To re-direct the R&D and innovation policy according to the challenges our society faces, such as climate change, efficient use of resources and energy, health and demographic change*".
- *To strengthen all links of the innovation chain, from "blue sky" research to marketing."*

In doing so, a global revision of all the elements involved in the agricultural innovation chain, like identifying innovation requirements for the system, research, knowledge transfer, and ensuring continuous interaction between research, advisors, and businesses.
The original EIP instrument gave rise to the specific EIP-AGRI for agriculture. This is a European Union initiative to remove one of the frequent barriers to innovation processes: the gap between research results and the adoption of new practices/technologies/organizational forms by farmers, businesses, and consultancy services.

EIP-AGRI goal is to tackle broad but targeted topic areas that were and still are in the agricultural production field: efficient use of resources, profitability, competitiveness, reduction of emissions, climate friendliness and climate resilience in agriculture and forestry, approach to agro-ecological systems in harmony with essential natural resources which the farming and forestry depend on; steady and sustainable supply of existing and new food, feed, and biomaterials; improvement of environment protection methods, mitigation, and adaptation to climate change. Many of these thematic areas confirm their importance even in the current and unpredictable scenario caused by the ongoing pandemic. The connection between research and advanced acquired technologies and farmers, rural communities, businesses, and consultancy creates value added to research, encourages the fast and large-scale adoption of innovation, and makes the scientific community aware of agricultural research's real needs.

Therefore, this highlighted innovation as a vital element of the objectives of the 2014-20 programming period, in all sectors for growth, competitiveness, and employment, and the appropriateness of an integrated policy approach in different sectors.

[1] Communication COM(2012) 79 European Innovation Partnerships 'Agricultural Productivity and Sustainability',

The 2014-2020 programming period for the use of the European Structural and Investment funds (ESIF) and the related national co-funding has consistently included *"Strengthening research, technological development and innovation"* and *"Fostering competitiveness of small and medium enterprises, agriculture, fishery and aquaculture",* and, as part of sustainable growth, equally essential objectives like "*Promoting adaptation to climate change, risk prevention and management"* and *"environmental protection and promotion of the efficient use of resources"* among its thematic objectives.

The innovation policy promoted through EIP-AGRI is a bridge between sectoral policies and research policies. In the programming period now almost to its conclusion, it has been implemented also using instruments that were not previously present, namely:
a) The instruments reported in the rural development regulation (Reg 1305/2013): the European Innovation Partnership Network and Operational Groups, like partnerships including all the parties concerned with agricultural innovation (farmers, researchers, advisors, agri-food entrepreneurs) for implementing innovation actions.
b) The instruments present in the Horizon 2020 programme for research and innovation, and the numerous topics related to agriculture, including food security, bio-economy, and sustainable agriculture. The adequate instruments conceived to foster innovation in this topic area are mainly the *multi-actor projects* and the *thematic networks*.
In the rural development 2014-2020 programming period, predominantly developed on a regional basis (RDP – Regional Development Programmes) and partly at the national level (NRDP – National Rural Development Programme and Rural Network), the support to innovation processes also concerns, through other RDP measures, individual investments, business modernization and collective investments to share research and development paths along the chains, local farming, and forestry systems. In any case, the systemic, multi-actor, and cross-disciplinary approach implemented through interactive cooperation among the players of different topic areas, and thus bearers of other (scientific, practical, formal, informal, etc.) types of knowledge seems to be the most viable to identify and provide practical and tailored solutions in response to specific problems and opportunities of businesses, territories, chains, and production systems.
The actions of the regional programming to foster innovation are included in "Measure 16 – Cooperation" implemented with the support to diversified cooperation forms and beneficiaries to overcome the economic, environmental, and other disadvantages related to fragmentation, and so favouring innovation development and the promotion of knowledge transfer to agriculture, forestry, and rural areas. Measure 16 fosters innovation and cooperation in rural areas, improves farm competitiveness, pursues agroclimatic and environmental objectives, and facilitates small enterprises' diversification, creation, and development.

The "sub-measures" 16.1 and 16.2 of the RDP promote innovation through cooperation by funding the Operational Groups (OGs) and pilot projects for developing new products and processes. The different procedural and financial implementation modalities that the Italian Regions have adopted complicate the survey on the types of initiatives and the allocated funding. Nevertheless, such data are crucial for monitoring to highlight the instrument's adequacy and effectiveness.
The Operational Groups (OGs) are then part of EIP-AGRI. Following the regional public call, they are composed of the concerned parties like farmers, researchers, advisors, and agri-food

entrepreneurs relevant to achieving the EIP objectives. The OGs elaborate a plan containing the following elements: a) a description of the innovative project they intend to develop, test, adapt or implement; b) a description of expected results and contribution to the EIP-AGRI objective of increasing productivity and improving sustainable management of resources. The OGs disseminate the implemented projects' results, mainly through the EIP network, as stated in the EU Regulation. Therefore, the promotion of innovation in Italy and in Puglia region is based on the rural development programming instruments. In contrast, in Albania and Montenegro, which rely upon the pre-accession instruments to the European Union, a strategic path inspired by what occurs in other European countries has been launched.

The EIP-AGRI initiative is part of the broad approach to research, training, and services, which is conventionally summarized as Agricultural Knowledge and Innovation System – AKIS - covered in Chapter 2.
The future of the coming 2021-2027 policies for enhancing innovation shall be inspired by the strategic European framework outlined from 2017. It still recognizes the crucial role of the knowledge system to foster a fair transition towards a sustainable development and food production system.

1. Analysis of the EIP-AGRI approach experiences in Italy, Albania, and Montenegro

1.1. The EIP-AGRI in Italy

1.1.1 EIP-AGRI objectives in the 2014 - 2020 RDP of the Italian regions (sub-measures 16.1 and 16.2)

The agricultural regulatory and financial EIP-AGRI framework was presented in the rural development European Regulation (EU Reg. 1305/2013) for the creation of an EIP-AGRI European Network to provide guidance and promote specific actions to be funded ("sub-measures") under its programming Rural Development Programme (RDP) instrument. The regulation and some guidance documents of the European Commission have clarified that innovation promotion and dissemination had to be implemented through Operational Groups (OGs), partnerships among innovation chain operators, which have to design and manage actions to solve agriculture and forestry problems or enhance existing opportunities through one or several innovative available solutions. A key element of the OG action is the dissemination of these innovative solutions to the concerned businesses.
The OGs have been supported by the RDP through sub-measures 16.1 and 16.2[2].
As mentioned above, some methodological elements characterize the approach of this initiative:

- The interventions of innovation promotion start from a detailed check of the users' needs.
- The components of OG partnerships are also operators of the innovation and knowledge system and experts of the project contents.
- Work arrangements refer to the interactive participation model considered to be the most efficient among more traditional methods since operational dialogue among researchers, entrepreneurs and technicians improves innovation applicability and dissemination.

Participation in the Italian RDP has been quite large, with an estimated budget of about 205 million euros and 626 envisaged OGs (NRN February 2020). The Italian RDPs fall under the Regions' responsibility and autonomously decide how and whether to participate in the actions stated in the rural development Regulation. Only Val d'Aosta has not activated the sub-measure that funds the OGs.
In Europe, 27 member States have activated the EIP-AGRI initiative voluntarily. It is operating in 98 RDPs. The total envisaged number of OGs is about 3200 (EC March 2020).

[2] Since the European Commission proposed different procedural modalities to select and fund the OGs, the Italian Regions decided, based on expediency considerations, diverse modalities. Therefore, in some Regions the OGs are funded both through sub-measure 16.1 and sub-measure16.2.
For further details, please refer to *Innovarurale* of the National Rural Network that reports the progress of actions https://www.innovarurale.it/it/pei-agri/documenti?field_tipo_doc_value%5Bpsr%5D=psr.

Facilitation and procedure setting activity in the rural territories, relating to the EIP-AGRI initiative, has fostered an interesting dialogue between public national and regional institutions and the parties concerned with implementing innovation projects. Numerous solutions have been proposed and several criticalities have been observed.
One preliminary matter was about whether to indicate or not at the programming stage the key topics of the OG action of each Region. Some Regions considered it essential, but during the consultation with the European Commission, they had to desist since their attention was called on the importance of allowing the OG partnerships to be as free and creative as possible.
Another option was choosing the most appropriate modalities to allow businesses to play a central role in the initiative both in terms of participation in the partnerships and implementing their autonomous activities eligible for funding.
The need to have the OGs as a place of interactive participation of all the agricultural knowledge and innovation system components was much debated. In some cases, the need was stressed to "mitigate" the role of research institutions that, since they were more accustomed to participating in partnership projects, undoubtedly have greater managerial capability. In some other cases, the need of also involving business advisors in the project was apparent. They were supposed to play a crucial role in the connecting activity between research and businesses.

Finally, the administrative and financial complexity in managing the action under the RDP was quite evident. The formulation of calls, their management until the issue of rankings and the control of allocated and expended funds, and the verification of results are all particularly complex in the frame of the procedural rules of rural development policies.

1.1.2 Governance approaches

The EIP-AGRI initiative is a classical public action to promote development, characterized by precise strategic indications recommended to pursue a better global result of the action. It is then fundamental for the relevant institutions to set the implementation path through procedural, communication, and financial choices; in other words, the process's governance plays a key role for more effective action.
The current quite advanced implementation stage allows us to make some comments starting from the information available in the communication instruments of the national rural Network and some in-depth studies.
The critical aspects of the governance process appear to be:

a. the negotiation with the offices of the European Commission upon the approval of the RDP,
b. the operational approach of the RDP Measure (in this case, it refers to sub-measure 16.1 of Measure 16),
c. the information and facilitation activity addressed to the participants,
d. the approach to and the contents of calls (with reference to the selection criteria),
e. the modalities of assessment of the projects and the composition of rankings,
f. ongoing support and monitoring of the action of Operational Groups,
g. administrative and financial control and management processes.

The abovesaid elements can be easily grouped under two action areas: the formal implementation of the action and consistency with the rules (a, b, d, e, g), the promotion of the initiative among potential users in terms of information and support (c, f).
The Regions differently managed the negotiation with the European Union. The formal and consistent implementation of the action with the rules (a, b, d, e, g), the promotion of information about, and the support to the initiative among potential users (c, f).
The regions differently managed the negotiation with the European Commission (a); in some cases, the EIP-AGRI action fully adapted to the European requests; in other cases, they followed their strategy trying to hold a dialogue with the contact persons of the Commission and they succeeded to make an action more tailored to the regional needs.
The formulation of the datasheet of sub-measure 16.1 (b) then derived partly from the Regions' internal procedural choices, and partly from the dialogue with the Commission.
The structure of the action is approximately uniform in every Region. The differences concern the choices related to:

- the modes of funding, whether only under sub-measure 16.1 or under several measures of the RDP consistently with EIP-AGRI projects,
- the opportunity or not to foster the creation of partnerships and the drafting of the projects by an action that funds the project group's creation and the project idea finetuning before promoting the selection of Operational Groups,
- precise indications relating to the eligibility of expenditure and modalities of reporting.

The abovementioned choices resulted in a variety of action implementation modes among Regions. This made the Operational Groups' financial and administrative promotion processes not very uniform, thereby making applicants' participation in projects in several Regions complex.
Information, facilitation, and support activities to participants (c, f) are among the most crucial governance actions to ensure a public policy action's consistency with the envisaged strategic orientations and approaches. They are actions of varying nature: the presentation and confrontation seminar to be held at the beginning, the technical discussion table among the representatives of the concerned parties, specific training times to support participants in drafting the projects, availability of information desks, the supply of working tools such as databases of innovation or expert players. Almost all the Italian Regions promoted some of the abovesaid initiatives, in some cases with the national rural Network's support. These actions usually require the involvement of human resources that the regional agriculture departments have not. They often collaborate with technical instrumental bodies, if any is present and available. This is the case of the technology park of Umbria, *Veneto Agricoltura* in Veneto, the Agency of Services to the Agri-food sector of Marches, the Foundation Edmund Mach in the province of Trento.
Another crucial aspect for implementation to be as consistent as possible with the founding spirit of EIP-AGRI is the structuring of the call for the project selection and management (d). The essential conditions for OG partnerships are crucial. In general, they refer to the presence of some players like farm entrepreneurs and research institutions and/or consultancy among the implementing parties, and a specific financial dimension. Moreover, the criteria selected for awarding the scores the selection boards may adopt are decisive due to their weight and qualitative characterization. Some Regions, for instance, have much rewarded the scientific

level and the degree of innovation of the proposal (Umbria, Emilia Romagna), others have stressed the project response to the real businesses' problems and its consistency with the regional agriculture characteristics (Veneto, Marches); other regions emphasized the central role of dissemination actions in the project (Basilicata), others stressed the consistency of the proposed innovative activities with other development actions promoted by the regional policy (Umbria, Veneto).

Finally, the level of administrative and financial complexity (e, g) of the approval and management process of the Operational Groups' projects is certainly high. The general rules about the disbursement of rural development funds are complex. They do not readily apply to basically intangible types of actions like innovation knowledge promotion, and dissemination.

The establishment, funding, and control of complex partnerships and multi-annual projects with actions of different nature exhibit difficulties both before the project approval and at the verification stage of activities, but especially for their effects and results. The starting documentation that each partner had to produce to access to partnership and the execution modalities of some expenses based on tenders and comparisons between providers has slowed down the procedure and made project choices more muddled. Halfway of EIP-AGRI, after the national rural Network has made the definition of some standard costs available, the Regions have started a streamlining process that still needs to be extended and improved.

1.1.3 Implementation results

As at 31 August 2020, in Italy, the projects of 545 Operational Groups were officially approved under a total allocated contribution slightly exceeding 181 million euros (Tab.1). These OGs operate in 14 Regions and autonomous Provinces that have completed the tender and ranking approval procedures. Nevertheless, 6 of them are still performing the administrative selection activities (among the Italian Regions only Val D'Aosta has not included the EIP-AGRI initiative in the RDP).

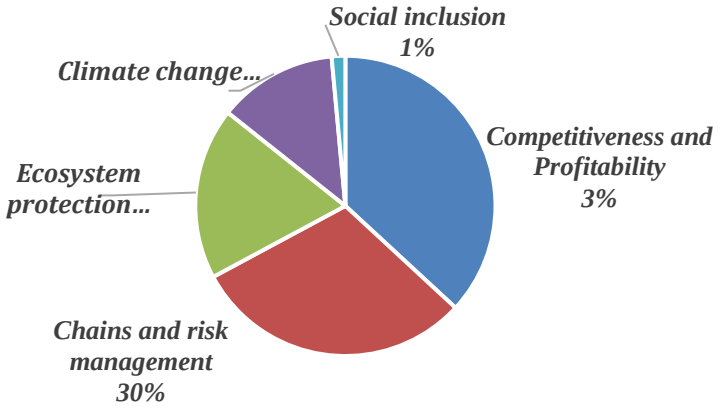
Table 1: Operational Groups approved in Italy as at 31 August 2020: number and allocated contribution per Region

Region	Total qualified OGs (n)	Total allocated contribution (€)
Basilicata	11	2,800,000
Bolzano*	3	749,970
Campania	42	13,349,863
Emilia-Romagna	165	34,379,436
Friuli V.G.	8	2,258,901
Lombardy	25	12,723,095
Marches	49	14,813,539
Piedmont	6	872,961
Puglia	52	24,547,039
Sicily	54	27,000,000
Tuscany***	49	14,587,453
Trento	12	3,946,979
Umbria**	13	5,268,.553
Veneto	56	23,763,598
Totale	**545**	**181,061,387**

** Bolzano: 2 OGs awaiting to be accepted*
*** Umbria: 4 OGs awaiting to be accepted*
**** Tuscany: 6 OGs awaiting to be accepted*
Source: National rural Network elaboration from direct collection of information and from websites of the Managing Authority

In absolute terms, Emilia Romagna is the region that has invested more on EIP-AGRI with more than 34 million euros, followed by Sicily, Puglia, and Veneto regions. The average financial availability of OGs per Region is another interesting element worthy noting. It shows that some regions have chosen to fund large projects, such as Lombardy, Sicily, Puglia, others have decided to promote smaller actions, such as Piedmont, Emilia Romagna, and Friuli V. Giulia. For Emilia Romagna, the high number of projects – as high as 165 – was favoured over the average availability of resources.
The analysis of the number of Operational Groups, based on the strategic priorities of rural development (Figure 1), shows that the innovation projects' objectives especially concern business competitiveness and the chain approach, namely the businesses' economic problems followed by environmental protection, and the response to climate change. The importance of the social innovation theme was limited.

Figure 1. Number of OGs per rural development priority (31 August 2020)



Source: NRN processing from direct collection of data and the websites of the Managing Authority.

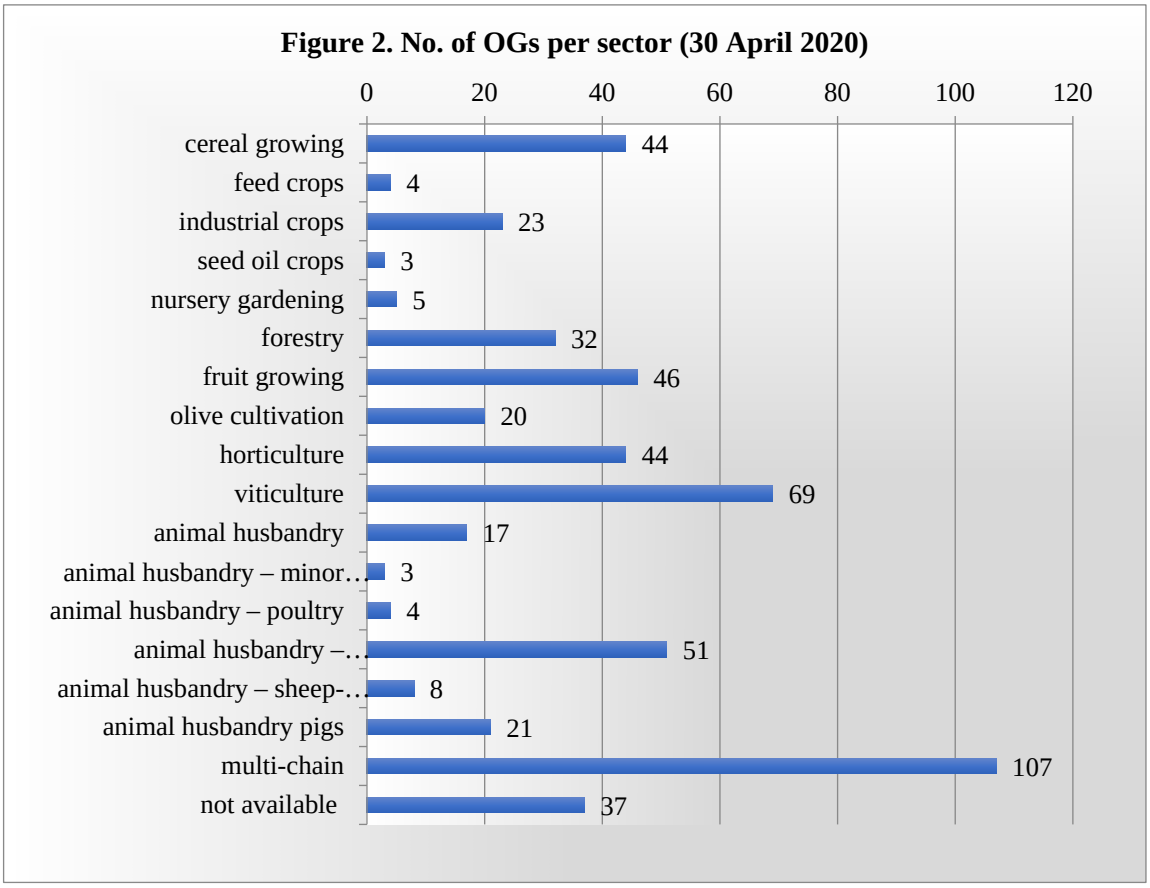
Concerning the projects' technical and production contents, the current national Rural Network's information is available as at 30 April 2020. It corresponds to more than 500 OGs (Fig 2). Viticulture exhibits the highest number of projects followed by beef husbandry, fruit growing, cereal growing and horticulture.

A cross-check of the production technology, experimented by the OGs and of which they disseminate innovations, is equally interesting since it gives an idea of the current most pursued solutions in response to the business and sector problems.

Surprisingly, business management (Fig 3) is the area for which most businesses request the highest support. Organic agriculture, biodiversity, agri-food chains, plant protection from diseases and infestations follow. Economic themes alternated with environmental topics require more knowledge and improvement in the Italian productive fabric.

Some choices of the Regions can be checked to verify their content differentiation also relating to farming characteristics:

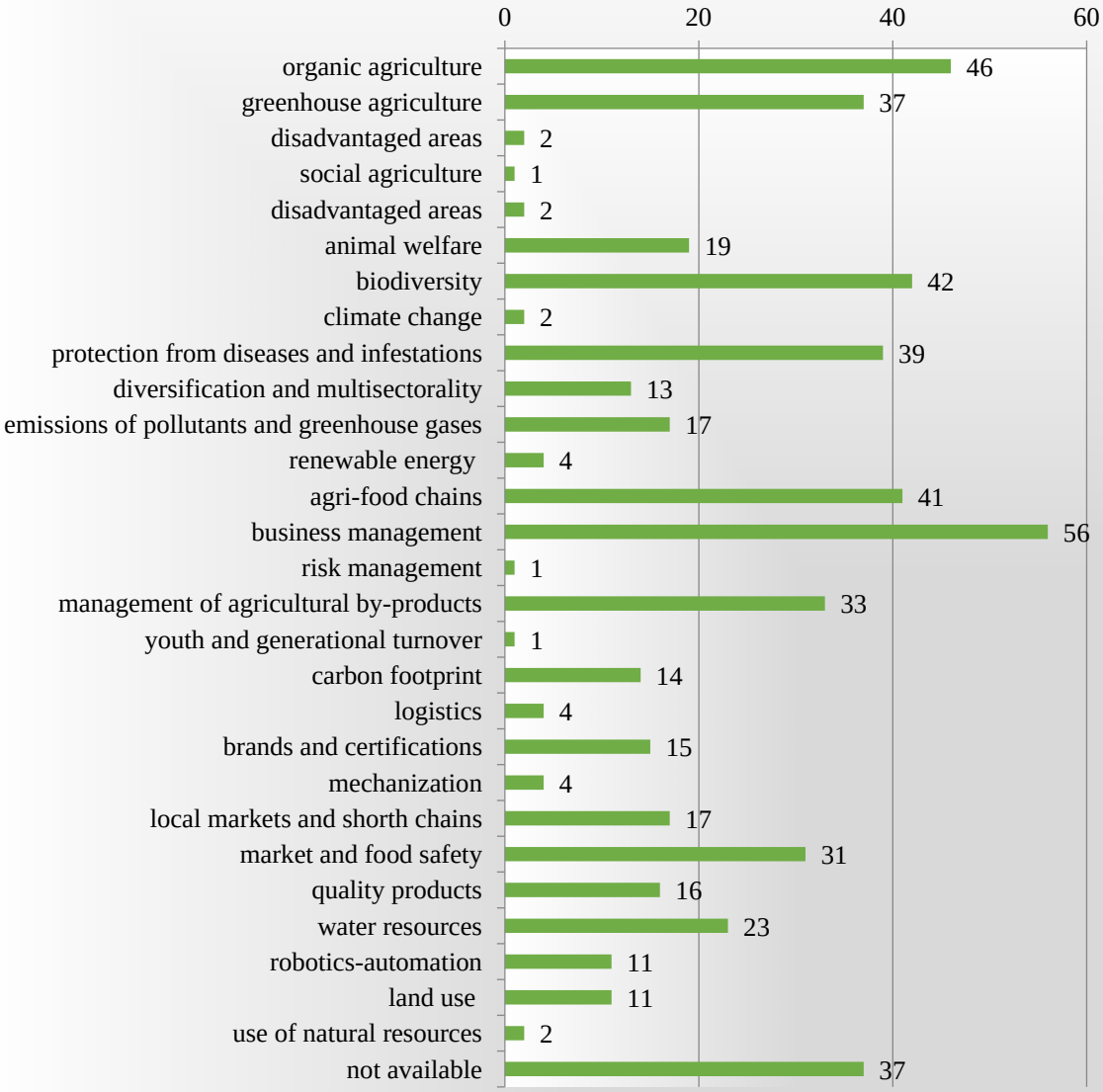
- Basilicata, Bolzano, Lombardy, Marches, Piedmont, Puglia, Sicily have chosen to invest only on economic themes (profitability, competitiveness, chain);
- Campania, Emilia Romagna, Piedmont, Tuscany, Trento, Veneto have focused on energy supply from renewable sources,
- Emilia Romagna, Tuscany, Trento, Veneto, among other things, have promoted actions for climate change mitigation,
- Emilia Romagna, Trento, Veneto have focused a fair amount of funding on irrigation issues.



Source: NRN from direct collection of information and from websites of the Managing Authorities

Little information and data are provided by the guidance documents and the statutory indications of the European Commission and that may help understand if the EIP-AGRI initiative has consistently responded to the supported approach: centrality of needs, system-oriented measure, interactive participation.
Partnership analysis projects can provide an estimate; the qualitative and quantitative types of participants can be an important indicator of the success or failure of the desired co-creation and co-management achievement of the innovative process. The EIP-AGRI Operational Groups' database available on the pages dedicated to innovation in the National Rural Network's Portal can help (https://www.innovarurale.it/it/pei-agri/gruppi-operativi/bancadati-go).

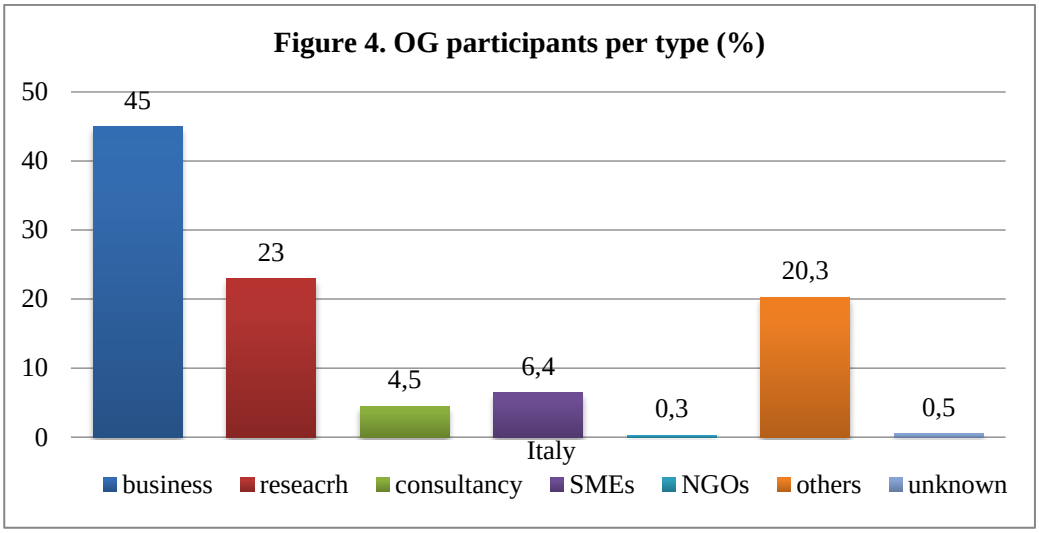
Figure 3. No. of OGs per cross-cutting themes (30 April 2020)



Source: NRN processing from direct collection of information and websites of the Managing Authority

The database contains (as at September 2020) the datasheets of 352 OGs and counts approximately 3000 involved parties in the projects. Net of the presence of the same parties in different OGs, the number of public and private facilities related to the Italian knowledge and innovation system is certainly high and will increase still further as all the OGs add their datasheet in the database.

In percentage terms, the involved parties are distributed in the typological categories indicated by the European Commission as reported in the graph below (Figure 4).



Source: Database of the Operational Groups of the site Innovarurale.

Most of them, almost 50%, are businesses, followed by research facilities, small and medium enterprises, and only 4.5% business consultancy. The category called *others* gathers a considerable number of parties, 20%; it may be an indicator of the presence, in the knowledge and innovation system, of new parties or conventionally unimportant parties that should be surveyed to understand their role in the innovation processes. The partnerships analysis shows that businesses play a key role in OG projects. This is a positive signal of the importance of their needs; the important presence of research bodies can also be an indicator of acceptance of the EIP-AGRI approach whose regulation envisages to build bridges between entrepreneurs and the research system.

The EIP-AGRI initiative is quite successful in Europe. In May 2020, 1,464 OGs were registered in the specific European database. Italy has the highest number, equal to 23% out of the total, followed by Spain (19%), Holland (14%) and Germany (12%). France represents hardly 9%, Poland 2%. This means that the number of projects and the decision of investing in this initiative were not related to the importance of agriculture in various countries.

More than 65% of the European OGs were concerned with environment and climate change-related themes. The types of partners in the OGs in Europe follow the situation previously mentioned for Italy: high number of businesses (28%) and research bodies (20%), low involvement of consultancy (9%). In other European countries there is a fair number of small and medium rural enterprises (15%) and the percentage is quite high in the category *others* (25%).

To conclude, the following positive aspects are observed:

- awareness of the central businesses' role in projects,
- the central businesses' and research bodies' role in the OGs,
- the presence of parties unconventionally considered to belong to the knowledge and innovation system that may respond to new agricultural needs and orientations.

Nevertheless, some other critical elements need to be solved:

- awareness of the difficulty of always involving businesses effectively,
- impossibility for the Regions to make strategic choices of the OGs' contents in the RDP,

- extreme diversification of approaches, contents, and procedural choices among Regions. This jeopardizes those participating in projects in various regions,
- the administrative and financial complexity of EIP-AGRI implementation within the rules of rural development policies,
- the central role of facilitation and involvement actions of stakeholders in setting up the EIP-AGRI approach is not always duly considered in all Regions,
- impossibility to grasp, at this stage, the correct implementation of the interactive approach,
- widespread scarcity of the technical advisors' involvement.

1.2. EIP-AGRI in Puglia region

1.2.1 The EIP-AGRI objectives in the 2014 – 2020 RDP of Puglia Region (sub-measures 16.1 and 16.2)

The Puglia region RDP finances actions under all the six rural development priorities, with special focus on preservation, restoration and enhancement of the ecosystems related to farming and forestry as well as to strengthened agricultural competitiveness.
In the Puglia region RDP, innovation is pursued through continuous learning and vocational training of entrepreneurs and operators of rural areas for sustainable development with the support to vocational training and acquisition of skills, improvement of basic knowledge of workers in agriculture and forestry, especially focusing on innovation and cooperation issues; moreover, it ensures the presence of professionals who can match innovation demand and supply, fostering dialogue between the players of the System and facilitating the processes of technological transfer on the territory (innovation broker). It supports the increase of both production and organizational innovation level between research and farmers, forestry, and food businesses. This path requires various types of actions like the need of networking the knowledge system players, environmental protection innovation to improve knowledge of regulatory and production aspects.

The set of measures 1, 2, 16 (16.1 and 16.2) constitutes the regional challenge to Focus Area 1A: fostering innovation, cooperation, and development of basic knowledge in rural areas, namely, the design of the RDP to meet the challenge posed by EIP-AGRI. The context analysis of the RDP has shown that the knowledge system, the production system and the public government institutions are not ready yet to adopt the ideal model of regional development to ensure correct and steady functioning of the existing links and dynamics between agriculture and forestry, on one hand, and the world of research and innovation on the other hand. Therefore, the strategy outlined in the RDP is based on the identification and promotion of innovation in a collaborative way through the support to both cultural and technical growth of operators as well the support to cooperation projects (of the OGs) by advisors/support services to innovation.
Therefore, the innovation that the Operational Groups intend to promote, and transfer is oriented to achieve specific and concrete results in favour of the primary sector businesses, through the application of research results, the implementation of new ideas, the testing and adaptation of existing techniques/practices in the scope of the envisaged thematic areas.

The approach to innovation proposed by the Region appears to be complete in its policy and strategic parts. The progress of activities instead, still suffers considerable time delays due to the apparently too complex administrative/bureaucratic activities.
Sub-measure 16.1 of the Puglia region RDP pursues the objective of fostering and supporting the creation of groupings capable of exploring the innovation needs of farms. This sub-measure envisages the setting up of OGs relating to the following themes:

- sustainable increase in productivity, profitability, and efficiency of resources in the agro-ecosystems,
- climate change, biodiversity, soil functionality and other ecological and social agriculture services,
- coordination and integration of chain processes, and strengthening the agriculture role,
- quality, typical characteristics and safety of farming and food products and healthy lifestyles,
- sustainable use of bio-resources for energy and industrial purposes,
- prevention, control, and fight against phytopathological diseases resulting from quarantine pathogens.

The following parties can contribute to the proposals for setting up the Operational Groups: farms, SMEs in rural areas, traders, service enterprises, public authorities, players operation in the production of research, knowledge and transfer of innovations, Non-Governmental Organizations – NGO, associations, consortia, producers' organizations, businesses' representatives and other groupings, players operating in training, dissemination and information, players who professionally provide advisory services.
Sub-measure 16.2 supports the OG's implementation of pilot projects and development activities of new products, practices, processes and technologies in the agri-food and forestry sector, as well as the transfer and dissemination of the results obtained. It is aimed at supporting projects that provide concrete responses to the innovation needs of enterprises by promoting experimentation and verification of the applicability of technologies, techniques and practices relating to Apulian business, geographic and/or environmental contexts. The project activities implemented by the operational group shall be oriented to achieve specific business results, through developing and applying research results, the implementation of new ideas, the testing and adaptation of existing techniques/practices compliant with the EIP objectives, the needs identified in the context analysis and the priorities identified by the 2014-2020 RDP.

The beneficiary of the support is the Operation Group (OG), irrespective of whether or not it has participated in sub-measure 16.1; it may have the legal form of public entity Groupings or Grouping with no legal personality but registered by a public deed and composed of the following stakeholder categories: farms and forestry enterprises, SMEs in rural areas, traders, service enterprises, public authorities, players in the production of innovation research and transfer, NGOs, associations, consortia, producers' organizations, enterprise representatives and other forms of groupings, players operating in training, dissemination and information, players who professionally provide advisory services.
The OG project shall include at least one of the following topics:

- sustainable increase of productivity, profitability, and efficiency of resources in the agro-ecosystems,

- climate change, biodiversity, soil functionality and other ecological and social agricultural services,
- coordination and integration of the chain processes and strengthening the role of agriculture,
- quality, typicality and safety of farming and food products and healthy lifestyles,
- sustainable use of bio-resources for energy and industrial purposes,
- prevention, control, and fight against phytopathological diseases resulting from quarantine pathogens.

1.2.2 Governance approaches

For the selection of the proposals to be included in sub-measure 16.1, the principles for defining the selection criteria consider the SWOT analysis output and the indications from the need analysis included in the RDP. In particular:

- the proposal's relevance to the EIP objectives, to the needs identified in the RDP context analysis and to the priorities of the present RDP,
- potentials of the submitted project idea with a view to achieve the EIP-AGRI and the RDP objectives.

For the selection of proposals to be included in sub-measure 16.2, the principles for defining the selection criteria consider the SWOT analysis output and outputs from the need analysis of the present RDP analysis as listed below:

- quality of the technical-scientific proposal in terms of timing adequacy and budget,
- potential return of the proposal in terms of applicability of results,
- consistency with the OG project objectives and with the priorities of the present Programme, and meeting the needs identified in the RDP context analysis,
- composition and relevance of partnership to achieve the project objectives,
- partnership dimension in terms of economic players who participate in the project implementation,
- quality of the communication plan for the disclosure and dissemination of results.

Sub-measure 16.1 started with the managing authority decision - DAG no. 247 of 22 July 2016 - that approved the public notice for the submission of support applications, opened on 18 July 2017 and closed on 4 October 2017; by the DAG decision no. 51 of 01 March 2018, the assessment results of the proposals were published. The sub-measure 16.1 is closely related to sub-measure 16.2 since the promoting parties of the action plans assessed as eligible, must subsequently transform ideas into contents/operating actions, define a detailed implementation plan, support the partnership establishment and its related roles, define the legal form and prepare a proposal of pilot project and/or development project of new products, practices, processes and technologies to be submitted under sub-measure 16.2, in accordance with all the elements governed by the corresponding public notice.

Sub-measure 16.2 was launched by the Managing Authority decision - DAG no. 194 of 12 September 2018 - through the approval of the Public notice for the submission of support applications. DAG no. 280 of 12 December 2018 has extended the deadline of the Support

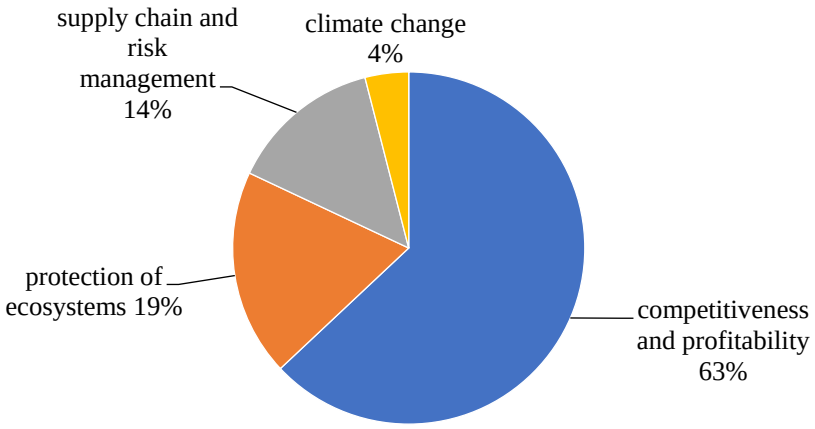
Applications to 15 January 2019. The decision DAG no. 501 of 23 December 2019, published in the Official Gazette of Puglia Region - BURP no. 1 of 2 January 2020 - approved the temporary ranking of the eligible support applications. The decision DAG no. 142 of 7 April 2020, published in the Official Gazette of Puglia Region - BURP no. 53 of 16 April 2020 – approved the final ranking of the eligible support applications, the remodulation of the budget and moved on in the ranking of project applications. The first decision of the granting of aid no. 116 of 18 June 2020, was published in the BURP no. 93 of 25 June 2020.

The previous description highlights some comments somehow similar to those about the national scenario, or peculiar to the Apulian situation. Both the matters referring to the structuring of notices (for instance, the categories of implementing bodies) and the criteria (and related weights) chosen for assigning the scores are somehow similar to the decisions taken in many other regions (specifically for Puglia region, bonuses recognized for innovativeness of the proposal and for the dissemination activities). Indeed, a careful analysis should focus on the huge difficulties encountered downstream the presentation of notices but especially because of the absence of the preparatory function of sub-measure 16.1 with respect to16.2.

1.2.3 Implementation results

As at 31 August 2020, in Puglia region, the projects of 49 Operational Groups were officially funded, compared with the 52 projects accepted as eligible and that could be funded, and compared with the 116 eligible[3] projects for a total allocated contribution of 24,547,039.00 euros. The analysis of the number of Operational Groups according to the strategic rural development priorities (Figure 5), highlights that the objectives of the innovation projects especially concern business competitiveness and the chain-oriented approach; then, followed by the economic businesses' problems, environmental protection and then the response to climate change.

Figure 5. Number of Puglia region OGs per rural development priority

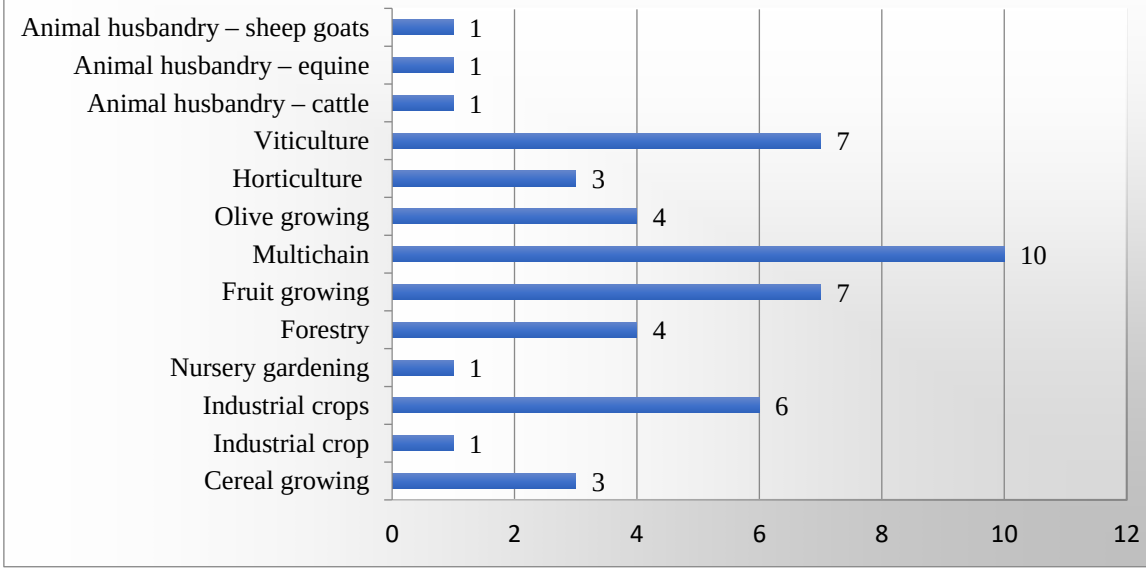


Source: our processing from direct collection of information.

[3] Decision of the RDP Managing Authority Puglia 7 April 2020, no. 142. R.D.P.

By classifying the projects per production sector (Figure 6), the innovative projects concerning the chains do prevail. They are followed by projects focusing on specific production sectors such as fruit growing, vine growing and industrial crops.

Figure 6. Number of Apulian OGs per sector

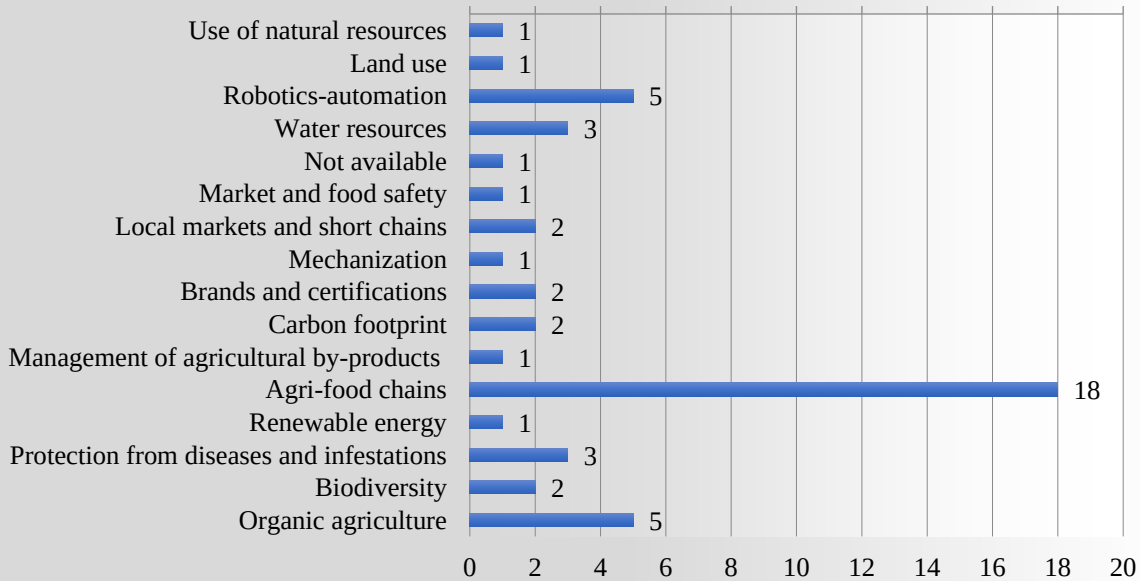


Source: Our processing from direct collection of information.

It is equally interesting to check the cross-cutting thematic areas or, even better, the production technology that the OGs experiment and of which they disseminate the innovations because it gives an idea of the currently most pursued solutions in response to the businesses' and the sector's problems (Fig. 7). Businesses estimate to introduce innovations especially in the agri-food chain, followed by organic agriculture and the introduction of new technologies (robotics – automation). These productivity-related themes, alternated with environmental themes, are thus deemed to require some changes with some margins of further production and environmental improvement performance.

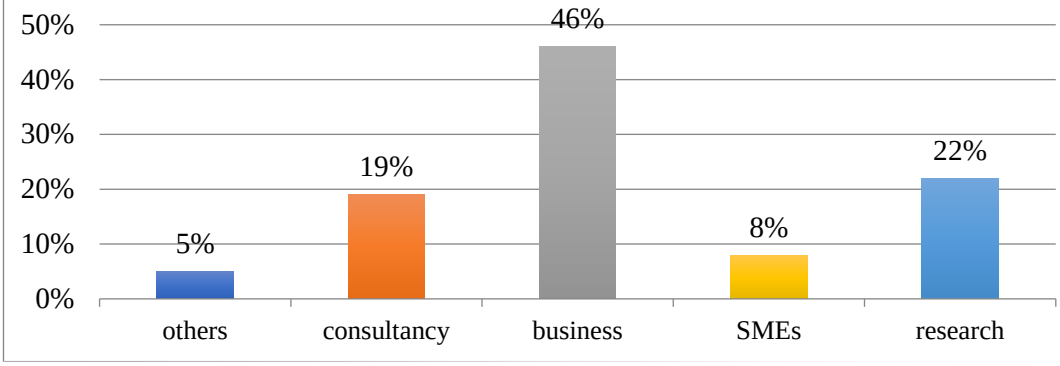
A general indication can be drawn from the analysis of the project partnerships (Figure 8). As previously highlighted at the national level, the qualitative and quantitative types of participants can be an important sign of the success or failure of the desired innovative process co-creation and co-management. The survey has shown that the partners of Apulian OGs are 440. Net of the presence of the same players in different OGs, the number of private and public facilities relating to the knowledge and innovation system is certainly high (approximately equal to 9 partners per OG on average).

Figure 7. Number of Apulian OGs per cross-cutting themes



Source: Our elaboration from direct collection of information.

Figure 8. Participants of Apulian OGs per type



Source: Our processing from direct collection of information.

Most of the Apulian OGs players are businesses, 46%, followed by research facilities and consultancy businesses. The data on SMEs are not easily detectable because of little information being available.
The analysis of partnerships shows that businesses play a central role in OG projects and, for Puglia region as well, this is a positive indication of the importance of their needs; the high number of research bodies as well can be an indication that regions follow the EIP-AGRI approach.

1.3. Promotion of innovation in the two IPA countries: Albania and Montenegro

The challenge of innovation for the European ecological shift, where agriculture is a leader, could be faced through involving neighbouring EU countries, and even more so the countries

wishing to join the EU. The IPA pre-accession eligible countries, and those benefiting from the IPARD rural development instrument receive financial and technical assistance to improve agriculture and rural areas sustainability and align with the EU common agriculture policy. Albania and Montenegro, which participate in FILA initiative, are candidate and beneficiary countries, in addition to Northern Macedonia, Serbia and Turkey. Beneficiary countries contribute by national funds to the implementation of the IPARD programmes based on measures defined by the European Union, but in the 2014-2020 programming period only some measures of rural development are activated, namely:

- Measure 1 "Investments in physical assets of agricultural holdings"
- Measure 3 "Investments in physical assets concerning processing and marketing of agricultural and fishery products" designed for adapting the projects on food processing plants to meet EU safety and environmental rules
- Measure 4 "Agri-environment, climate and organic farming"
- Measure 5 "Implementation of local development strategies – LEADER approach" designed for funding local action groups that activate "bottom-up" strategies for local development
- Measure 7 "Farm diversification and business development" is for rural businesses and farming families seeking to develop nonagricultural activities
- Measure 9 "Technical assistance" for training, analysis, monitoring of programmes, capacity building and preparation of local action groups.

All the above shows that measures for the knowledge system (training, in Measure 9 "Technical assistance") are minimal.
In the 2014-2020 programming period, the IPARD fund has supported, for all the launched measures, Albania with 71 million euros and Montenegro with 39 million euros[4].
The debate on the status of implementation of IPARD programme in some IPA Countries, Montenegro[5] in particular, emphasizes the need for measures in support of innovation, the introduction of new technologies and knowledge transfer.

1.3.1 Albania[6]

In Albania agriculture represents 20% of the GDP and employs about 50% of the national labor force. It has launched an implementation process of innovation policies by some nation-wide initiatives, as highlighted by the recent numerous strategy papers, some of them for the sectors' development including agriculture, others being specific research-oriented projects:

- from 2017 it is active in the smart specialization (S3) accession process with a national working group to define a tailored roadmap in the 12 regions (*qark*),
- it has defined a national intersectoral rural development strategy (ISARDS), in line with the parallel CAP programming, which considers the specificities of the different rural areas and envisages instruments like the CAP to improve sustainable competitiveness of the Albanian agricultural production and rural development. Nevertheless, they do

[4] EU source, Overview of EU pre-accession assistance for rural development (IPARD).
[5] Report from the workshop on early IPARD II calls (Montenegro, 2019).
[6] From the report produced by the Albania partner in FILA project.

not fully exploit the possibilities offered by the EU through the various financial instruments in addition to the access to the single market,

- the integrated rural development Programme - 100 + Villages 2019-2021 – reflects the general government's objectives, with a special focus on rural areas to improve the quality of life in small villages,
- IPARD II programme supports financial measures for structural investments of businesses, of processing and marketing of agricultural and fishery products, in addition to farm production diversification, aiming to integrate the sector-oriented initiatives, following a bottom-up process defining the rural areas needs and potentials. This programming has the preconditions to foster sector innovation but has not been implemented yet.

Concerning research, Albania has introduced a national strategy of scientific research and innovation that will be implemented by the National Agency for Research and Innovation (*NASRI*) and the Albanian Investment Development Agency (AIDA) and, as associate country, Albania participates in Horizon 2020 and it will also participate in the next 2021-2027 programming period.
It also started a quantitative analysis of the scientific innovation and economic potentials. It will be followed by a qualitative evaluation with the support of the JRC that will consider its level in each region (12 *qark*) highlighting strengths and weaknesses.
It has also adopted a national strategy for intellectual property (2016-2020), a digital agenda, a strategy for investment development (2014-2020), as part of the broader national development and integration strategy.
As for the implementation of the said strategies some critical elements are observed, namely:

- for less than a decade, agriculture has been among the 6 national priorities included in the S3 and in the research and innovation priorities,
- technological transfer and scientific research, supported by a recent regulatory framework, are not mature enough yet for an efficient system that needs to innovate also in advanced education,
- the number of patents is small, entrepreneurial culture to stimulate research and innovation is poor (there is no technological park, as in other Balkan countries), the existing poor innovation is limited to digital technology and to startups fostered by youth population,
- skills in research and innovation are fragmented, with poor aggregated data on the progress of activities.

Since 2007, 5 *Agricultural Technological Transfer Centres* 5 *(ATTC*), in addition to the University of Korçë and Tirana, have been operating for education, dissemination, assistance and support to the sectoral policies, with demonstration/experimental areas, and 4 regional agencies of the Ministry of Agriculture for agricultural extension.
What is missing, however, is an organized system capable of enhancing research results and related data that may give a real picture of agriculture progress through innovation. Moreover, production is oriented to traditional, low technological and competitive activities.
Although the regulatory framework identifies the roles of the key centres for innovation and creates an ideal context for innovation transfer, indeed the process suffers from the poor

operators' collaboration and the lack of an operative organizational network. A project that might generate innovation sometimes naturally expires and produces very small effects.
The Albanian context apparently prefers to fit to technologies already experienced in other contexts rather than devising new ones in its own context. Startups are a success player for social and economic development because the interaction between diversified players fosters the creation of the so-called "innovation ecosystem". Budget and personnel endowments for scientific and technological areas are still limited. Innovation is needed in digitalization, also for food supply, as highlighted by the criticalities of the ongoing COVID-19 pandemic. Cooperation among knowledge parties (academia, transfer centres, etc.) needs to be improved. To foster entrepreneurial capacity, the promotion of startups – currently concentrated only in Tirana - needs to be widespread to the whole country.
Looking ahead, it results that through adequate analysis and mapping of the performed activities and by the involvement of regional authorities in elaborating a country-based strategy, it may be possible to foster the development of Albania and its specificities.

The LEADER approach, outlined in the "Integrated Program on Rural Development" (IPRD), represents the roadmap towards increased awareness of the importance of local and territorial involvement for development.
The ideas that emerged in the Living Labs of FILA project for the future orientation towards innovation policies consider various needs, including:

- developing new organizational and market models to foster the innovation ecosystem development,
- collecting and analyzing national data to detect gaps and investment requirements for existing and new businesses,
- fostering farmers' groupings forms to access to benefits and technologies,
- supporting young people through an interactive approach for implementing innovative ideas,
- defining a legal and structural framework for intellectual property,
- entrusting Advanced Education and Universities with technological and knowledge transfer about industrial and intellectual property, in connection with the regional extension agencies, which appears to be a key player for the transfer to farmers and final consumers,
- strengthening collaboration and networking forms between institutions and universities also to foster their participation in advanced networks that allow benefiting from dedicated resources,
- intensifying the degree of knowledge and the development of innovative technological products to improve business performance,
- organizing extension systematically, using adequate tools to enhance the role of the universities through Agricultural Technology Transfer Centers (ATTC) and regional extension services,
- fostering university-businesses-farmers relationships also basing on students in training.
- ensuring consultancy to entrepreneurs and farmers.

The adequacy of this interactive model - supported by the CAP innovation tools and equally submitted for the 2021-2027 period - is thus confirmed, both for the design of extension systems and to bring the knowledge and players sectors closer to each other.

1.3.2. Montenegro[7]

In recent years, in the European integration process, Montenegro has defined strategies to foster innovation oriented to the European Strategy 2020 and the Union for innovation. It has actively participated in various implementation programmes, entering the European Research Area, participating in "Horizon 2020", including the ESFRI (Pan-European research infrastructure) programme.
Quite recently, it has set up a robust legislative and policy framework in support of research and innovation, trying to strengthen the existing innovative potential.
The strategic planning process of available resources for pre-accession to the EU - IPA II 2014-2020 - and the related national priorities are described in the 2014-2020 Indicative Strategy Paper for Montenegro (ISDCG) for 8 thematic areas including agriculture and rural development. Moreover, it participates in 9 cross-border programmes, including FILA (Italy, Montenegro, Albania). It is committed to the S3 Strategy to strengthen participation and intensify research investments through European programmes. In 2018, using the Horizon 2020 instruments it adopted a programme to support innovative startups.
In its geographic area, it participates in some strategies to bring the countries of the Balkan area closer to Europe, also through:

- the EU Strategy for the Danube Region - EUSDR, 2014–2020 - which is the most significant in the innovation context with priority 7 ''Society of knowledge'' focusing on research, innovation, and ICT,
- Regional Strategy for Research and Development for Innovation of the Western Balkans**,** aimed at strengthening the research and innovation capacity, also considering the opportunity of getting European funds and strengthening its presence in the European Research Area (ERA),
- the (SEE) South East Europe 2020 Strategy, where one of the pillars (dimension E) has the main objective of increasing investments in research and innovation,
- the European strategy for Adriatic and Ionian regions (EUSAIR EU Strategy for the Adriatic and Ionian Region, 2014–2020), aimed at creating interaction among different policies, structured into 4 pillars including the Blue growth and agriculture, environmental quality for the marine ecosystem and biodiversity areas, in addition to sustainable tourism and transports. In this strategy Montenegro shares the coordination role with Greece.

In 2020, Montenegro issued two important national laws pertaining to innovation. They define the functioning of the national innovation ecosystem, provide incentives to national and international businesses, identify the beneficiary parties and the types of incentives for innovation with a view to create a new economic value for the Country.
These rules thus define the "national innovation ecosystem", in agreement with international standards and needs of Montenegro society, which includes the parties that implement

[7] From the report of the Montenegro partner in FILA project.

innovation, the establishment of the Council for innovation, and a fund dedicated to innovation and the Smart Specialization Strategy implementation.
The bottom-up approach of a coordinated system of parties is the performing element of a vision for “Healthy, Sustainable, Digitalized” Montenegro.
The selected priorities include sustainable agriculture, the value chain for food and ICT as cross-themes in support of all the priorities. Considering that Montenegro agriculture is characterized by regional climate-related diversity, the presence of numerous native animal and plant species, agriculture sustainability of Montenegro must safeguard tradition and the specificity of rural areas, and it identifies two prevailing objectives: strengthening the value chain of organic production, and development of new farm products. From today until 2024, Montenegro intends to double the number of organic farms and native innovative food products.
Considering the monitoring on the policies implemented so far in the country, some goals for future policies do emerge:

- spreading innovation culture especially in the inter-farm interaction through knowledge centres, financial support, critical mass, adoption of international standards, creating the conditions for international trade,
- building and reinforcing the national innovation system also through a greater use of European resources,
- providing support to innovation in the energy and environmental sector.

2. The knowledge system and the EIP-AGRI: professional profiles and new needs

2.1 The Agricultural Knowledge and Innovation System (AKIS)

The mostly shared and appropriate definition of AKIS (Agricultural Knowledge and Innovation system) is the one developed by the OECD in 2012: "A *set of agricultural organizations and/or persons, and the links and interactions between them, engaged in the generation, transformation, transmission, storage, retrieval, integration, diffusion and utilization of knowledge and information, with the purpose of working synergistically to support decision making, problem solving and innovation in agriculture*". One evident element is the complexity of the said system both for the activities implemented and the relations and links between actions and players.
Also, experts in the subject, when describing and assessing AKIS, always highlight the great variability in time and space, since it has changed with the evolving agriculture and knowledge and has numerous modalities of expression and organization in different rural areas.
To standardize the said complexity and variability three major areas of interest of AKIS are traditionally identified: research, training, and consultancy/extension. In the last decades, the increasingly advanced technical and scientific development has led to the growth of very structured types of technologies that require specific and expensive instruments and skills. In addition to the traditional areas, the so-called "support advanced technologies" are added. They provide the data systems with information and instruments useful for a sounder and more efficient use of research, training, and consultancy activities (ICT, meteorology, mapping systems, chemical-physical analyses, etc.).
As for the said characteristics, AKIS is certainly an area very well equipped with professionalism and expertise.

Researchers and experimenters have skills and capacity related to study and knowledge production activities. Their professional profile covers the design and development of scientific actions aimed at searching innovative solutions to various types of problems or devising new products or knowledge concerning unexplored knowledge paradigms. These professionals' skills are based on very advanced knowledge, on the capacity of working and networking internationally and expose their work to the scientific community in general. Over the last 10-15 years, researchers/experimenters have been asked to also acquire management skills to draft and manage projects, communication capacities to better look at the civil society and the business system's needs, for better targeting their work.
Trainers fall in a quite varied professional field depending on the users they address to, on basic or school education, higher and tertiary education, life-long training. Their work essentially aims to develop their learners' pool of knowledge and skills making them more capable of understanding their life and work and performing specific functions and roles. A trainer can analyze users' needs of cultural growth, can design actions to improve their knowledge, allowing them experimenting new capacities and instruments, leading to cultural and vocational development.

Advisors/extensionists usually have the task of supporting the production system and accompanying it in the implementation of the changes needed for economic and social development of its components. Operationally speaking, this activity consists in identifying problem-solving solutions or enhancing context opportunities always keeping in mind the real businesses' needs, the working environment constraints, and the skills and resources they can make available.
Instead, activity contents broadly vary, including especially the traditional support to the implementation of technical processes and the possible conversion of production capacity; they equally concern the traditional support to regulatory compliance, the establishment of a sound path for business financial and economic management, the design of communication and marketing plans, the use of data and information for production and management purposes, the provision of services to the community as part of the business activity. All the above contents can be summarized as accompanying measures to innovation[8].
To this end, consultancy services are provided by professionals[9] who combine their technical knowledge in various fields of agriculture, forestry, and food production, with the capacity of:

- understanding and diagnosing real situations,
- processing context data and information,
- using the most appropriate communication tools to dialogue with entrepreneurs,
- helping workers to modify production/management modalities and processes,
- playing the role of intermediary with local institutions, scientific parties (public and private), the entrepreneurial fabric and its representatives.

Given the richness and complexity of the advisor's activities, they often require the combined work of several professionals, each specialized in a part of the activities. The advisor can then play the role of facilitator to stimulate communication and exchange processes among players, of specialized technical support for solving production processes and business technologies problems, and so on.
As for the *support advanced technologies*, the involved professionals usually have a high technical or economic or social qualification. Since these specialists provide a support instrument to other AKIS professionals, they should have a good communication and relationships propensity and understanding of the problems other professionals may raise. Soon, European policies will focus especially on digitalization of the agri-food and forestry sector, referring also to the broad availability of computerized and Internet supports that currently allow businesses to work at reduced costs and environmental impact. Digital specialists could then be useful to hold a dialogue with businesses and other AKIS players to detect or design adequate solutions for different needs.

Last but not least, the role of the agri-food entrepreneurs and workers is worth mentioning. They are the users of the system, but they also play a major role in highlighting the major

[8] The Oslo Manual by OECD defines innovation as the "implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations".

[9] Standing Committee on Agricultural Research, Collaborative Working Group (CWG) AKIS, Policy Brief on the Future of Advisory Services, 2017.

problems of the sector and devising the preliminary experiential solutions that often offer a very good basis for a co-innovation action together with research parties.
The short analysis of more traditional professionals operating in AKIS shows the importance of the role of each of them in inter-area communication, and of the need for each professional to develop skills and capacities in managing relationships, networking among players, devising instruments to facilitate information exchange in implementing joint projects.

2.2 The Innovation broker: role, skills, capacity

The EIP-AGRI initiative, focusing on the interactive approach to innovation and basically being implemented within the Operational Groups' projects, has highlighted, on one hand, a greater effectiveness of this approach compared with innovation dissemination and, on the other hand, the difficulty of the various AKIS components to trigger real interactivity.
The latest version of the European Commission guidelines published in support of EIP-AGRI states: *"In the interactive innovation system, innovative proposals come from science but also from practice and intermediaries, including farmers, advisors, NGOs, researchers as players of a bottom-up process. …Innovation generated through an interactive process tends to identify solutions that best fit to contexts..." (EC, Draft on EIP 12/2014).*
To this end, based on the experience gained so far and on the outcomes of dialogue with different stakeholders, the following major criticalities are observed in Italy:

- creation of partnerships,
- the choice of problems/opportunities and innovative solutions agreed among partners,
- the interactive process of innovation dissemination.

Partnerships around a shared problem or opportunity are difficult to be established, but they may result from: choices of representation (for instance, all the parties concerned with a given sector in an area are involved), of pressures exerted by some partners - often research institutions –, difficulties to involve the contact persons of the consultancy services. Moreover, the operating practice of project management mostly uses the work package style or the project phase-based approach rather than co-management. Extension to businesses does not take place throughout the management period of the activity, but more traditionally upon the conclusion with seminars, publications, leaflets.
These issues had already been highlighted in other innovation dissemination actions before EIP-AGRI and had raised some reflections by scientific experts. In 2006, Howells was the first author who highlighted the need for "Intermediaries in Innovation" for them to act as a link between two or more parties involved in an innovation process. In 2010, referring to agriculture, Klerkx and Leeuwis tried to systematize the tasks of a hypothetical broker to facilitate the interactive innovation path:

- articulation of demand, namely, organizing innovation needs and the related demand in terms of technology, knowledge, financing, and policy, obtained through diagnosis and forecasting exercises,
- composition of the network, namely, facilitating the links between relevant players, definition of areas, selection and promotion of relationships among possible cooperation partners,

- management of the innovation process, namely, harmonizing the needs of the network players who often come from very different institutional contexts and frameworks much differing in their name, values, incentive schemes.

These tasks basically refer to facilitation activities that ensure the networks to be sustained and productive, for instance through confidence building, definition of working procedures, promotion of learning, management of conflicts and of intellectual property.
The European Commission has adopted this support proposal and inserted it in the abovesaid guidelines as potential component of the Operational Groups' partnerships, underlining that the innovation broker can be a new professional profile or a new function that may be performed by the existing professionals.
In Italy, in the sub-measure 16.1 datasheet, 11 Regions out of 20 have envisaged an innovation broker profile (Abruzzo, Lazio, Liguria, Lombardy, Marches, Piedmont, Puglia, Sardinia, Tuscany, Umbria, Veneto).
Looking ahead to an Operational Group, the skills of an innovation broker profile may correspond to a set of specific actions, like:

- promoting a collective project construction, sharing its objectives, articulation, expected results, etc.,
- identifying operative project objectives, the responsibility of which falls on several partners jointly,
- envisaging modalities for sharing materials, documents, results – even as draft – to allow everybody to be acquainted with the situation,
- envisaging the other partners' feedback on each partner's products and results,
- programming and managing regular partnership meetings,
- setting up the testing and adaptation stages of innovations to allow businesses to propose and obtain changes in processes and results.

In May 2019, the Ministry for Economic Development issued a decree on "*a straight grant in the form of voucher, to the benefit of micro, small and medium enterprises, for the purchase of expert advice relating to technological and digital transformation processes, through the enabling technologies included in the national business Plan 4.0, and modernization processes of the business management and organization, including the access to the financial and capital markets*". This action is a sign of the cross-interest of development policies in innovation themes, as indicated in Chapter 1 of this report, and of the need to develop specific professional profiles.
However, the articles describing the professionals that businesses may refer to for benefitting from the said contribution do not include agricultural and forestry sciences and food-related themes. "Oversight" the agri-food and forestry sector among the development promotion actions by the public promoters in charge of economic and social development is not something new and would clearly require action by both institutions and the entrepreneurial and professional representatives.

2.3 New professionals for new needs

In the introduction of this Chapter, we underlined that the mutability of the context, of needs and thus of the organization and the priority activities of the system is a characteristic of AKIS.

In line with changes, the need may arise of new professionals or updated professional profiles.
At this stage, one major aspect of the knowledge and innovation development-related area is the strong need for making AKIS operational, namely, promoting coordination, connections and relationships among institutional and operative parties. Therefore, professionals who have relational and communicational abilities, and who can apply specific tools contributing to networking and collaboration building are crucial. The innovation broker profile certainly comes into this category.
The frequent practice of not recognizing the professionals a specific and expert communication skill - this probably being the most immaterial knowledge – is a key element worth of attention. A common mistake is that unspecialized professionals who are unaware of the stimulus and relationship building tools apply them without knowing their purposes and thus wiping out the results achieved so far.
Professionals with these skills can also be found in non-purely agricultural areas or, failing to have expert persons, vocational training could be provided both in public education and life-long training bodies for adults.

Technically speaking, the required professionals are certainly those involved in reducing the *environmental impact* of agricultural practices and their effect on *climate change,* and in the so-called *circular economy.* They are crucial in the next European development strategy (Green Deal, 2019; From farm to fork, 2020). These professionals are already present in the AKIS research and support advanced technologies areas. They are probably less specialized in training and consultancy. In the latter two cases, rather than an advanced technical skill it is necessary to have the capacity of understanding the users' problems (users under training activities and the consultancy-oriented entrepreneurs) and identifying the most environment-, climate- and circular economy-oriented adequate solutions.
Finally, the need for professionals having *managerial capacity* becomes increasingly urgent, especially for complex projects with diversified partnerships. Adequately caring for administrative and financial aspects and the organization of activities with special focus on their harmonization is crucial. In some cases, dedicated specialists need to be involved in the project, in other cases it is appropriate to allow different "technical" AKIS profiles to acquire also managerial skills in view of the need to coordinate the technical aspects using management rules dictated by the funding public institutions or more simply by the national regulations.

2.4 Consistency of the professional profiles with the needs of a new AKIS

The activities promoted through the 2014 -2020 rural development policy have allowed the agriculture knowledge and innovation system to be back on track and implement numerous actions. The EIP-AGRI action has certainly more novelties in approach and contents and it can be a testing ground of AKIS at the local and regional level.
Research, training, and advanced technologies have been the areas where professional profiles have been more present and, consequently, more involved.
As evidenced from the analysis in Chapter 1, researchers have been the driving professionals in creating many EIP-AGRI Operational Groups. Some reasons for their leading role result from their being more involved in the projects, and the difficulties of reduced funding to

research. This situation generated some positive and some critical effects: on one hand, it allowed rapidly solving procedural and administrative aspects, and stimulated researchers to be directly exposed to the businesses' needs, on the other hand, in some cases it has probably favoured the research approach to the detriment of innovation extension and dissemination actions.

The presence of training actions within the Operational Groups' projects has made the innovation dissemination activity more effective since entrepreneurs and agricultural workers could better understand the characteristics of the proposed innovations and the best modes to introduce them on farm.
Advanced technologies are largely present in the OGs; especially digital technologies provide support to many process innovations proposed to farms in order to have sounder agricultural practices and reduce the environmental impact as well. An analysis performed in the 340 OGs[10] present in the database of the portal *Innovarurale,* shows that 40% of projects concern digital technology, a value including both the OGs where innovation is the key project objective, and those adopting digital instruments in support of the project implementation. Specialized technicians with advanced technical competence have been very useful for developing projects; at the beginning, they had some difficulties in tuning in with researchers and entrepreneurs, but with further collaboration they finally were mutually in phase.
Very few OGs have officially involved the innovation brokers, namely by proposing their professional profile in the call. Nevertheless, many OGs that are satisfied with the performed activity declare that they have a project manager with a profile very close to the innovation broker coming either from the research area (few of them) or the private consultancy system.
At the current European programming stage, the advisors' profiles defined both in the narrower sense of operational support to the business production activity, and in the broader sense as represented in chapter 2 are almost absent. The scarcity of consultancy activity makes AKIS to lack:

- a connecting function among players and a networking function for disseminating innovations and for the agri-food system growth,
- the support action to businesses for maintaining innovations in business and production practices.

Should also these functions be replaced by other professionals, in the OGs for instance, they would subsequently be missing in the daily use of the system and would not contribute to the large-scale dissemination of innovative results.

[10] Bonfiglio A., Carta V., *Digitalizzazione in agricoltura: la trasformazione digitale passa attraverso i Gruppi Operativi*. In Pianeta PSR, 92 (giugno 2020).

3. Networking in the 2014-2020 innovation policies

In the 2014-2020 European programming, the centrality of the interactive approach for better disseminating innovation and achieving a smoother information and knowledge flow has confirmed the fundamental role of promoting relationships, networks and connections among players, organizations, and activities.
The so-called "networking" action has been one of the commitments strongly pursued by the European Commission especially in the rural development policies, both by promoting European institutional networks – the European network for rural development and the European innovation partnership network – and fostering the creation of national rural networks (art. 51, 52 e 53 of the EU reg. 1305/2013). A convergent proposal is to include cooperation (art. 35 of EU reg. 1305/2013) in the actions of the Regions' Rural Development Programmes (RDP), this being a mode to implement development actions that favour the creation of networks or poles for the promotion of innovation, short chains, diversification, on-farm tourism, etc. As reported in Chapter 1, it is within this action that EIP-AGRI is implemented and the OGs are funded.
Pursuant to the regulation, the European network of rural development is assigned some similar tasks: a driver for the stakeholders' participation, improved quality in implementing rural development programmes, information to the public and potential beneficiaries, each at a different territorial level, of course. They also have peculiar capacities, namely the support to the RDP evaluation, and the support to innovation, respectively.
In the present report, of high interest are the mission and tasks of the EIP-AGRI European network. This is a networking initiative aimed at favouring exchanges of experiences and good practices and holding a dialogue between farmers and the research community, favouring the participation of all the stakeholders in the knowledge exchange process.
Two actions of the EIP-AGRI European network are of great impact: the numerous study and thorough analysis events, and the establishment of Focus groups, temporary groups of selected experts who focus on a specific subject and share knowledge and experiences. All the initiatives are publicized, and their results are disseminated on the EIP-AGRI portal at: https://ec.europa.eu/eip/agriculture/en.
Events are various (https://ec.europa.eu/eip/agriculture/en/events):

- at the start, the initiatives have involved especially institutions and potential Operational Groups' participants to clarify the setting rules, understand the implementation difficulties and suggest solutions,
- later, they have focused on thematic exchanges of views between OGs, aiming to promote mutual knowledge among players, know-how exchange, contamination between technologies and innovative solutions.

At this stage, seminars about the next programming phase of European policies were promoted and the major policy aspects are illustrated in Chapter 5. Meetings were organized to debate on digitalization of the agri-food system (https://ec.europa.eu/eip/agriculture/en/event/eip-agri-seminar-new-skills-digital-farming) and the modes of strategic design of innovation and knowledge themes in the near future (https://ec.europa.eu/eip/agriculture/en/event/eip-agri-seminar-cap-strategic-plans-key-role-akis).

The Focus groups (https://ec.europa.eu/eip/agriculture/en/focus-groups) have considerably grown in number – more than 40 – on specific themes like: bee health and sustainable apiculture, soil salinization, agricultural activity diversification through producing medicinal and cosmetic substances, soil protection from contamination, on-farm food loss, non-chemical weed control products, olive tree pests and diseases, new feed for pigs and poultry, are some of the themes concluded in 2020.
These are expert groups (about 20) coming from the research area, consultancy area, farms and industrial businesses, and other concerned players who:

- draft a starting document to provide the background of the relevant theme,
- exchange views to highlight the available innovative solutions to the emerging problems, to recommend best practices, and indicate the themes to be further investigated,
- prepare a final report, and in some cases leaflets as well, and dissemination sheets of identified ideas and solutions.

A peculiar aspect of the European EIP-AGRI network activity is the operative application of the participatory approach that has been proposed in all the implementing documents because of its proven effectiveness, and that the European Commission has diffused after the approval of the rural development regulation 1305/2013. The agricultural knowledge and innovation system (AKIS) players are constantly involved, and always with active roles for presenting their experiences, problems and opportunities.
An action targeted to the knowledge and innovation themes was also conducted by the national rural Network that launched a set of support and facilitation activities at various levels:

- at the regional level, by promoting the coordination and confrontation among institutional players responsible for the implementation of the scheduled actions,
- among stakeholders, trying to gather needs and raise awareness for the new contents and, especially, the new approaches through documentary material and/or confrontation events,
- with the Ministry of Agricultural Policies, which is the key contact authority of the European Commission and which promotes an important institutional action of research and innovation policies coordination (with special reference to the 2014 - 2020 Strategic Plan for agriculture, food and forestry innovation and research),
- at the European level, to ensure a two-way information flow and the country presence at crucial meetings and events.

Also, the national rural Network has promoted the implementation of a Portal called *Innovarurale* (https://www.innovarurale.it/it) on the knowledge and innovation system themes; it is a section of the broader general national rural Network Portal and provides information on the above reported actions and a global and updated picture of EIP-AGRI initiative (https://www.innovarurale.it/it/pei-agri).
Due to the centrality and relevance of the cooperation and innovation theme, some important actions promoted in the rural development and the European research framework programme Horizon 2020 area have launched networking processes among players who – though only initially - could be the protagonists of a new working method within AKIS.

In the preceding chapters we have largely debated about Operational Groups and the numerous ongoing project experiences are certainly the start point of local collaboration networks that could further continue in the future.

In the current programming period, the RDP cooperation has continued to finance - in parallel with the OGs - also the collaborative innovation testing actions among small players' partnerships. These activities are less complex than those of the OG projects but, in any case, they aim at verifying and testing innovations for solving businesses' and territory problems. Operationally speaking, the action is supported by sub-measure 16.2 and has been quite successful in the Italian RDPs. In February 2020, 268 projects were approved for a total funding of slightly more than 50 million euros and based on the estimated available budget from the Regions, such funding should be considerably increased. These small partnerships already present in the previous 2007-2013 programming period, have already demonstrated to be effective for creating networks and collaboration forms stable in time.
The framework programme Horizon 2020 has promoted an important connecting action between research and agricultural practices through multi-actor projects and thematic networks.
The rationale at the basis of both types is the same: to promote applied and targeted research activities by including not only researchers but also the parties specialized in innovation dissemination and adoption, end-users, and entrepreneurs in the project partnership. The thematic networks are considered a sub-set of the multi-actor projects, having the specific purpose of gathering existing knowledge and best practices on a given theme to turn them into formats easily comprehensible and available to end-users like farmers, forestry operators, advisors and others.

So far, about 120 multi-actor projects about the agricultural and forestry system have started. Forty of them are thematic networks. Among thematic networks, two areas exhibit a higher number of projects: animal production (9) and the ecological and organic approach (8). The end-of-the period objective is to totally achieve 180 multi-actor agri-food and forestry projects for a total investment of 1 billion euros.
The above short analysis confirms the centrality of the interactive and participatory approach of the European innovation policy.
The envisaged achievements have generated some positive and some critical outcomes:

- the partnership approach to development actions has become central in the actions of all the stakeholders of the agri-food and forestry system, whereas in the past it probably was only for research institutions,
- the need to spread this modality has probably reduced the attention on networks' efficiency and effectiveness. Sometimes, one has the feeling that some networks, especially the institutional ones, perform similar functions, duplicate efforts or make efforts at a larger-scale level in actions that would better fit the local level,
- in some situations, networks and partnerships exist only formally because each partner carries out its part of the project and develops few relations with other partners,
- the EIP-AGRI Operational Groups' experience, because of its diffusion and capillarity, will certainly leave a mark on future modes of action of many parties and will increase collaboration in a stable manner,

- the positive impact of OGs on the rural fabric would be effective if more relations and networks were developed between OGs based on theme similarity and the problems they face.

In the near future, it could be extremely interesting to make initial implementation and impact verifications to highlight results, success stories, possible mistakes in application, and the required correction actions.

4. The 2021-2027 innovation promotion policies

4.1 EU strategy and priorities: confirmations, novelties

The 2021-2027 policy framework must meet the global environmental and food production challenges, basing on the new European strategies designed since 2017 and closely interconnected to each other. The guiding thread to foster the transition towards sustainable development and food production systems is promoting research and innovation, confirming the need of advancing along the EIP-AGRI orientation, this being a novelty of the current programming.
The European strategy is mainly outlined in the three Commission's Communications: *The Future of Food* COM(2017)713; *Green Deal* COM(2019)640, and the latest *Farm to Fork* COM(2020)381. The innovation promotion policies shall be implemented in the light of the strategic objectives defined so far and that fall within the sustainable development goals.

The first strategy is *The future of food*, COM(2017)713. It gives a picture of the European agriculture that must ensure food supply to more than 500 million European citizens and that preserves almost half surface area of Europe: 48% of the European area is used for agricultural production, which implies caring for soil, water, air, and biodiversity (foresters manage more than an additional 36%). Agriculture employs almost 22 million workers who amount to 44 million workers employed in food processing and distribution. Moreover, EU rurality gives rise to other forms of employment and employs 55% of citizens, if other related activities including tourism are involved.
This Communication states that the rural development policy is implemented through support to investments, knowledge acquisition, food chain organization, environmental protection through acting for climate. In particular, in the 2014-2020 period the innovation and risk management tools have been reinforced. The EIP-AGRI «Agriculture productivity and sustainability» has given impetus to knowledge creation and sharing. Nevertheless, the mid-term evaluation of the European Commission has highlighted, on one hand, the great momentum given by decision makers to adopt measures for its implementation – not a negligible player for a newly establish partnership (the Operational Groups) - on the other hand, the need for further significant efforts to facilitate the farmers' access to knowledge.

This first strategy for starting the new CAP underlines the need of using research and innovation to face the agricultural challenges, linking knowledge with agricultural and food systems, and invoking the need to further reinforce the synergy between policies, between the CAP and the research and innovation policy for promoting innovation.
Though it is evident that technological development and digitalization increase the resource use efficiency for more sustainable agriculture, the document stresses that their diffusion - especially for small and medium enterprises - is not adequate and evenly distributed yet. Thus, it makes sense to involve the public sector in research and innovation to fill the gap between rural areas that require digital innovation and better connectivity, and the providers of new technologies. Even the access to the new required knowledge is unequal in Europe

and, accordingly, the status of progress of the CAP tools, general competitiveness and the agriculture development potential in general are different.

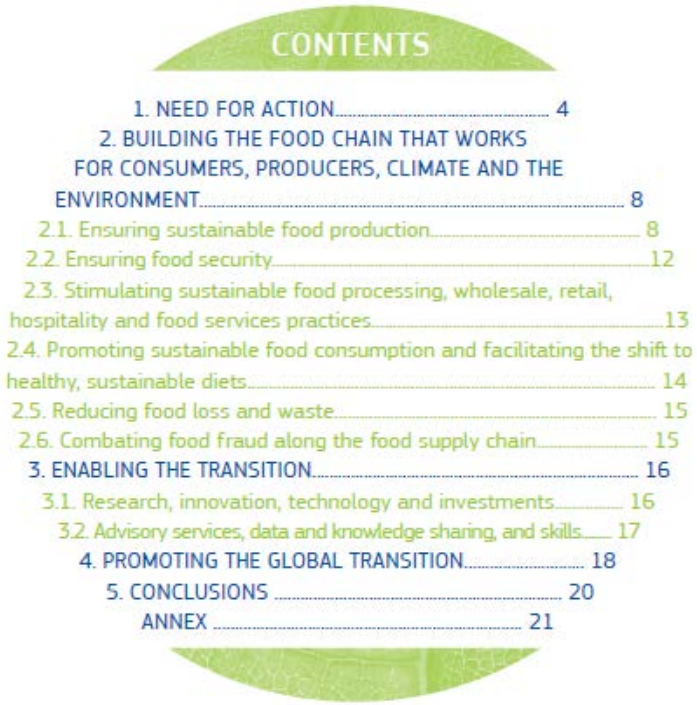
"Smart" agriculture based on knowledge, technologies, and adequate digital tools (Agriculture 2.0, also defined as precision agriculture) can speed up the achievement of significant sectoral objectives: sustainable increase in production, real time production data, better quality, better animal health, reduced impact of production on natural resources, and reduced production costs.
Then the ideas of sustaining knowledge, innovation and technology are consolidated. They are indispensable for the future CAP to coordinate the orientations for reinforcing the economic, social, and environmental results, including mitigation/adaptation to climate change, through consistently using them with the instruments for knowledge, consultancy, competence, and innovation.
This strategy highlights the EIP-AGRI efficacy in mobilizing agriculture for innovation, fostering the stakeholders' participation in national and European networks to make new knowledge available through a composite system resulting from the diversified functioning of agricultural knowledge and innovation in various States. These systems recognize the essential role of the agricultural advisor who should, in any case, be reinforced also to cover agricultural consultancy services. In the document of 2017, the reinforcement of the consultancy activity is even indicated as one of the requirements for approving national individual Strategic Plans.
To reinforce the support to knowledge, networking, and cooperation exchanges among farmers, it is proposed to act through the producers' associations (PA), as a vehicle for sharing knowledge, innovation, and saving on farmers' costs on a quite regular basis. However, in the general CAP analysis at 2017, the strategy recognizes that the innovation path is still burdened with excessive bureaucracy, which is still the major obstacle to the achievement of the results pursued by the ongoing policies.
Though keeping the support to farmers and rural communities based on the two pillars (income and market support measures, and rural development measures), the processes for defining the objectives and the achievement of results need to be simplified and made mutually consistent, putting them together in a single Strategic Plan.
Food supply, environmental protection with the conservation and protection of biodiversity, landscape, forestry systems, soil and water management, the promotion of sustainable agricultural practices also to face climate change, are themes that reiterate ambitious targets that can no longer be delayed, and which cannot disregard knowledge and innovation.
The roadmap outlined in Communication COM(2019) 640, known as *Green Deal*, reformulates the European commitment to face the climate and environmental problems, and includes policies and measures that are directly related to the agriculture and food area. Within the *Green Deal* (Figure 9), stimulating research and innovation is the basis to support all the objectives and actions described so far.

Figure 9. Schematic graph of the Green Deal strategy.

Source: COM(2019) 640
(https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52019DC0640&from=EN)

The stated objective to change the EU economy for a sustainable future implies, indeed, the elaboration of a set of deeply transformative policies, including designing a fair, healthy and environmental-friendly food system, subsequently specified in the strategy *From farm to fork*: if the target is to make the European food safe, healthy and of high quality, it must also become a world reference for sustainability; all the food value chain operators must benefit from the new opportunities offered by new technologies and scientific discoveries, and equally so the primary producers (farmers, fishery operators) who are key in managing the transition. The CAP and the Common Fisheries Policy must still be two fundamental instruments to guarantee a fair revenue to operators.
Finally, in May 2020, the strategy *From farm to fork* COM(2020)381, closes the policy scenario for starting the new programming (Figure 10).

Figure 10. Contents of the strategy "From farm to fork".



Source: COM(2020)381
https://ec.europa.eu/food/sites/food/files/safety/docs/f2f_action-plan_2020_strategy-info_en.pdf

Given the emphasis recognized to the contribution of agriculture in providing EU citizens with adequate food quantity and quality, in caring for natural resources, ensuring employment, promoting rural areas, and developing the single market, it will be necessary to identify operational guidelines to promote and reinforce interconnected areas, like:

- employment, growth, and quality investments,
- circular economy and bioeconomy, together with environmental protection, fight against and adaptation to climate change,
- research and innovation transfer to the production sector,
- digital economy in rural areas and farm digitalization processes,
- protection and integration of migrants who live and operate in rural areas.

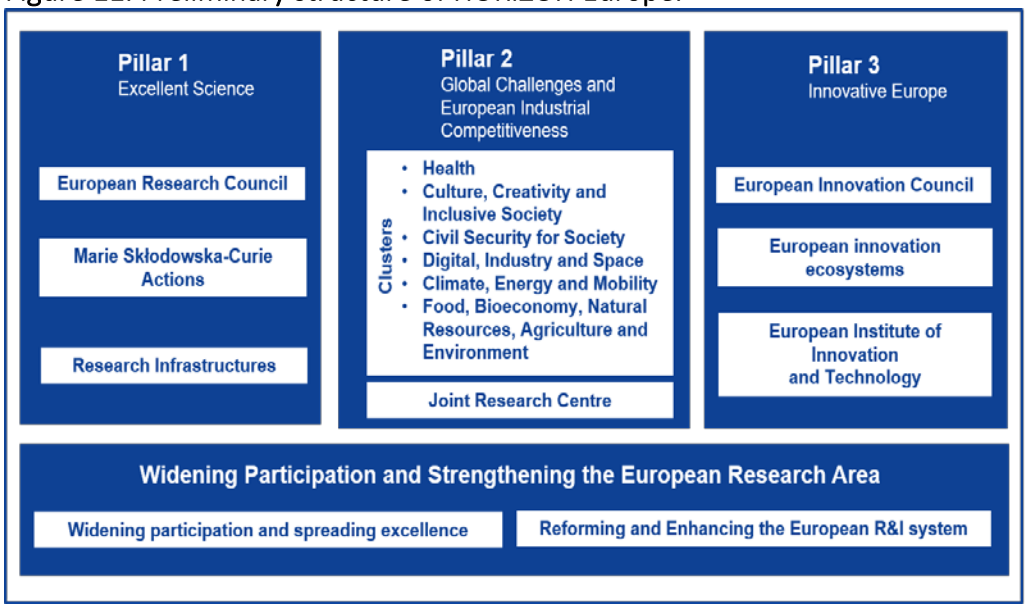
The adoption of innovation in the production sector is part of these operative areas.
The Communication stresses the need for a more ambitious CAP than the EU commitments taken at the international level on climate and environment (COP21) and sustainable development (Agenda 2030 for sustainable development).
The document also focuses on three aspects that should qualify the reform process: simpler rules with less bureaucracy, flexible result-oriented approach, more competences to Member States that will have greater responsibility for the achievement of results.
It is confirmed that the shift to sustainable, healthy, and inclusive food systems from the primary production to consumers shall neglect no link of the supply chain: fostering sustainable practices in food production and the downstream sectors (processing, trade,

catering services, etc.), facilitating the shift to healthy and sustainable food consumption, reducing food losses and waste, fighting food frauds to achieve a healthy and safe food supply.
Focus is placed on adequate investments and technology, and on a strong impetus to research and the innovation adoption that, based on the latest drafts of Horizon 2020, allocates a total amount approximately equal to 1 billion euros to the Green Deal priority. Horizon Europe - the European research and innovation programme - at its upcoming seven-year period 2021-2027 proposes to invest 10 billion euros in R&I for research on food, bioeconomy, natural resources, agriculture, fishery, aquaculture, and environment, as well as on the use of digital technologies and solutions based on the agri-food sector specificity (thematic area referred to as cluster 6).
Some specific food production themes will also concern microbiome, food from oceans, urban food systems and the increased availability of alternative protein sources like proteins of plant, microbial, marine and insect origin.

The EIP-AGRI role in designing strategic plans for the use of the European Agricultural Fund for Rural Development (EAFRD), and the funds for smart specialization - European Regional Development Fund (ERDF) - is expected to increase.
In addition to research, the availability of adequate technology (rapid broadband Internet for all by 2025) and investments (including the ones that the CAP can support to improve farm resilience and accelerate the green and digital shift) shall allow expanding precision agriculture and the use of artificial intelligence with reduced costs for farmers, improvement in soil management and water quality, reduced use of fertilizers and pesticides, and greenhouse gas emissions, biodiversity improvement, and a healthier environment for farmers and citizens.
Stating that knowledge and consultancy are essential for system sustainability, it is emphasized that primary producers should rely upon objective and tailored consultancy services. Agricultural Knowledge and Innovation Systems, (AKIS) shall be effective, through strengthening the CAP measures to achieve the *Green Deal* objectives.
Also, the instruments already in use, like the Farm Accountancy Data Network (FADN), must be revised to facilitate data retrieval on the objectives of the strategy allowing for a comparative farm performance analysis with respect to the regional, national, or sectoral means. In addition to tailored consultancy services, an adequately revised FADN could provide farmers with some orientations, by connecting their experience in the European innovation partnership with research projects, fostering resilience of the involved farmers also in relation to income.
The implementation of a common European area of data on agriculture, equally including production, land use and the environment, shall enable an accurate and targeted application of the on-farm production approaches and the monitoring of the sectoral performance.
The CAP national strategic agriculture plans shall reflect the ambitions of the *Green Deal* and *Farm to Fork* strategies, and indicate actions for sustainable practices, with reduced use of chemical pesticides through precision agriculture, organic agriculture, the agroecological approach, agroforestry; they should foster the adoption of stringent rules for animal welfare, better environmental and climatic performance, including carbon management and storage in the soil, optimal use of nutrients to improve water quality and reduce emissions, developing sustainable fishery production as a source of low carbon food.

All the above requires adopting innovations for the sustainability of the whole production system: *stimulating research and innovation* is the cross-action for all the policies to be implemented.
Equally important is the role of education and training, with attention being especially focused on re-training and skills upgrading.
The implementation of the two strategies will be possible by using all the instruments made available by the 2021-2027 programming and the new HORIZON Europe programme for research and innovation (Figure 11). Innovation for agriculture is the major research and innovation field. As it has often been mentioned, innovation for agriculture can also rely upon specific EAFRD measures.

Figure 11. Preliminary structure of HORIZON Europe.



Source: https://ec.europa.eu/info/horizon-europe_en

Through the support to initiatives that combine the driving force of civil society, involving local communities in a spirit of sharing precious knowledge of different origin and under the impetus of the technological push it will be easier to support the ecological shift also thanks to digital transformation.
"Pillar 2" of Horizon Europe (Global Challenges and European Industrial Competitiveness) aims to boost underpinning EU policies & Sustainable Development Goals technologies and solutions.
The thematic aspects are composed of 6 Clusters:

1. Health,
2. Culture, creativity, and inclusive societies,
3. Civil security for society,
4. Digital, industry and space,
5. Climate, energy and mobility,
6. Food, bioeconomy, natural resources, agriculture and environment.

In addition to the usual research and innovation forms (research projects etc.), the same as in the previous programming, the European research area populates with new forms of collaboration between bodies that promote research and innovation: partnerships are co-programmed and co-funded actions - in a more advanced form than the previous ERANET actions and joint programming actions (JPIs, EJPs) - which shall involve all the players in aggregate forms likely to result in real living labs (as the one proposed for the Agroecology area – soil health and food). Moreover, they will promote different policies, also because national programmes based on various funds can become part of a common knowledge heritage in a coordinated and structured form within partnership. Out of the 45 programmed partnerships, 8 are in Cluster 6 and represent areas of top interest for the primary sector (agriculture, forestry, and fishery):

- *Accelerating farming systems shift: agro-ecology living labs and research infrastructures*
- *Animal health: Fighting infectious diseases*
- *Agriculture of Data (Environmental Observations for sustainable EU agriculture)*
- *Rescuing biodiversity to safeguard life on Earth*
- *Blue Oceans: A climate neutral, sustainable, and productive Blue Economy*
- *Safe and Sustainable Food System for People, Planet & Climate*
- *Circular bio-based Europe: sustainable innovation for new local value from waste and biomass (Sustainable, inclusive, and circular bio-based solutions)*
- *Water4All: Water security for the planet*

The partnership ambition is to coordinate players, programmes and activities to pursue shared objectives on specific themes. They are R&I governance forms that accompany the activities of the various countries that include all the players of sustainable food systems from producers to consumers, for innovative solutions that generate the expected benefits from research and sustainable development policies.

5. Analysis of the experiences of some innovation stakeholders in view of the EIP-AGRI-AKIS approach

This chapter gives a synthesis of a survey carried out in the project partner Countries and Regions. The survey was based on an open question questionnaire submitted to a wide range of stakeholders selected according to their direct knowledge and experiences in the agri-food systems innovation. A synthesis of their replies to the questionnaire is given in the following.

Annex 1 provides the results of the survey per each partner.

1. *In your opinion what are the main innovation needs of the agricultural system of your country / region?*

Respondents think that two different kinds of innovation are needed in Puglia region. One concerns the organizational model of companies in relation to management, economic management, the working environment, and external relations; the other is related to the improvement of production processes and the reduction in the use of resources. In Albania, a permanent and stable agriculture information system should be established to exchange information and knowledge. In Montenegro, the need to stimulate and strengthen the agricultural system innovation, i.e., to introduce innovations in agricultural production processes is necessary.

2. *In your opinion what type of innovation has been implemented so far in the agricultural domain?*

According to respondents, in Puglia region, the only kind of implemented innovation is related to the improvement of production processes and the reduction in the use of resources. In Albania, innovation is limited to EU-funded projects on new cultivation technologies and varietal improvement but to a limited number of farms. In Montenegro, so far, innovations related to connecting agricultural producers and end-users of agricultural products have been applied using digital tools (websites) where farmers can advertise and sell their products; many educational trainings and workshops, and laboratory capacities have been improved.

3. *To what extent is there a favourable environment for the introduction and dissemination of innovation? How is it characterized?*

In Puglia region, there is growing producers' and consumers' awareness' for innovative production and a generalized expectation for a revival of agriculture. In Albania, the interviewees think that the environment is partially favourable. Existing obstacles are the low rate of diffusion of the Internet service system in rural areas, and the technologies used by farmers. A favourable environment for introducing and disseminating innovation in Montenegro does exist, but economic opportunities and the lack of adequate infrastructure is often the reason for their slow development.

4. *Can you list the agents (i.e., individuals) and the facilities that currently compose the Agricultural Knowledge and Innovation System in your country/region?*

Respondents' answers to this question lead to the conclusion that in Puglia region AKIS is not formally organized and there is a strong need for a strategic framework to enable existing facilities, players, processes, and procedures to be efficiently and effectively connected. The same applies also to Albania. Instead, under the Law on Innovative Activity, Montenegro encourages its development and finances entities that perform innovation activities.

5. *In your opinion who and/or what facilities would need to be added?*

Answers to the previous question is confirmed by the answers to this question. In fact, one respondent stressed the need to add facilities that allow for collaboration among the players in charge of carrying out research activities, and innovative companies that need to acquire innovation. In Albania, some of the interviewees think that the coordination of the current facilities, which have separate activities from each other, should be implemented. In Montenegro, facilities that are not included are within the Ministry of Agriculture and Rural Development and the Ministry of Tourism and Sustainable Development, as well as the Environment Protection Agency.

6. *In your opinion what are the main functions that the Agricultural Knowledge and Innovation System should perform?*

According to Apulian interviewees, a renewed AKIS should perform the following main functions: to recognize and identify the innovation needs of regional businesses and encourage their acquisition; develop experimental and innovative projects and disseminate the use of research results; realization of full-scale demonstration experimental tests; creation of a multi-year strategic document on regional agricultural innovation. Albanian respondents believe that AKIS should increase agriculture and food sustainability and competitiveness by improving access to and acquisition of knowledge, education, innovation, and experience through a coordinated effort of public, private and civil society organizations. In Montenegro, the main functions that AKIS should perform are related to encouraging the introduction of modern technologies, education, and capacity building of institutions, of different technician profiles in the field of agriculture, through workshops, trainings, seminars, etc.

7. *In your opinion who are the agents (i.e., individuals) and/or the facilities that perform these functions?*

Respondents' answers to this question in Puglia region may be divided into two groups. One formed by those who believe that those functions are performed by universities and research centres, and the other group composed of those who attribute these functions to entrepreneurs and innovation brokers. In Albania, all share the opinion that these functions are performed by: MARD (Ministry of Agriculture and Rural Development), Regional Agricultural Extension Agencies, Agricultural Technology Transfer Centers (ATTC), Agricultural University, farmers and their unions, Albanian Rural Development Network and other NGOs with a focus on rural development, etc. In Montenegro these are scientific and educational

institutions, many companies in the field of agriculture, business associations, public institutions in the Government of Montenegro, the NGO sector and the like.

8. *In your opinion what kind of interactions occur between the agents (i.e., individuals) and/or the facilities of the Agricultural Knowledge and Innovation System? Please specify whether interactions are strong or weak; episodical or stable.*

For Apulian respondent's interaction is weak and fragmented. The strong need to make interactions much more solid and structured is evident. Also, for Albanian interviewees, there is a variety of operating and coordinating players in the above-mentioned agricultural sector, but their interaction and cooperation is weak and fragmented. In Montenegro, interactions between individuals (specifically agricultural producers) and facilities within the agricultural knowledge and innovation system are currently satisfactory, but with much room for further progress.

9. *In your opinion what kind of interactions should be strengthened? Among what agents (i.e., individuals) and/or facilities?*

Most of the answers show that in Puglia region interactions between agricultural and agri-food enterprises and innovation-developing enterprises, as well as between the latter and public and private research bodies should be strengthened. In Albania, respondents think that the work of Agricultural Extension Agencies and their interaction with farmers should be strengthened. Interaction with academia and civil society, vocational high schools, consulting societies, farmers' organizations as well as greater financial support are essential. In Montenegro, interactions between the education system and the agricultural sector need to be strengthened. Higher education institutions can work on strengthening innovative capacities and thus contribute to the application of knowledge and innovation.

10. *What is your perception/impression about the current ability of the Agricultural Knowledge and Innovation System to enhance innovations? Is the system effective?*

According to the interviewees, AKIS in Albania and Puglia region is not officially organized, the level of cooperation between the existing facilities is not enough and does not adequately respond to the challenges faced by farmers. Similarly, in Montenegro the current system is not efficient enough to have a significant impact on improving innovation. In all areas there is still plenty of room for improvement.

11. *What is your perception/impression about the current political/regulatory framework regarding the functioning of the Agricultural Knowledge and Innovation System in your country/region?*

In Puglia region, the regulatory framework should be more effectively implemented, while respondents think that the current political and regulatory framework in Albania is incomplete. In Montenegro, a strategic framework for innovation activities was adopted in 2016 and in 2020. The Government adopted two laws, namely the Law on Innovation and the Law on Incentives for the Development of Research and Innovation.

12. *In your opinion, what role has the public administration played in promoting the functioning of the Agricultural Knowledge and Innovation System in your country/region? For example, are there any tools (regulatory, financial) that support it?*

The promotion of the functioning of the knowledge and innovation system takes place essentially using community development programmes in all areas.

13. *In your opinion, how an entity that intends to carry out a specific innovation project is supported by the Public Administration?*

The support comes mainly from the public contribution envisaged in specific support schemes in all areas.

14. *In your opinion, what role does the Innovation Broker (or a specific professional figure) play in favouring the functioning of the Agricultural Knowledge and Innovation System?*

Most of the answers for all the areas show that there is a correct perception of the role of Innovation Brokers, who should be the central figure of the knowledge system in agriculture, allowing various players to communicate effectively.

15. *In your opinion, what professional profiles should be added?*

According to all respondents, the following expertise should be added: innovation managers supported by specific field skills (experts and agronomists); professionals with high scientific knowledge; IT specialists for agriculture, innovation advisors, agricultural marketing specialists, civil society members, etc. should be added, together with experts in legislation, and in EU projects.

16. *In your opinion, what activities have been carried out by the Public Administration to disseminate/publicize the Agricultural Knowledge and Innovation System among stakeholders?*

According to the interviewees' answers, in Puglia region an initial analysis of innovation needs has been performed. Other concrete initiatives are expected. In Albania, a specific forum on "Agricultural Knowledge and Innovation System (AKIS)" has been organized, and the public administration has also conducted several trainings. In Montenegro, the agricultural knowledge and innovation system has been increasingly promoted among stakeholders in recent years.

17. *In your opinion, how is the level of networking - at a regional level - among the players of the Agricultural Knowledge and Innovation System (and among the Operational Groups)?*

In Puglia region, respondents discriminate among different situations of networking activities. The level is high among and inside research institutions and within them. Instead, there are no interactions between the various OGs. It is necessary to stimulate the creation of a regional network between the players of AKIS and between operational groups. In Albania as well there is a need for more networking among AKIS players.
In Montenegro, networking level is high among players and operational groups. Networking reflects that the agricultural knowledge and innovation system players allow for knowledge transfer to operational groups.

18. *In your opinion, how is the level of networking - at national and international level - among the players of the Agricultural Knowledge and Innovation System (and Operational Groups)?*

Respondents of Puglia region and Albania think that networking at national and international level between AKIS players is fragmented. A more structured situation is found in Montenegro.

19. *In your opinion, how can the current Agricultural Knowledge and Innovation System in your country/region be improved?*

The main improvements of the Apulian innovation system consist in making businesses' dialogue with the innovation players feasible; in Albania there should be a pluralistic model. In Montenegro, the current agricultural knowledge and innovation system can only be improved by monitoring the success of the implementation measures that encourage innovation, connecting and exchanging experiences on best practices.

20. *Finally, in your opinion, what are, the main challenges for the current Agricultural Knowledge and Innovation System of your country/region?*

The challenges of the agricultural knowledge and innovation system in Puglia region, Albania and Montenegro are those identified by the new European 2021/2027 programme, by the new "*From farm to fork*" programme and those related to climate change.

6. Strengths and weaknesses, opportunities and threats resulting from the global analysis

6.1 Strengths

- Adequate number of profiles of the traditional agricultural research and innovation system (researchers, teachers, advisors).
- Adequate number of institutions/organizations of the traditional agricultural research and innovation system (Universities, research bodies, training bodies, consultants).
- Previous collaboration experiences among innovation players.
- Increasing role of innovation intermediaries.
- Awareness of the businesses' centrality in projects.
- Presence of parties not conventionally considered to be part of the knowledge and innovation system that can provide responses to new needs and orientations of agriculture.
- Centrality of the partnership approach in development actions for all the stakeholders of the agri-food and forestry system, not only a privilege of research bodies, as it was previously the case.
- Diffusion and capillarity of the approach through establishing EIP-AGRI Operational Groups with a significant effect on future modes of action of many parties (increasing permanent collaboration).

6.2 Weaknesses

- ✓ Poor propensity to innovation cooperation among players and innovation groups.
- ✓ Poor information of the innovation needs of agri-food businesses and specific statistics on agriculture innovation and knowledge systems.
- ✓ Insufficient connection of available innovation with the businesses' needs.
- ✓ Occasional and non structural information, facilitation and support activities.
- ✓ Poor availability of professionals in support of the agricultural innovation and knowledge systems in agriculture (innovation broker).
- ✓ Lack of coordination between institutions and (public and private) bodies of the agricultural innovation and knowledge system.
- ✓ Very complex administrative procedures required to access to financing, and absence of an integrated intervention framework to favour innovation and technological transfer.
- ✓ Low concertation level with the territory players in defining innovation policies.
- ✓ Absence of specialized figures on innovation in businesses (innovation manager).
- ✓ Lack of facilities (Hub) and qualified/certified instruments to foster innovation and technological transfer, including the creation of enterprises managed by young people in the agri-food sector.
- ✓ Marginal role of consultancy in the adoption and diffusion of innovation.
- ✓ Marginal role of the professional system of farm technicians in national initiatives on innovation.
- ✓ Low level of business investments for innovation.

- ✓ Absence of private investors (business angels, banks, etc.).
- ✓ Impossibility for the Italian Regions to make a strategic choice relating to the contents of OGs as early as during the rural development programmes (RDP).
- ✓ Administrative and financial complexity in the EIP-AGRI implementation in the scope of the rural development policy.
- ✓ Extreme diversification of the procedural choices, approach, and content choices among Regions, which leaves the project participants in different areas in the lurch.
- ✓ Centrality of the facilitation and coordination stakeholders' actions in setting the EIP-AGRI action not always properly taken in due account by all the Regions.
- ✓ Impossibility to understand, at this stage, the correct implementation of the interactive approach to innovation.
- ✓ Reduced attention to the networks' effectiveness and efficiency.
- ✓ Development of poor stable relations among the project partners.
- ✓ Insufficient positive impact of OGs on the rural fabric related to the promotion of relations and networks among OGs (based on themes and problems faced).
- ✓ Overlapping of roles and functions of the institutional networks, and replacement of networks' functions more suitable to the local level.

6.3 Opportunities

- ❖ Availability of financial resources allocated for agricultural innovation and knowledge system.
- ❖ Availability of technologies and the stage of applied research and/or experimental development.
- ❖ Availability of legislative instruments that foster collaboration among the players of the agricultural innovation and knowledge system.
- ❖ Widespread need for a socio-economic transformation of systems.
- ❖ Generalized new generations' interest in the agri-food sector
- ❖ International cooperation both for startups and support organizations (ISO).

6.4 Threats

- Poor level of material, immaterial and digital infrastructures.
- Heightened risk of "digital divide" among territories and/or type of businesses and farms.
- Reduced public resources for basic research and innovation.
- Scarce public resources for (public) consultancy activities to foster knowledge transfer.
- Excessive importance given to the number of scientific publications by researchers to the detriment of the implementation of the Third Mission of universities and popular publications.
- Low level of diffusion of innovations produced in different fields (H2020, initiatives financed through various types of funding sources).
- Scarcity of facilities and initiatives specifically dedicated to foster exchange flows among the players of the agricultural innovation and knowledge system.

7. Suggestions and ideas for the future programming

1. To promote knowledge flow and application by stimulating the innovation chain players' participation. To this end, it is proposed to implement a "*Rural Open Innovation Lab*" in blended mode (onsite and online), as a public tool for knowledge exchange and effective transfer, pursuing the following objectives:
    - to give businesses a key role in the innovation processes,
    - to stimulate the emergence of the businesses' needs and facilitate the search for possible solutions (analyses/indicators at the macro/system level; on-farm and inter-farm diagnosis tools),
    - to work for bringing together businesses' innovation needs and research results both through the online platform and other computerized tools, and onsite meetings (living Lab, tailored consultancy, demonstration actions),
    - to promote the creation of (formal and informal) collaborative multi-stakeholder contexts and tools to connect the innovation chain players; to make a public *back office* (or help desk) available to strengthen the knowledge flow through specialized professional profiles (knowledge transfer manager).

2. To encourage researchers to participate in collaborative multi-stakeholder innovation processes, by improving the current public research assessment systems both in their general set-up and in the applications at the institutions. To this end, it is proposed:
    - envisaging the provision of incentives and adequate recognition of roles and functions to the researchers involved in the innovation transfer,
    - development of innovation-oriented research methods for businesses and rural areas,
    - promoting the validation and testing of research results to make them readily transferrable to the operational environment.

3. To encourage the adoption of innovations through setting up a structured consultancy service system, and sustainable over time, which may guarantee an expert support to the business fabric of the agri-food and forestry sector. To this end, it is proposed:
    - to develop specific training paths within the institutional educational paths,
    - to define methods and instruments for certifying the skills of the professionals in charge of consultancy services.

4. To promote the qualification and operation of new professionals to support AKIS (innovation manager, innovation broker, innovation coach, research-business cooperation) taking care of its specific training paths.

5. To define an institutional and regulatory process for the recognition (at the European, national, and regional level) of the Agricultural Knowledge and Innovation System

(AKIS) also by establishing an AKIS Board for the coordination and connection among various components of the system, including businesses.

6. To support networking among EIP-AGRI Operational Groups and other (formal and informal) innovation initiatives to share results, favour the emergence of further needs/opportunities and promote new knowledge (*Virtuous circle of knowledge sharing "From the transfer to the creation of new knowledge*").

7. To strengthen collaboration for innovation in the Public Administration, overcoming the current divisions based on sectoral expertise: agriculture, industry and services, economic development, rural development, active employment services, land and environmental management, promoting integration between operational programmes, and continuous dialogue with all the players of the knowledge system (research organizations, service and consultancy facilities, training institutions, businesses, and so on).

8. To innovate administrative procedures for the implementation and financing of partnership projects to promote innovation, supporting the businesses' central role and the involvement of all related players on a specific theme.

9. To improve monitoring and assessment systems of public initiatives that provide incentives for innovation, through analysis methods of global sustainability performance, especially focused on the social one.

10. To reinforce specialized infrastructures for agri-food innovation (Hub) equipped with adequate, qualified, and certified instruments and laboratories to favour:

    - innovation and technological transfer processes to agri-food businesses,
    - development of innovative solutions starting from businesses' challenges/needs (open innovation programme),
    - Support to the creation of new youth entrepreneurship.

Annex 1

Analysis of the AKIS system in Albania

1. In your opinion what are the main innovation needs of the agricultural system of your country/region?

Respondents think that in Albania a permanent and stable system of information on agriculture should be established with accurate data (the number of farmers, farm characteristics, mechanization degree, plant varieties, etc.) Also, information should be exchanged, and knowledge should be transferred between different players. The need for advisors and agronomists is high, so the facilities of agricultural extension need to be strengthened, to orient farmers toward harmonized production techniques. A special, well-organized, sustainable networking structure should be established to increase cooperation between farmers and other AKIS players. The government should provide more financial and legal support to advisory institutions, researchers and organizations operating in the field of agriculture and rural development.

2. In your opinion what type of innovation has been implemented in the agricultural domain?

According to the interviewees, so far, the legal framework of quality schemes for agriculture has been approved, the establishment of the AIAX system on land register is in progress. With the help of TAIEX (Technical Assistance and Information Exchange) experts the FADN (Farm Accountancy and data Network) system was set up. An Action Plan related to the Counseling Reform is available, while for the Veterinary reform the amendment to the law no. 10465, dated 29.9.2011, "On the veterinary service in the Republic of Albania", Law 71, 2020 has been approved.
Innovation has been limited to EU-funded projects, new intensive and super intensive cultivation technologies have been introduced in orchards. A drip irrigation system has been introduced, fertilization techniques have been changed, and a varietal improvement has been carried out according to market demands. All the above have been applied to a limited number of farmers and farms, not to a large extent.
In relation to plant protection, efforts have been made to use EU-permitted preparations, and a piece of software has been used for the prognosis and signaling of diseases and pests.

3. To what extent is there a favourable environment for the introduction and dissemination of innovation? How is it characterized?

According to the interviewees, the environment is considered partially favourable. In 2018, the Ministry of Agriculture and Rural Development (MARD) undertook a substantial reform to improve the public advisory service in Albania. The reform, with the creation of 4 new

Regional Agricultural Extension Agencies, aimed to respond, as efficiently as possible, to the needs of a constantly growing sector. The establishment of Regional Agricultural Extension Agencies (AREB's) improved the focus on the advisory service and aimed at increasing the interaction with the Agricultural Technology Transfer Centers (ATTC) by providing a better service to farmers and other interested players. Meanwhile, the Cross-cutting 2014-2020 Strategy for Rural and Agricultural Development was approved, as well as the National Strategy for Science, Technology, and Innovation. Obstacles are the low rate of spread of the Internet service system in rural areas, of the technologies, and the old equipment currently used by farmers in the region.

4. Can you list the agents (i.e., individuals) and the facilities that currently compose the Agricultural Knowledge and Innovation System in your country/region?

Respondents' answers to this question lead to the conclusion that AKIS in Albania is not formally organized and lacks a strategic framework to enable existing facilities, players, processes, and procedures to "be efficiently and effectively connected". Interaction between players is fragmented. However, the players that could create the AKIS facility are: MARD (Ministry of Agriculture and Rural Development), Agricultural University, Agricultural Technology Transfer Centres (ATTC), Regional Agricultural Extension Agencies, Veterinary Service and Plant Protection Agencies, municipalities, farmers' and agribusiness organizations, civil society, donors, etc.

5. In your opinion who and/or what facilities would need to be added?

Some of the interviewees think that the coordination of the current facilities, which have separate activities from each other, should be performed. Other interviewees think that Agricultural Cooperative Societies, agricultural input trading units, agricultural innovation centres as well as civil society should be added.

6. In your opinion what are the main functions that the Agricultural Knowledge and Innovation System should perform?

Respondents believe that AKIS should increase the agricultural and food sectors sustainability and competitiveness by improving access to and acquisition of knowledge, education, innovation, and experience through a coordinated effort of public, private and civil society organizations. Sharing knowledge and expertise is essential to keeping agriculture and food production competitive as well as rural areas vibrant. Frequent consultations, trainings, and coaching for the applications of the acquired knowledge, mentoring and study visits to places where these systems are functional and fruitful should be performed.

7. In your opinion who are the agents (i.e., individuals) and/or the facilities that perform these functions?

All respondents share the opinion that these functions are performed by: MARD (Ministry of Agriculture and Rural Development), Regional Agricultural Extension Agencies, Agricultural Technology Transfer Centers (ATTC), Agricultural University, farmers and their unions, Albanian Rural Development Network, and other NGOs with a focus on rural development, etc.

8. In your opinion what kind of interactions occur between the agents (i.e., individuals) and/or the facilities of the Agricultural Knowledge and Innovation System? Please specify whether the interactions are strong or weak; episodic or stable.

According to the interviewees, there is a variety of operating and coordinating players in the above-mentioned agricultural sector, but their interaction and cooperation are weak and fragmented; they do not properly convey knowledge and information to farmers. Interactions are farmers-to-farmers, between points of sale of agricultural inputs-farmers, during the implementation of various projects among governmental facilities, academic staff, and farmers.

9. In your opinion what kind of interactions should be strengthened? Among what agents (i.e., individuals) and/or facilities?

Respondents think that the work of Agricultural Extension Agencies and their interaction with farmers should be strengthened, to provide them with wide access to Agricultural Knowledge and Innovation Systems. Training of specialists working in these agencies is necessary, as well as actions based on a well-defined regulatory framework. Interaction with academia and civil society, vocational high schools, consulting societies, farmers' organizations as well as greater financial support are essential. Interaction among research institutions, civil society, and farmers, as well as civil society and the MARD (Ministry of Agriculture and Rural Development) should also be strengthened.

10. What is your perception/impression about the current ability of the Agricultural Knowledge and Innovation System to enhance innovations? Is the system effective?

According to the interviewees, in Albania, AKIS is not officially organized, the level of cooperation among the existing facilities is not sufficient and does not adequately respond to the challenges faced by farmers today. Funds for scientific research in universities or scientific institutions are insufficient, innovation has not achieved visible results, so AKIS is ineffective.

11. What is your perception/impression about the current political/regulatory framework regarding the functioning of the Agricultural Knowledge and Innovation System in your country/region?

Respondents think that the current political and regulatory framework is incomplete; also, according to experts, the elements of the Integrated Administration and Control System

(IACS), the creation of a functional register for farms, Parcel Identification Systems, a system that allows the application of geospatial assistance, integrated computerized and on-farm control system, statistics, etc. are missing. Also, prices - Farm Accountancy and data Network - (FADN) - are not fully in use, yet; the same as the reforms related to veterinary service, land consulting and consolidation. An Action Plan related to the Counseling Reform is adopted, while for the Veterinary reform the amendment to the law no. 10465, dated 29.9.2011, "On the veterinary service in the Republic of Albania", Law 71, 2020, has been approved. The establishment of the AIAX system about the land register is in progress, and with the help of TAIEX experts the FADN system has been set up.

12. In your opinion, what role has the public administration played in promoting the functioning of the Agricultural Knowledge and Innovation System in your country/region? For example, are there any tools (regulatory, financial) that support it?

According to the interviewees, the main role of the Public Administration is related to the national schemes for agriculture and rural development support; ARDA has been established and implements the national support schemes, introduces the principle of monitoring and evaluation of these schemes. The staff of agricultural extension agencies, although insufficient, contribute promoting the functioning of the Agricultural Knowledge and Innovation System. Also, the promotion of the functioning of the Agricultural Knowledge System and Innovation has been implemented and promoted through projects/programmes such as: IPARD; IPESA, in cooperation with civil society organizations, the EU Horizon 2020 Programme, etc.

13. In your opinion, those who intend to carry out a specific innovation project how are they supported by the public administration?

According to the interviewees, the state's support is related to the support schemes that affect the improvement of cultivation technologies and innovation. According to the established criteria: funding will be up to 50% of the total value of tax invoices for processes that improve cultivation technologies or bring innovations. The administration of AREB, Agro-points, Agricultural Technology Transfer Centers (ATTC) according to their functions and competencies, support specific projects in the field of innovation.

14. In your opinion, what role does the Innovation Broker (or specific professional figures) play in favouring the functioning of the Agricultural Knowledge and Innovation System?

Most of the respondents had no information about the existence of Innovation Brokers in Albania, but they think that they could play a key role as facilitator and intermediary agent, uniting research, industry, and farming communities, so that new and innovative agricultural

solutions can be adapted to the needs and interests of farmers and help them enter the market.

15. In your opinion, what professional profiles should be added?

Respondents think that IT specialists for agriculture, innovation consultants, agricultural marketing specialists, members of civil society, etc. should be added.

16. In your opinion, what activities have been carried out by the Public Administration to disseminate/publicize the Agricultural Knowledge and Innovation System among stakeholders?

According to the answers of the interviewees, on July 9, 2019, the Ministry of Agriculture and Rural Development (MARD) organized a forum on "Agricultural Knowledge and Innovation System (AKIS)", with the support of GIZ and the EU-funded IPESA project. This forum took the first step of cooperation among AKIS players in Albania and laid the basis for drafting the Strategic Action Plan. Also, the promotion of this system, although not at the desired level, is performed by ARDA, and support schemes of agriculture and rural development. The public administration has conducted several trainings.

17. In your opinion, how is the level of networking - at a regional level - among the players of the Agricultural Knowledge and Innovation System (and among the Operational Groups)?

Respondents think that networking among AKIS players, at the regional level, is almost non-existent, unsustainable, and fragmented. ANRD to create spaces of interaction among different players, has modestly established four forums of broad public-private partnerships /in four development regions.

18. In your opinion, how is the level of networking - at national and international level - among the players of the Agricultural Knowledge and Innovation System (and Operational Groups)?

Respondents think that the networking among AKIS players at national and international level is almost non-existent, unsustainable, and fragmented.

19. In your opinion, how can the current Agricultural Knowledge and Innovation System be improved in your country/region?

According to the interviewees, in Albania, AKIS should rely on EU approaches, moving from the existing top-down approach to a more pluralistic model. Human and financial capacities for Agricultural Extension Agencies should be increased, the expertise and presence of civil

society, scientific research institutions, local agricultural and rural development organizations should be increased, cooperation with international partners and donors should be improved, equally so the investments in Information and Communication Technology (ICT) and agricultural vocational schools.

20. Finally, what are, in your opinion, the main challenges for the current Agricultural Knowledge and Innovation System of your country/region?

Respondents think that the main challenges facing AKIS in Albania are:

- Limited awareness of farmers about the importance of AKIS, its benefits and operational requirements among key stakeholders,
- Lack of communication and coordination among the main players of AKIS,
- Limited financial and operational resources in the public domain,
- Lack of attraction of the younger generation in agriculture.

Analysis of the AKIS system in Montenegro

1. In your opinion what are the main innovation needs of the agricultural system of your country/region?

In Montenegro, the need to stimulate and strengthen the innovation of the agricultural system, i.e., the need to introduce innovations in agricultural production processes is necessary to enable the creation of favourable conditions and incentives for all those interested in the agricultural sector to strengthen their capacities and improve production, to transform Montenegro agriculture. The future development of the economy, as well as agriculture as a branch of the economy, should be based on the new technologies, artificial intelligence, robotics, virtual reality, blockchain, Internet of things, big data analysts, etc. However, it is very important not to forget the importance of man who drives all these technologies and to whom those technologies serve. Innovations in the agricultural system should primarily be focused on innovations in equipment for agriculture. New technology in equipment helps meet the demands that change brings in agriculture - higher food production with fewer resources, in a period of climate change. Equipment implies the means or tools that are needed for a particular activity. Data collection is very important for agriculture. Telematics, i.e., transmission of computer information remotely, allows machines to be connected with a computer system. Real-time information can be sent and received. Mapping is also important because it is related to field data collection. In this way, "recipes" are obtained, i.e. tips for all fields, as an example the amount of fertilizer needed in a plot. It is also needed to pay attention to the control of the material application, in order to reduce "wastefulness" or double sowing, fertilization, irrigation, and similarly. Robots can perform jobs and processes in the agri-food sector. Robots can make that sector more efficient. Thus, robots are used on-farm to clean and sort eggs; in milking on dairy farms; putting fresh food in front of animals; mixing milk and feed substitutes for young animals (calves, lambs, and goats); weeding vegetables; soil moisture testing in fields or orchards; pruning vines in the vineyards.
In terms of environmental protection, the main needs for innovation reflect in mitigating the consequences of climate change, with sustainable production processes. Among other things, the implied substitution of all toxic pesticides, herbicides, fungicides, fertilizers, etc. with some organic and eco-friendly substances that can increase agricultural yields. Montenegro, but also other countries of the region, need to cooperate more with each other in achieving a common digital future. Only innovation and technological development can bridge the existing economic development gap between the countries of the region (including Montenegro) and many European countries. The latest trends in the field of technological development in the region and the world can bring a better future for all citizens. The condition for faster technological development is the establishment of regional cooperation. So there needs to be as much as possible cooperation with partners from the region. Young people are the bearers of all innovation and digitization processes.

2. In your opinion what type of innovation has been implemented in the agricultural domain so far?

In line with economic opportunities, Montenegro is still not competitive with other countries in the region when it comes to developing innovation in the agricultural sector. However, with the adoption of the Smart Specialization Strategy (S3), Montenegro will significantly work on the introduction of new measures and instruments in the coming period, which will enable better quality research, access to modern technologies and infrastructures, and better access to the European Union funds.

Recently, many educational trainings and workshops for agricultural producers have been organized within various projects, to raise awareness of the importance of introducing innovation in agriculture.

So far, certain innovations related to connecting agricultural producers and farm products end-users have been applied, through certain digital tools (websites) where farmers can advertise and sell their products.

Some progress has been made when it comes to the safety of agri-food products and the availability of data to the end-consumer on the origin and quality of raw materials. Laboratory capacities have been improved. Also, work is being done on the establishment of innovative laboratories, which will significantly contribute to the development of agriculture by connecting the academic and business sectors. One of the applied innovations is the use of specialized microorganisms, as an adequate substitute for artificial fertilizers. Also, one of the examples is setting up meteorological stations on plots and connecting them with special pieces of software, where precise data on air humidity and temperature are obtained, these being the basic indicators for the appearance of diseases, to protect plants preventively.

3. To what extent is there a favourable environment for the introduction and dissemination of innovation? How is it characterized?

A favourable environment for the introduction and dissemination of innovations in Montenegro does exist; however, economic opportunities and the lack of adequate infrastructures have often been the reason for their slow development. Many government institutions have recently increasingly invested on the introduction and spread of innovations in the agricultural sector through various programmes and support systems. These are primarily the Ministry of Agriculture and Rural Development of Montenegro through the AgroBudget, the Ministry of Science of Montenegro through various programmes for scientific research projects and innovative grants, then the Ministry of Economy of Montenegro through various programmes. Innovation and Entrepreneurship Centre Tehnopolis also significantly contributes to the development and dissemination of innovations in agriculture in Montenegro, through using the latest methods and the most modern equipment. Also, through the European Union accession funds significant work is being done on the improvement of Montenegrin agriculture.

Five paths for improving agriculture in Montenegro are possible: better optimization of resource use, increased production, creation of urban farms, greenhouses, indoor farms, improvement of genetic material to obtain higher yields and protection against diseases and parasites, but also less waste along the food production chain. Innovation does not only mean the creation of new products, but also a new organization and transformation of the

company. The favourable environment for the introduction of innovations and their dissemination is the creation of mutual relationships between the company and the partner, as well as among professionals within a company.
Innovations in the agricultural sector in Montenegro should be effective, concrete, and affordable to be accepted.

4. Can you list the agents (i.e., individuals) and the facilities that currently compose the Agricultural Knowledge and Innovation System in your country / region?

In recent years, Montenegro, as a country in the process of European integration, has focused its activities on stimulating innovation following the Europe 2020 Strategy. According to the Strategy of Innovative Activity in Montenegro, smart growth focusing on research and innovation, requires quality improvement education, strengthening research capacities, promoting innovation and knowledge transfer, as well as making full use of ICT.
Within the Law on Innovative Activity, the national innovation system consists of interconnected entities: the Government of Montenegro, state administration bodies, local self-government units, the Innovation and Smart Specialization Council and the Innovation Fund of Montenegro, which manage, encourage its development and finance it, as well as entities that perform innovation activity, entities that provide innovation infrastructure, investors in innovation activity and other entities in the field of science, education and economy, which contribute to the development of innovation capacities, ideas and application of innovations.
Within the S3 Smart Specialization Strategy, and within the priority area Sustainable Agriculture and Food Value Chain, the environment for research and innovation is represented by the following facilities: scientific and educational institutions (University of Montenegro, University of Donja Gorica, Institute of Public Health of Montenegro, Montenegrin Academy of Sciences and Arts, Specialist Veterinary Laboratory), a large number of companies in the field of agriculture, business associations (Chamber of Commerce of Montenegro (PKCG), Union of Employers (UP), Montenegro Business Alliance (MBA), National Association of Beekeepers, Association of Olive Growers "Boka" from Ulcinj, National Association of Winegrowers and Winemakers, Cluster of Registered Cheese Producers, Cluster of Small Wineries, Cluster of Ponds, Cluster of Olive Growers, Cluster of Montenegrin Prosciutto, Cluster of Raspberries, Public Institutions (Ministry of Agriculture and Rural Development, Ministry of Economy, Ministry of Science, Ministry of Sustainable Development and Tourism, Monteorganica certification body of Montenegro, Investment and Development Fund, local government, Directorate for Food Safety, Veterinary and Phytosanitary Affairs, Accreditation Body of Montenegro, Department of Hydrometeorology and Seismology, Center for Eco-toxicological Testing), as well as the civil sector (Center for Consumer Protection).
The structure of licensed scientific research institutions consists of 33 faculties, which are organizational units of three Montenegrin universities, 8 institutes (2 of which are part of universities), 5 independent private faculties, 1 independent state faculty, 3 companies, 3 non-governmental organizations, 3 centers, 2 agencies, 1 institute and 1 museum.

47 licensed higher education institutions and 178 accredited study programmes are registered in the Register of the Ministry of Education.
Although in Montenegro there is no specific programme that includes the cooperation of Montenegrin scientists, researchers, and diaspora innovators, the importance of the diaspora for the country's development has been recognized. Emigrant scientists present in the "Scientific Network" system, enable this base to be significantly expanded.
A very important indicator of potentialities is the number of students from Montenegro who are in doctoral studies.
The cluster also has an important role in information because they can increase their capacity for innovation, diffusion of technologies and technological knowledge, improve technological processes, connect experts, and ultimately increase productivity.
Patents are one of the indicators of a country's capacity in the commercialization of scientific knowledge.

5. In your opinion who and/or what facilities would need to be added?

Facilities that are not defined by the Strategy are those operating within the Ministry of Agriculture and Rural Development and the Ministry of Tourism and Sustainable Development. Also, it can be the Environment Protection Agency of Montenegro – EPA Montenegro, etc.

6. In your opinion what are the main functions that the Agricultural Knowledge and Innovation System should perform?

The main functions that the agricultural system of knowledge and innovation should perform are related to encouraging the introduction of modern technologies when it comes to the production of healthy and quality food, sustainable management of natural resources (water and land) in the process of agricultural production, and reducing the negative impact of agriculture, when it comes to mitigating the effects of climate change, with sustainable production processes. In addition to the introduction of modern technologies, the priority should also be education and capacity building of institutions of different profiles in the field of agriculture, as well as agricultural producers, through various workshops, trainings, seminars, conferences, and the like (education primarily on the harmful effects of supplements for better agricultural yields) which are still widely and uncontrollably used in Montenegro.
The agricultural system of knowledge and innovation should, in cooperation with the Ministry of Agriculture and Rural Development, enable agricultural producers to quickly and easily obtain funds to improve agricultural production on-farm or within their enterprise, to produce safe and quality food, and enable the protection of domestic production and increase its recognizability.

7. In your opinion who are the agents (i.e., individuals) and/or the facilities that perform these functions?

These are scientific and educational institutions, many companies in the field of agriculture, business associations, public institutions in the Government of Montenegro, then the NGO sector and the like. As far as individuals within the mentioned facilities are concerned, they must be trained experts from recognized fields, as well as trained young people, who have the knowledge and skills to approach the problem efficiently and to look at it globally. Based on previous experience, agricultural producers want to cooperate with people who are experts in the field, who are accessible and open to cooperation, but also agricultural producers who are ready to adopt new technologies and knowledge.

8. In your opinion what kind of interactions does occur between the agents (i.e., individuals) and/or the facilities of the Agricultural Knowledge and Innovation System? *Please specify whether the interactions are strong or weak; episodic or stable.*

Interactions between individuals and/or facilities are still weak and episodic, with some improvements in the availability of verified information and increased awareness of individuals in the production and processing chain, as well as service activities. Interactions between individuals (specifically agricultural producers) and facilities within the agricultural knowledge and innovation system are currently at a satisfactory level, but with much room for further progress, since one of the priorities of future innovative Montenegro will be investing in agricultural innovation to have strong and stable expected interactions.

9. In your opinion what kind of interactions should be strengthened? Among what agents (i.e., individuals) and/or facilities?

Interactions need to be strengthened between the education system and the agricultural sector. Higher education institutions can work on strengthening innovative capacities and thus contribute to the application of knowledge and innovation through the research work of young researchers and scientists. Thanks to the opportunities for research work, more and more young people will be involved in the development of modern technologies and their strengthening through the transfer of knowledge and technology with the business sector, where agriculture is the most important. The capacities of various institutions would be strengthened, which would transfer their knowledge to agricultural producers as the most important players in the agricultural sector.

10. What is your perception/impression about the current ability of the Agricultural Knowledge and Innovation System to enhance innovations? Is the system effective?

The current system of knowledge and innovation in Montenegro is not efficient enough to have a significant impact on improving innovation. The inefficiency of the system could be attributed to the insufficient commitment of the competent authorities and the state in general, in strengthening the connection between the education system and the agricultural sector. Also, the establishment of the Technology Transfer Centre, the development and

installation of trademark software, the creation of an information centre, the establishment of a patent register, incubators' register, Centres of Excellence, a Science and Technology Park, the Innovation and Entrepreneurship Centre Tehnopolis and many others are a major step forward to a future that will be important for the development of the state and society. Although Montenegro has recently worked to encourage the introduction of innovation in the agricultural sector, there is still plenty of room for improvement.

11. What is your perception/impression about the current political/regulatory framework regarding the functioning of the Agricultural Knowledge and Innovation System in your country/region?

The Government of Montenegro seeks to enable the creation of better conditions for agricultural producers, through the support for developing their ideas, financial and advisory assistance by the implementation of regulations in many areas, especially in the field of agriculture and food production.
The legislative and strategic framework for innovation activities was adopted in 2016 to shape a sustainable and efficient innovative ecosystem in Montenegro. In this way, the legal basis has been established for planning support instruments in the form of innovation programmes and projects and strategic guidelines for optimal use of innovative potentials and their orientation towards market application.
In 2020, the Government of Montenegro adopted two laws, namely the Law on Innovation and the Law on Incentives for the Development of Research and Innovation.
The Smart Specialization Strategy (S3) adopted by Montenegro in 2019 is one of the regulatory frameworks developed to speed up smarter innovation development and innovation development management. To encourage innovative and science-based development of the food sector, especially in the field of food quality and safety, the Center of Excellence (CoE) was established. Its mission is to create innovations in the food sector through research, knowledge transfer, development and improvement of native and traditional food and agricultural products, and resources.

12. In your opinion, what role has the public administration played in promoting the functioning of the Agricultural Knowledge and Innovation System in your country/region? *For example, are there any (regulatory, financial) tools that support it?*

Public institutions in the Government of Montenegro, such as the Ministry of Agriculture and Rural Development, the Ministry of Science, the Ministry of Economy, through various programmes and incentive measures, provide the greatest support for the development and promotion of the agricultural knowledge and innovation system in Montenegro.
Montenegro will have a sustainable and efficient innovation system, aimed at facing the social challenges of the future. This system will be one of the key drivers of the Montenegrin economy and improving development, because of technological and non-technological innovations, increasing investment and stimulating private sector investment and its

innovation potential, which will increase economic competitiveness, encourage investment and development while improving economic conditions and life standard in the country.

13. In your opinion, how those who intend to carry out a specific innovation project are supported by the public administration?

The innovation project can be implemented by various innovative organizations, which are registered in the Register of Innovative Organizations and which include: scientific research institutions, higher education institutions, centres of excellence and business entities (innovation and entrepreneurship centres, business incubators, companies, or part of a company). The public administration supports them through various programmes.

14. In your opinion, what role does the Innovation Broker (or specific professional figures) play in favouring the functioning of the Agricultural Knowledge and Innovation System?

An innovation broker represents a link between the research facility, the business sector, and end-users (agricultural producers) in favour of the development of new products and services.

15. In your opinion, what professional profiles should be added?

Through a special information system called "Scientific Network", records are kept of all information relevant to scientists, researchers and innovators from Montenegro and the diaspora. For the time being, there are no precise data on scientists from the Montenegrin diaspora, but one of the most important sources of data in the last period is certainly the "Study on Cooperation with Scientists from the Diaspora". Although in Montenegro there is no specific programme that includes the cooperation of Montenegrin scientists, researchers and diaspora innovators, the importance of the diaspora for the country's development has been recognized.
Among other things, they should be experts from recognized fields (IT experts, agricultural engineers, biotechnologists, as well as in the field of legislation and knowledge of EU projects, etc.).

16. In your opinion, what activities have been carried out by the Public Administration to disseminate/publicize the Agricultural Knowledge and Innovation System among stakeholders?

The system of agricultural knowledge and innovation has been increasingly promoted among stakeholders in recent years. Businessmen in Montenegro have become aware of the importance of digitalization in agriculture, the development of innovative food products, monitoring the needs of markets that are increasingly dependent on the world situation (monitoring modern trends). State institutions, as creators of the legal and strategic

framework for innovation, in cooperation with all other entities are obliged to define the main obstacles to development and their causes, identify current user's needs and consider recommendations to establish a comprehensive, efficient, and sustainable innovation system.

17. In your opinion, how is the level of networking - at a regional level - among the players of the Agricultural Knowledge and Innovation System (and among the Operational Groups)?

At the regional level, there is a high networking level among players and operational groups. Networking reflects that the agricultural knowledge and innovation system players enable the knowledge transfer to operational groups.
Also, the cooperation of all players in the innovation system - state institutions, universities, research institutions, businesses and NGOs, adequate training programmes, infrastructures, market, and various financial support instruments - is a key factor in shaping and arranging the innovation system of a country.
Universities and scientific research institutions, as generators of scientific research, need to direct the results of research towards concrete application, which inevitably leads them to connect with the business sector, but also dialogue with state institutions in search of an optimal model of innovation commercialization. While, on the other hand, for economic entities mostly focusing their activities from services to production and development - it is necessary to focus on research institutions, which will compensate for the lack or underdevelopment of enterprise development sectors by proposing innovative solutions that will respond to their real needs.

18. In your opinion, how is the level of networking - at national and international level - among the players of the Agricultural Knowledge and Innovation System (and Operational Groups)?

At the national and international level, networking among players and operational groups is high. Networking refers to cooperation with other organizations in the region and the world (global cooperation). In the context of concrete creation of innovations, the connection and establishment of cooperation among the academic, scientific and economic sectors are the most important, and special attention should be paid to designing adequate national support programmes, which will certainly open to involving other players in the innovation system and achieving optimal use of opportunities arising from various EU and international research and innovation programmes. However, there is still plenty of room for improvement.

19. In your opinion, how can the current Agricultural Knowledge and Innovation System in your country/region be improved?

The current agricultural knowledge and innovation system can only be improved by monitoring the success of the implementing measures that encourage innovation. There is a wide range of indicators that can measure the degree of innovation of a company. On the one hand, they include efforts to create innovation, which are measured through the investment

of resources for innovation, while on the other hand, they include concrete results of innovation processes, which are measured by new or improved products or processes, protected patents, new "start-ups", etc. The system can be improved by developing a plan for setting up national innovation statistics, in the context of the monitored success of the implementation of measures that encourage innovation. The system can also be improved by strengthening the instruments for connecting players in the innovation system and favour mutual cooperation.

Montenegro has chosen a model that finances research, development, and innovation projects for a certain period (up to three years), and which includes cooperation within the sector, among sectors, and international cooperation.

The organization of various promotional events is the best mechanism for informing target groups about EU programmes, the opportunities provided, the conditions for participation, ways of connecting with potential partners and the services provided by the competent institutions for their coordination. Also, they are an ideal opportunity for domestic institutions to connect and exchange experiences on the best practices of participation in various programmes, as well as to use joint capacities towards external partners.

20. Finally, what are, in your opinion, the main challenges of the current Agricultural Knowledge and Innovation System of your country/region?

The lack of information of both the local population and competent institutions about the invaluable negative impact that irrational and unplanned agricultural production has on the environment, primarily on human health; then, the lack of motivation of young people in agriculture who would accept innovation knowledge development. The challenge is an innovation that will lead to improvements and concrete results in the field in terms of improving agricultural production. Also, for the current system of agricultural knowledge and innovation, the main challenge is significantly higher agri-food product imports compared to exports. Accordingly, it is necessary to develop innovative solutions to enable the production of healthy and quality food in Montenegro - a country with large capacities - and thus increase exports compared to imports. For the goals of the agricultural knowledge and innovation system to be successfully realized in the future, representatives from Montenegro must get thoroughly acquainted with EU values, with the EU policy in various areas, legislation and ways of implementation, successful solutions, and experiences from other countries within the EU, as well as the methods and rules based on which the EU operates. In that sense, Montenegro's participation in EU programmes would contribute to deepening knowledge and strengthening the capacity of various players when it comes to European standards and projects.

Analysis of the AKIS system in Puglia

1. In your opinion what are the main innovation needs of the agricultural system of your country /region?

Respondents think that in *Puglia* region two different types of innovation are needed. One type concerns the organizational model of companies in relation to management, economic management, the working environment, and external relations; the other is related to the improvement of production processes and the reduction in the use of resources. Supporting interaction and cooperation among companies through stable and lasting forms of aggregation not linked to obtaining an incentive; improved knowledge transfer; increased consistency of research activities with the needs of the agricultural and rural world are examples of innovation needs of the first type. Greater use of the Internet of Things in production; high mechanization with low environmental impact; introduction of automated systems and widespread sensors; facilitated access to information via the web and training in the use of this kind of information; conservation systems with high energy efficiency; longer shelf life and final packaging totally recyclable at low costs are examples of innovation needs of the second type.

2. In your opinion what type of innovation has been implemented in the agricultural domain so far?

According to respondents, the only kind of innovation introduced is the one linked with the improvement of production processes and the reduction in the use of resources. The answers to the question, in fact, deal with: innovations related to the mechanization and efficient use of inputs (water, fertilizers, pesticides); the conservation, protection and enhancement of agricultural genetic diversity; introduction of new plant varieties; use of low environmental impact techniques and means ; cultivation techniques; small steps have been made in terms of sensors, traceability systems and traceability of production; whereas embryonic software innovations were implemented on agricultural vehicles / equipment.

3. To what extent is there a favourable environment for the introduction and dissemination of innovation? How is it characterized?

According to the interviewees, the environment is considered partially favourable. The regional agricultural world is increasingly perceiving the strategic importance of investing in innovation to compete on global markets, and farmers are aware of the need of introducing machines and mechanization, which reduce cultivation costs. More generally, they are always in search of saving and greater resource use efficiency. Producers and consumers are also increasingly aware of innovative production and have a generalized expectation for a revival of agriculture. However, the introduction and dissemination of innovation is limited by the economic capacity of the company or companies capable of organizing themselves into associations or consortia. It has been pointed that a favourable environment for the

introduction and diffusion of innovation is better available d when agricultural entrepreneurs (relatively young or so) join a good level of education (graduates) who communicate with other local players, especially with research institutions.

4. Can you list the agents (i.e., individuals) and the facilities that currently compose the Agricultural Knowledge and Innovation System in your country/region?

Respondents' answers to this question lead to the conclusion that AKIS in *Puglia* region is not formally organized and there is a strong need of a strategic framework to enable existing facilities, players, processes, and procedures to "be efficiently and effectively mutually connected". Interviewees have made a list of the main players of AKIS (Universities, Research Centres, Regional Agricultural Office, farmers' and agribusiness organizations, consulting firms, agronomists) just in terms of their presence in the projects submitted by the Operational Groups.

5. In your opinion who and/or what facilities would need to be added?

Answers to the previous question is confirmed by the answers to this question. In fact, one respondent stressed the need to add facilities that allow collaboration among parties involved in research activities and innovative companies in need of acquiring innovations. In any case, facilities like Territorial districts, technicians from the public or private sector who support the dissemination of innovations by transferring information, ARPA - Regional Agency for Environmental Protection - should be added to make a better AKIS. Many interviewees think that Public Authorities should have a much more proactive attitude in the AKIS.

6. In your opinion what are the main functions that the Agricultural Knowledge and Innovation System should perform?

According to interviewees, a renewed AKIS should perform the following functions: having more meetings, including virtual ones, on the benefits of technological innovation in agriculture, and holding demonstration days; recognizing and identifying the innovation needs of regional businesses and encouraging their acquisition; developing experimental and innovative projects and disseminating the use of research results; realization of demonstrative experimental tests in full scale; promoting innovations in supply chains; facilitating relationships; arising entrepreneurs' awareness of the importance of innovation for the agricultural sector; reinforcing the agricultural entrepreneurial fabric; creation of a multi-year strategic document on regional agricultural innovation. One answer was particularly impressive: AKIS should apply the well-known saying: “Think globally, act locally”.

7. In your opinion who are the agents (i.e., individuals) and/or the facilities that perform these functions?

Respondents' answers to this question may be divided in two groups. One group formed by those who believe that those functions are performed by universities and research centres, and the other one composed of those who attribute these functions to entrepreneurs and innovation brokers. Probably, the answers are dependent on the role of the interviewees, but they non share the opinion that there are agents or facilities that perform or at least organize the abovementioned functions.

8. In your opinion what kind of interactions do occur between the agents (i.e., individuals) and/or the facilities of the Agricultural Knowledge and Innovation System? Please specify whether the interactions are strong or weak; episodic or stable.

All respondents share the opinion that interaction is weak and fragmented. For some of them, interactions occur almost exclusively when there is the opportunity to participate in a tender to obtain incentives. Answers may appear to be overly pessimistic and in contrast with the previous answer. However, the strong need to make interactions much more solid and structured is evident.

9. In your opinion what kind of interactions should be strengthened? Among what agents (i.e., individuals) and/or the facilities?

Most of the answers show that companies are often small and with limited economic capacity to acquire innovations, that they do not know their real needs to improve their conditions on national and international markets. Therefore, mainly the interactions between agricultural and agri-food enterprises and innovation developing enterprises should be strengthened, as well as between the latter and public and private research bodies. In addition, the need to strengthen the interactions among the main parties of the Innovation System and the companies organized in stable forms of cooperation (still few) is highlighted with an increase in the direct presence in the companies. It would also be interesting to strengthen the interactions between research centres and agricultural trade associations.

10. What is your perception/impression about the current ability of the Agricultural Knowledge and Innovation System to enhance innovations? Is the system effective?

The answers to this question mainly show a low AKIS ability to give specific responses and, therefore, low effectiveness. However, there are those who believe that AKIS is effective in the few cases where there is interaction between companies, universities, and research centres or that even the system is very effective though needing better disclosure. Among those who express a negative perception; some highlight the need to improve its effectiveness, possibly by creating new facilities (public-private observatories) to foster knowledge and dissemination of innovations among companies in the sector, and others provide a strategic overview and refer to the impetus of public institutions towards research and innovation.

11. What is your perception/impression about the current political/regulatory framework regarding the functioning of the Agricultural Knowledge and Innovation System in your country/region?

The answers to this question express strong criticism on the regional political framework in support of AKIS. In fact, despite having guidelines and a regional law, incentives for their use are lacking and, above all, specific and timely training is lacking. This regulatory framework should be implemented more effectively, for example, through demonstration companies. The prevailing perception is that the knowledge and innovation system is developed only with sporadic initiatives by private individuals, universities, and research centres. The regulatory political framework, albeit inadequate, is still experiencing recent development that goes in the right direction to ensure a better functioning of the knowledge system.

12. In your opinion, what role has the public administration played in promoting the functioning of the Agricultural Knowledge and Innovation System in your country/region? For example, are there any tools (regulatory, financial) that support it?

According to the interviewees, despite having guidelines and a regional law, the public administration gives a disproportionate weight to the bureaucratization of the initiatives rather than to the content and effectiveness of the proposed activities. A feeble attempt to innovation was made by the regional administration with the establishment of the Networks of Public Research Laboratories. Unfortunately, the intervention was limited to financing for the purchase of new equipment and, subsequently, to support the costs of highly specialized personnel. Although laudable, the initiative lacked the most important part, the management at the regional level that would coordinate and direct the action of the established networks. The promotion of the functioning of the knowledge and innovation system takes place essentially using community development programmes.

13. In your opinion, how those who intend to carry out a specific innovation project are supported by the public administration?

There is no shortage of tools for financing innovative projects. The support derives from the public contribution that is foreseen by the specific support scheme (although they have become increasingly cumbersome and complicated). Should someone propose an innovation project that does not comply with a call, the issues become complicated and the support of the public administration is lacking.

14. In your opinion, what role does the Innovation Broker (or specific professional figures) play in favouring the functioning of the Agricultural Knowledge and Innovation System?

Most of the answers show that there is a correct perception of the role of Innovation Brokers. They help. However, their role becomes marginal, as they must first fulfill the bureaucratic commitments. According to interviewees, in theory, they would be very useful; their role is quite wide; they should be the central figure of the knowledge system in agriculture, which allows the various players to communicate effectively.

15. In your opinion, what professional profiles should be added?

According to respondents, the following expertise should be added: innovation managers supported by specific field skills (experts and agronomists); professionals with high scientific knowledge who have real working/collaborative relationships with farms and companies in the sector; innovation technicians but also communication skills.

16. In your opinion, what activities have been carried out by the Public Administration to disseminate/publicize the Agricultural Knowledge and Innovation System among stakeholders?

Based on the interviewees' answers, a few years ago focus groups were held with companies and institutional representatives to build an initial analysis of innovation needs. There appears to be no follow-up with other concrete initiatives aimed at implementing the actions identified by the focus groups, nor at disclosing what AKIS is. Some projects funded by the RDP aimed at disseminating innovations in certain supply chains. However, there is no system vision and communication actions on the meaning and importance of AKIS.

17. In your opinion, how is the level of networking - at a regional level - among the players of the Agricultural Knowledge and Innovation System (and among the Operational Groups)?

Respondents discriminate among different situations of networking activities. The level is high among and inside research institutions and within them. The players that revolve around the knowledge system joined the operational groups thanks to the opportunity of the public notice to apply for the RDP sub-measure 16.2. Instead, among the various OGs, there are no interactions nor any action by the region to stimulate networking between the OGs. It is necessary to stimulate the creation of a regional network among the agricultural knowledge and innovation system players and among the operational groups.

18. In your opinion, how is the level of networking - at national and international level - among the players of the Agricultural Knowledge and Innovation System (and Operational Groups)?

Respondents think that networking at national and international level among AKIS players is almost non-existent, unsustainable, and fragmented. Some networking activities have been implemented by the National Rural Network at national level and for OGs.

19. In your opinion, how can the current Agricultural Knowledge and Innovation System in your country/region be improved?

The main improvements of the innovation system will be to make the businesses dialogue with the innovation players. Innovation must not end with the scientific project but must be incorporated into the corporate culture. A regional reference structure needs to be created. The challenge is to identify an innovation-based process with a regional connotation, to identify actions and facilities (research bodies, innovative companies, and professionals) that can collaborate to foster the diffusion of innovations in the primary sector.

20. Finally, what are, in your opinion, the main challenges for the current Agricultural Knowledge and Innovation System of your country/region?

The challenges of the knowledge and innovation system in Puglia region agriculture (and not only in this region) are those identified by the new 2021/2027 European programming and by the new "*From farm to fork*" programme, and especially those related to climate change.

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