

EIP-AGRI: EU initiatives for the transfer and co-creation of innovations on and for grassland

Schreuder R.¹, Peratoner G.², Goliński P.³ and Van den Pol-van Dasselaar A.⁴

¹EIP-AGRI Network Facility, Koning Albert II laan 15, 1210 Brussels, Belgium; ²Laimburg Research Centre, Vadena/Pfatten, 39040 Ora/Auer, Italy; ³Poznań University of Life Sciences, Department of Grassland and Natural Landscape Sciences, Dojazd 11, 60-632 Poznań, Poland; ⁴Aeres University of Applied Sciences, De Drieslag 4, 8251 RR Dronten, the Netherlands

Abstract

The EIP-AGRI is dedicated to foster competitive and sustainable farming and forestry that ‘achieves more and better from less’ and therefore ensuring a steady supply of food, feed and biomaterials. The aim of this paper is to provide insight into the consideration of grasslands in the EIP-AGRI. It discusses focus groups (FG), operational groups (OG), multi-actor projects (MAP) and thematic networks (TN) with a link to grasslands. Grassland is one of the many agricultural topics covered by these EIP-AGRI key building blocks. In FG, grassland topics are well represented (they were addressed in 46.5% of all FG) in contrast to OG, where they are the subject of a marginal number of OG (7%). The OG cover a wide range of grassland related topics. The topics addressed by OG are less focused on environmental issues than, e.g. recommendations coming from the FG. Under the EIP initiatives, several grassland MAP/TN were implemented as H2020 research projects, where farmers are at the centre of practice-based innovation.

Keywords: European Union, operational group, focus group, multi-actor projects, thematic networks

Introduction

The European Innovation Partnership for Agricultural productivity and Sustainability (EIP-AGRI) was launched in 2012 in the context of the Innovation Union (EC, 2013) and is one of five EIPs. It contributes to the European Union’s strategy ‘Europe 2020’ for smart, sustainable and inclusive growth. It is dedicated to foster competitive and sustainable farming and forestry that ‘achieves more and better from less’ and therefore in ensuring a steady supply of food, feed and biomaterials, developing its work in harmony with the essential natural resources on which farming depends (<https://ec.europa.eu/eip/agriculture/en/about>). This strategy sets the strengthening of research and innovation as one of its five main objectives and supports a new interactive approach to innovation (Wielinga, 2014). According to Faure *et al.* (2019), brokering functions and new services are key in this process to support actors to innovate by facilitating interactions for the co-production of knowledge, co-design of technologies, and identification of new institutional arrangements.

Having an idea is one thing; turning it into an innovation action is another. Different types of available funding sources can help get an agricultural innovation project started, such as the European Rural Development policy or the EU’s research and innovation programme Horizon 2020. The EIP-AGRI contributes to integrating different funding streams so that they contribute together to the same goal and avoid unnecessary duplication of results. The EIP-AGRI adheres to the ‘interactive innovation model’ which brings together specific actors (e.g. farmers, advisers, researchers, businesses, NGOs and others) in agriculture and forestry to work together in multi-actor projects to find a solution for a specific issue or developing a concrete opportunity. Together these actors form an EU-wide EIP network (<https://ec.europa.eu/eip/agriculture/en/node>). Within this network, Operational Groups (OG), Multi Actors Projects (MAP) and Thematic Networks (TN) are all key building blocks. Focus Groups (FG) play a role in inspiring OG ideas and directions of MAP and TN. From January 2015, the European Rural Networks’ Assembly was successfully launched as the main governance body of the ENRD and EIP-

AGRI Networks. The Assembly provides the strategic framework for the activities of the network support units and forms a platform to share stakeholders' priorities and concerns, covering all aspects of the Rural Development Policy 2014-2020. The aim of this paper is to provide insight into the consideration of grasslands in the EIP-AGRI.

Description and objectives of the four instruments

EIP-AGRI focus group

An EIP-AGRI Focus Group is a temporary group of 20 selected experts focusing on a specific subject formulated by the EU Directorate-General for Agriculture and Rural Development (DG AGRI) based on input from stakeholders (Focus Groups, 2016). The FG discusses and documents best practices and research results, explores practical innovative solutions to the problems or opportunities in the field that were listed, and draws on experience derived from related useful projects. The FG promotes the sharing and exchange of knowledge and experience among experts involved (researchers, farmers, advisers, etc.). Participants of an EIP-AGRI Focus Group are selected in a transparent manner from the pool of applications according to their competences based on documented expertise to support the work of the EIP-AGRI Focus Group. With the main emphasis on the expertise, the EIP-AGRI Focus Group is also composed with the intention of geographical balance and an adequate proportion as regards the fields of expertise and professional activity.

The FG results may have implications for dissemination and possible further directions for research that may help to solve practical problems in the agricultural or forestry sector and in rural areas. These may be related to production, processing, consumption, transport or other issues. The tangible output is focused on practical knowledge and where to get that knowledge as well as ideas for new OG. An EIP-AGRI FG is moderated by DG AGRI and several (usually three) experts of the EIP-AGRI Support Facility. An additional external expert can be invited on ad hoc basis, subject to the authorization of DG AGRI.

Objectives of each EIP-AGRI FG are:

1. To take stock of the state of play of practice in the field of the EIP-AGRI FG activity, listing problems and opportunities.
2. To take stock of the state of play of research in this field, summarizing possible solutions to the problems listed.
3. To identify needs from practice and propose directions for further research.
4. To propose priorities for innovative actions by suggesting ideas for practical OG or other project formats to test solutions and opportunities, including ways to disseminate the practical knowledge gathered.

EIP-AGRI operational group

OG are innovative projects tackling a certain (practical) problem or opportunity which may lead to an innovation (Operational Groups, 2016). Innovation in the agricultural and forestry sectors can be described in general terms as the introduction of something new (or renewed, a novel change) which turns into an economic, social or environmental benefit for rural practice. The OG approach makes best use of different types of knowledge (practical, scientific, technical, organizational, etc.) in an interactive way. Therefore, each OG is composed of those key actors that are in the best position to realize the project's goals, to share implementation experiences and to disseminate the outcomes broadly (such as farmers, advisers, researchers, businesses, NGOs, etc.). OG and Innovation Support Services are funded by the national or regional Rural Development Programmes (RDP). The EU member states or regions decide on the precise conditions to support innovation projects through their RDP.

OG can use support to develop new products, practices, processes and technologies in the agriculture, food and forestry sectors. Further possible areas of action include joint work processes, short supply chains, joint climate change actions and collective environmental projects. RDP support can cover the funding of the OG project but can also help to set up OG. Innovation brokers can help to develop a rough new idea into an innovation group ready to start a project (ISS, 2014). Bringing the right partners together and clear agreements on the concrete work plan and cooperation arrangements is key for the future success of OG projects.

Currently there are over 2200 OG set up in the EU, some of them related to grassland. A first evaluation of the OG was done in 2018 (Knotter *et al.*, 2019). However, no quantification and specific analysis for grassland-related OG has been done so far, to our knowledge.

H2020 projects: multi-actor projects and thematic networks

While OG are funded under the RDP, MAP and TN are supported by the Horizon 2020 Programme. Apart from the more classical research projects under Horizon 2020, the call includes several opportunities to support multinational interactive innovation projects in agriculture and forestry through TN and through MAP. The multi-actor approach should lead to innovative solutions that are more likely to be applied in the field, because those who need the solutions will be involved right from the start: from defining the questions, to planning, to implementing research work, to experiments and right up until possible demonstrations and dissemination. Openness to involve relevant groups operating in the EIP context (such as OG) has been strongly recommended in the work programme of Horizon 2020. The TN aim to:

1. Collect existing scientific knowledge and best practices on the chosen theme, and facilitate their use.
2. Develop easily understandable material for end-users like farmer, foresters, advisers, such as info sheets in a common format and audio-visual material. The material should be long-term available and easily accessible to end-users.

Analysis methods to evaluate the innovation effort in relation to grassland

Analysis of the Focus Groups (FG)

A first screening of FG and OG led to a list of grassland-related topics, potentially suitable to include most grassland-related aspects addressed by FG, OG and research projects. These aspects are: grassland farming profitability, grazing management, biodiversity and/or nature conservation, forage quality, smart grassland management, climate change mitigation, enhancement of functional diversity, quality and marketing of grassland-based animal products, meadows management, permanent grassland, fertilization and nutrient cycling, temporary grassland/leys, other, weed control, grass refinery, mechanization and agroforestry. For the FG the final reports of 43 FG were analysed according to these grassland-related topics based on their state of play in December 2021 (EIP-AGRI, 2021). The following classification of FG by topics was undertaken: (1) grassland-related FG (8-15 grassland-related topics addressed in the final FG report); (2) grassland-marginally related FG (2-7 topics); and (3) grassland-not related FG (0 topics).

Analysis of the EIP-AGRI database of operational groups

The EIP-AGRI maintains an extensive, freely accessible database (<https://ec.europa.eu/eip/agriculture/en/find-connect/projects>), which aims to provide basic information about running and completed OG, in order to foster the cooperation and ensure cross-fertilization between projects sharing common aims at a European level. To select and analyse the grassland-related OG only, a search of the database (download on 29 January 2022) was done by using some potentially grassland-related keywords ('grassland', 'grazed', 'ensiling', 'fodder', 'grazing', 'pasture', 'meadows', 'forage', 'silage', 'ruminants'). Following this first

screening, the descriptions of the remaining OG were evaluated according to the description of the aims and of the undertaken actions to achieve the stated objectives. All cases were retained that were either explicitly related to grassland or that included actions having a direct relationship to grassland. For instance, OG dealing only with animal product-quality were dropped unless grassland-related actions were also described. In total, 164 grassland-related cases were retained for further analyses and each case was assigned to all grassland-related topics addressed (as defined for the FG analysis). Other descriptors already included in the EIP-AGRI database (starting year, location, lead partner category) were used for the analysis as well. Moreover, each case, depending on the location of the OG, was assigned to one of the biogeographical regions of Europe according to the European Environment Agency (2017). Austria and Slovenia were assigned to the Alpine region, Belgium, Ireland, Netherlands and United Kingdom to the Atlantic region, Finland, Lithuania and Sweden to the Boreal region, Poland to the Continental region, Portugal and Spain to the Mediterranean region, and Hungary to the Pannonian region. For France, Germany and Italy, because of their biogeographical heterogeneity, the single OG were assigned to the respective biogeographical region based on their location. In order to analyse the relationship between biogeographical regions, topics and lead partner categories, a principal component analysis (PCA) was performed expressing the levels of the three factors as binary variables.

Online survey of operational groups

An anonymous online survey was conducted from 28 January to 10 February 2022 to gain a more detailed insight into aspects of the grassland-related OG not covered by the EIP-AGRI database. The coordinator of each OG was invited via e-mail to take part in a survey, implemented in Microsoft Forms, and to provide information about the topics addressed (according to the same list used for the analysis of FG and the EIP-AGRI database), the animal categories addressed (cattle, sheep, other animal species and no animals species; goats were merged with other animal species because of the too-low number of respondents), the kind of animal products addressed (milk and dairy products, meat, other animal products and no animal products), the stakeholder categories involved in the OG (developer of innovation, farmer, researcher, extension service/adviser, facilitator agent/innovation broker, veterinarian, local administration, policy maker, industry (supply and processing), marketing organization, retail, non-governmental organization (NGO), consumers' organization, farmers union, professional school for agriculture, student/pupil, journalist, other), the occurrence of international cooperation and, for completed OG only, the request to self-assess on a 1-10 scale (whereas 10 is the best result) the achievement of the stated aims and the achievement of the targeted impact on the local agricultural practice.

Analysis of multi-actor projects and thematic networks

The CORDIS database (www.cordis.europa.eu) was searched for H2020 MAP and TN with a relation to grasslands using the key words: 'grassland', 'grazed', 'ensiling', 'fodder', 'grazing', 'pasture', 'meadows', 'forage', 'silage', 'ruminants'. Further criteria for inclusion in a list of relevant MAP/TN was an EU contribution >500,000 euro. Following this first screening, the descriptions of the remaining MAP and TN were evaluated in a similar way as the OG. All cases were retained which were either explicitly related to grassland or contained actions having a direct relationship to grassland.

Consideration of grasslands in the EIP-Agri: focus groups and grassland

The analysis following the classification criteria resulted in nine grassland-related FG (20.9%), 11 marginally grassland-related FG (25.6%) and 23 non-grassland-related FG (53.5%). In the grassland-related FG the operational objectives for the research and MAP/TN that help to solve practical problems in grassland management were defined (Table 1).

Table 1. EIP focus groups with relations to grassland and their main results.

Topic of focus group	Main question	Main issues/operational goals for research that help to solve practical problems in grassland management
Profitability of permanent grassland (2014-2015)	How to manage permanent grassland in a way that combines profitability, carbon sequestration and biodiversity?	<ul style="list-style-type: none"> • Defining grassland typology in relation to biodiversity and productivity • Achieving grassland production and quality to match livestock needs • Benchmarking grassland dry matter production and its utilization at regional and national levels • Increasing grassland functionality by diversifying sward plant composition • Increasing resource efficiency to improve profitability and sustainability • Differentiating grass-based products for higher market value • Evaluate environmental impacts of grassland-based systems using Life Cycle Thinking
High Nature Value – Farming profitability (2014-2016)	How to make HNV farming more profitable without losing the HNV characteristics?	<ul style="list-style-type: none"> • Better access to semi-natural land for grazing (quantity and quality) • Making more efficient use of semi-natural fodder resources • Complementary use of HNV and semi-intensive land • Developing better technical and management solutions for HNV farming, e.g. HNV grassland • Increasing selling price of HNV products, e.g. grass-based products, and improving access to markets
Grazing for carbon (2017-2018)	How to increase the soil carbon content from grazing systems?	<ul style="list-style-type: none"> • Improving the understanding of strategies promoting better soil C management in grazed grasslands • Establishing monitoring schemes for C storage • Developing incentives to promote the adoption of good and appropriate grazing systems • Reaching equilibrium of soil organic content through optimal grazing management in different soil conditions • Providing guidelines for good grazing management/education/knowledge dissemination
Livestock emissions – Reducing emissions from cattle farming (2016-2017)	How to reduce cattle livestock emissions in a cost-effective way for farmers?	<ul style="list-style-type: none"> • Using grazing as a management tool to reduce ammonia emissions • Improving management practices and breeding/adopting new species and cultivars for obtaining the quantity and quality of feed to animals and also, in some regions and systems, enhance soil carbon storage • Combining controlled rotational grazing with precision management of grassland and monitoring of animal parameters • Monitoring nutrient composition and feed intake for grazing cattle • Development and testing of decision tools to improve N-efficiency
Water and agriculture (2015-2016)	What farm level adaptation strategies exist or can be developed to deal with water scarcity?	<ul style="list-style-type: none"> • Increasing water productivity by improvement in pasture and grazing management and feeding, or in animal health, and therefore an increase in the system's output • Improving water holding capacity and water infiltration by increasing soil organic matter: conservation agriculture and maintaining soil surface covered with residues, mulching, cover crops or green manure, and crop rotation using leys • Increasing irrigation efficiency monitored by remote sensing and calibrated and evaluated for local conditions • Increasing farm resilience under water scarcity by natural water retention measures: grasslands, buffer strips, agroforestry
Agroforestry: introducing woody vegetation into specialised crop and livestock systems (2016-2017)	How to develop agroforestry as a sustainable farming system which can boost agricultural productivity and profitability?	<ul style="list-style-type: none"> • Developing agroforestry system in farms with plantations of high value trees related with meadow or grazed orchards • Improving agroforestry system in high nature value farms related with mountain pastoralism • Differentiating grass-based products from agroforestry systems for higher market value • Managing silvopastoral farming for shaping landscape structure to prevent wind and water erosion and enhance water balance

Table 1. Continued.

Robust and resilient dairy production systems (2016-2017)	How to create good conditions for dairy cattle husbandry in different production systems?	<ul style="list-style-type: none"> • Farm management strategies to increase the robustness and resilience of dairy farming systems • Assessing feed quality will ensure that daily rations are prepared based on the real chemical composition of on-farm feeds • Choosing the right type or breed of cow for the right system • Introducing dry matter, energy and protein self-sufficiency evaluation on-farm as indicator of farm robustness and resilience • Better standardization and comprehensiveness of life cycle calculation including the valuation of ecosystem services • Implementing measures to increase farm robustness and resilience and responding to general or local consumer requirements
Mixed farming systems: livestock/cash crops (2015-2016)	How to develop livestock / cash crop interactions and promote their benefits as a sustainable alternative to farm or territorial specialization?	<ul style="list-style-type: none"> • Using more efficiently crops and grasslands to feed animals and fertilizing their fields with manure from the animals • Recoupling nitrogen and carbon cycle through legumes/grasslands in arable rotations • Enhance regional integration of mixed farming systems by the diversification of crops and grasslands produced on-farm • Including woody vegetation, conservation agriculture and permanent grasslands to improve existing mixed farming systems and their impacts on landscape mosaic
Sustainable beef production systems (2020-2021)	How can grass-based beef production systems, based on agro-ecology principles, remain sustainable?	<ul style="list-style-type: none"> • Applying of novel holistic assessment methods and tools as important innovations for assessing the real value of products deriving from grass-based beef systems • Improving grassland resource management and plant diversity to produce beef with low resource input, while providing high output in terms of ecosystem services and public goods • Developing the grazing management and stocking density for grass-based beef systems depend on local environment • Using the new decision support tools to improving herd and grazing management, soil health and feed quality • Raising awareness on sustainable beef production by promoting its evidence-based benefits on human health, landscapes, biodiversity, rural communities and keeping European traditions alive • Setting up methods and techniques for differentiating grass-based beef from beef from other systems, including certification/labelling

The goals of Table 1 relate to different types of grasslands, different intensity of their use, profitability in terms of the production of herbivores, as well as environmental issues. Climate change mitigation, grazing management and biodiversity and/or nature conservation were the most frequently addressed topics (70 to 80%), followed by permanent grassland, forage quality, enhancement of functional diversity, agroforestry and fertilization and nutrient cycling with frequencies of at least 50 and up to 65% (Table 2). Climate change mitigation, agroforestry, biodiversity and/or nature conservation, forage quality, enhancement of functional diversity and fertilization and nutrient cycling were much more frequently addressed in FG than in OG (more than 25% more frequently, according to the results of the OG survey).

Grassland-related topics were used marginally in 11 other FG (Table 3). They indicate that grasslands, with regard to their economic and environmental aspects, are important for the analysis and search for innovative solutions in other agricultural areas. It also shows the diversity of services that can be expected from grassland.

The proportion of grassland within the European agriculture area and its food system is substantial (Huyghe *et al.*, 2014; Krause *et al.*, 2018). When looking at the presence of grassland within the 43 FG, we might say that with 20 FG addressing grassland it is well represented.

Table 2. Number and percentage of focus groups and operational groups according to the EIP-AGRI database and to the operational groups online survey addressing topics from the defined list.

Topic	FG (n)	FG (%)	EIP-AGRI database (n)	EIP-AGRI database (%)	OG Survey (n)	OG Survey (%)
Grassland farming profitability	7	35.0	46	28.0	9	20.0
Grazing management	14	70.0	44	26.8	25	55.6
Biodiversity and/or nature conservation	14	70.0	40	24.4	16	35.6
Forage quality	12	60.0	37	22.6	13	28.9
Smart grassland management	4	20.0	33	20.1	7	15.6
Climate change mitigation	16	80.0	26	15.9	11	24.4
Enhancement of functional diversity	11	55.0	22	13.4	11	24.4
Quality and marketing of grassland-based animal products	6	30.0	21	12.8	6	13.3
Meadows management	9	45.0	20	12.2	12	26.7
Permanent grassland	13	65.0	19	11.6	25	55.6
Fertilization and nutrient cycling	10	50.0	19	11.6	10	22.2
Temporary grassland/leys	7	35.0	16	9.8	10	22.2
Other	0	0.0	16	9.8	9	20.0
Weed control	5	25.0	7	4.3	2	4.4
Grass refinery	2	10.0	7	4.3	4	8.9
Mechanization	5	25.0	6	3.7	6	13.3
Agroforestry	11	55.0	5	3.0	2	4.4

Table 3. EIP focus groups with grassland mentioned in their results.

Topic of focus group	Issue related to grassland
Organic farming – Optimising arable yields (2013–2014)	Importance of new crops combinations including leys, legumes, mixed farming, agroforestry
Protein crops (2013–2014)	Leaf protein from alfalfa and forage grasses as a source of high protein content products
Soil organic matter content in Mediterranean regions (2014–2015)	Improving the soil organic matter content of soils by using grass/legume species in time (crop rotation, use of cover crops) or space (intercropping or agroforestry systems, e.g. grassed orchards or vineyards)
Optimising profitability of crop production through Ecological Focus Areas (2014–2015)	Using of grassy or flower strips for enhance landscape features and contribute to the profitability of arable crop production
Carbon storage in arable farming (2017–2018)	Perennial grass leys for providing soil carbon through the grass roots and through the promotion of the soil organisms that are boosted by this
Enhancing production and use of renewable energy on the farm (2017–2018)	Using grass biomass for biogas production and biomass from agroforestry systems, which constitute potential income or cost reduction for farmers, if used as fuels to produce heat or electricity
New feed for pigs and poultry (2018–2019)	Implementation of green biomass (grass/clover) and protein extract made from grass/clover as a new feed option
Bee health and sustainable beekeeping (2019–2020)	Attracting pollinators thanks to multi-functional buffer zones surrounding fields composed of various herbs and grasses
Protecting agricultural soils from contamination (2019–2020)	Managed grazing that builds organic matter in the soil as a practice of regenerative agriculture
Wildlife and agricultural production (2020–2021)	Grassland as forage alternatives to wildlife and a practical strategy to reduce and avoid damages in arable crops
Climate-smart (sub)tropical food crops in the EU (2020–2021)	Maintaining grasslands or including grassland into crop rotations in order to store more carbon in soils, apart from agroforestry, as a practice for conservation agriculture in (sub)tropical zone

Consideration of grasslands in the EIP-Agri: operational groups and grassland

Analysis of the EIP-AGRI database on operational groups

The percentage of grassland-related OG between 2015 and 2020 was found to range between 3.8% and 9.1% of the total number of OG starting in the respective year, with a peak achieved in 2018 with 44 OG, corresponding to 9.1% of the total number of OG starting that year (Table 4). Apparently, both in terms of number of OG and of their percentage, there was an increase of the grassland-related OG until 2018 followed by a decrease to values around 6%.

In the EIP-Agri database, about half of the OG were located within the Atlantic region (78/164 OG), followed by the Continental region with about 20% of the cases (32 OG) (Table 4). The Alpine region, despite its relatively small area, was well represented with about 14% of cases (17 OG). The Mediterranean (23 OG), Boreal (12 OG) and Pannonian (2 OG) regions seem to be underrepresented, compared to their geographical area, whilst the opposite is apparently true for the Atlantic region, although this is the most favourable area for grassland farming from a climatic and (in most cases) topographic point of view.

Within the EIP network, the OG are multi-actor approaches. According to Kelly (2020), they are better for complex innovations; they address real issues, deliver clearer messages, more consistently, with less risk of contradiction and loss of relevance to targeted users.

The OG were most frequently led by advisers (34.1%) or researchers (31.7), whereas farmers, NGO representatives or small or medium enterprises led them with low frequencies (7.9%, 6.7% and 4.3%, respectively) (Table 5).

Concerning the OG topics, the most frequently addressed form of grassland utilization was grazing management, which was part of the OG concept and activities in slightly more than one third of the OG, whilst meadows management was addressed at about half of this frequency (Table 2). The most frequently addressed topics besides grazing management were grassland farming profitability, biodiversity and nature conservation, forage quality and climate change mitigation, with frequencies ranging between 28.0 and 15.9%. It is interesting that these topics represent a mixture of basic issues pivotal for a rational and profitable grassland management (and, in turn, livestock farming) and other emerging topics more related to environmental aspects. The frequency of all other topics other than the ones mentioned above was lower than 15% and particularly low values were observed for weed control, grass refinery,

Table 4. Number and percentage of grassland-related operational groups (OG) 2014-2019.¹

Starting year	All OG (n)	Grassland-related OG (n)	Grassland-related OG (%)	Grassland-related OG included in the online survey (n) ²	Grassland-related OG included in the online survey (%)
2014	1	0	0.0	0 (0)	
2015	79	3	3.8	1 (1)	33.3
2016	232	20	8.6	4 (4)	20.0
2017	409	30	7.3	8 (5)	26.7
2018	482	44	9.1	9 (5)	20.5
2019	530	32	6.0	9 (3)	28.1
2020	367	23	6.3	8 (0)	34.8

¹ Because of incomplete data from 2021 onwards, only data until 2020 are shown.

² In brackets the number of already concluded OG.

Table 5. Lead partner category according to the EIP-AGRI database and stakeholder categories acting within the operational groups according to the online survey (reclassified, where possible, according to the stakeholder categories used in the EIP-AGRI database).

Partner category	Lead partner EIP-AGRI database (n)	Lead partner EIP-AGRI database (%)	Stakeholder categories OG survey (n)	Stakeholder categories OG survey (%)
Adviser	56	34.1	32	71.1
Researcher	52	31.7	36	80.0
Other	25	15.2	22	48.9
Farmer	13	7.9	44	97.8
Representative of an NGO	11	6.7	16	35.6
Small and medium enterprises	7	4.3		
Industry			19	42.2
Civil servant			6	13.3

mechanization and agroforestry. Similar, relatively low frequencies were also observed for permanent grassland and temporary grassland/leys.

While for the FG, grassland topics were well represented, for the OG this was just a marginal 5%. We did not analyse why this representation was so low. It could be due to the selection of allowed/desired topics in the calls for OG by the RDP in the different member states, or to other agricultural sectors being more into multi-actor approach projects with producers. Another possible explanation could be that grassland farmers, advisers and researchers are less interested in participating in OG. This situation may be influenced by the poorly developed innovation brokering system related to grassland in many European countries (Goliński *et al.*, 2018), which means that the topic of grassland is less represented in OG than in other sectors of agriculture. This fact deserves further elucidation and, as grassland plays an important role within European circular and sustainable food systems, more R&D with involvement of farmers seems advisable. Concerning the analysis of the OG topics addressed in the EIP-AGRI database, it is worth remembering that some of them might not have been mentioned in the short description of the OG, as they were obvious to the authors of the abstract, and therefore escaped from being included in the analysis. Moreover, discrepancies between the topic frequencies of FG and OG might be due to the fact that the FG calls often required some set of topics to be mandatorily addressed and being usually related to the EU policies like the European Green Deal. The same applies to the OG calls within the frame of the RDP of some member states.

The first two components of a PCA accounting for the biogeographical region, the lead partner category and the addressed topics according to the short description of the OG in the EIP-AGRI database could explain the variability of the observations only to a small extent (23.8%) (Figure 1). Along the first component, advisors as lead partner were related mainly to the Atlantic region, whilst researchers in this role were mainly related to the Alpine and Mediterranean regions and to the topics of quality and marketing of grassland-based animal products. This may be related to the requirement for sound arguments to justify higher product prices needed under unfavourable production environments to sustain farm profitability. Along the second component, biodiversity and/or nature protection was found to be related to climate change mitigation, profitability of grassland farming, grazing management, permanent grassland and NGO as lead partner category, as opposed to smart grassland farming, underlining how grazing is regarded as part of a viable strategy to meet high environmental standards in combination with economic sustainability of farms. Finally, a quite close correlation was found between the Continental biogeographical region and the forage quality topic, both with moderately high loadings on Component 1 and Component 2.

The OG are addressing most of the time several topics at once. The PCA clearly shows the logic combination of the different regions. Combinations as profitability & biodiversity, alpine & quality and marketing of animal products, permanent grassland & grazing are obvious. Grassland is a source of many ecosystem services, both provisioning as well as environmental and social (Huyghe *et al.*, 2014), and the PCA provides evidence that OG take different categories of ecosystem services into account at the same time.

Based on our grassland-related OG analysis, we see the topics mixture of basic issues for the rational and profitable grassland management (and, consequently, livestock farming) on the one hand, and other emerging topics more related to environmental aspects on the other hand. It is probably related to the new awareness and/or pressure of public opinion or politics and is in line with the principles of the European Green Deal (Guyomard *et al.*, 2020). In this way, we can conclude that grassland is a friendly sector of agriculture that meets the expectations and objectives of the agricultural policy in the new EU financial perspective.

Online survey

The OG database only presents the objectives of the project. The project results are not uploaded and also background information is lacking. In our opinion, structured feedback requested to the OG participants and aiming at gaining specific knowledge about strengths and weaknesses of the process and its outcome would be beneficial to designing the strategy for future actions.

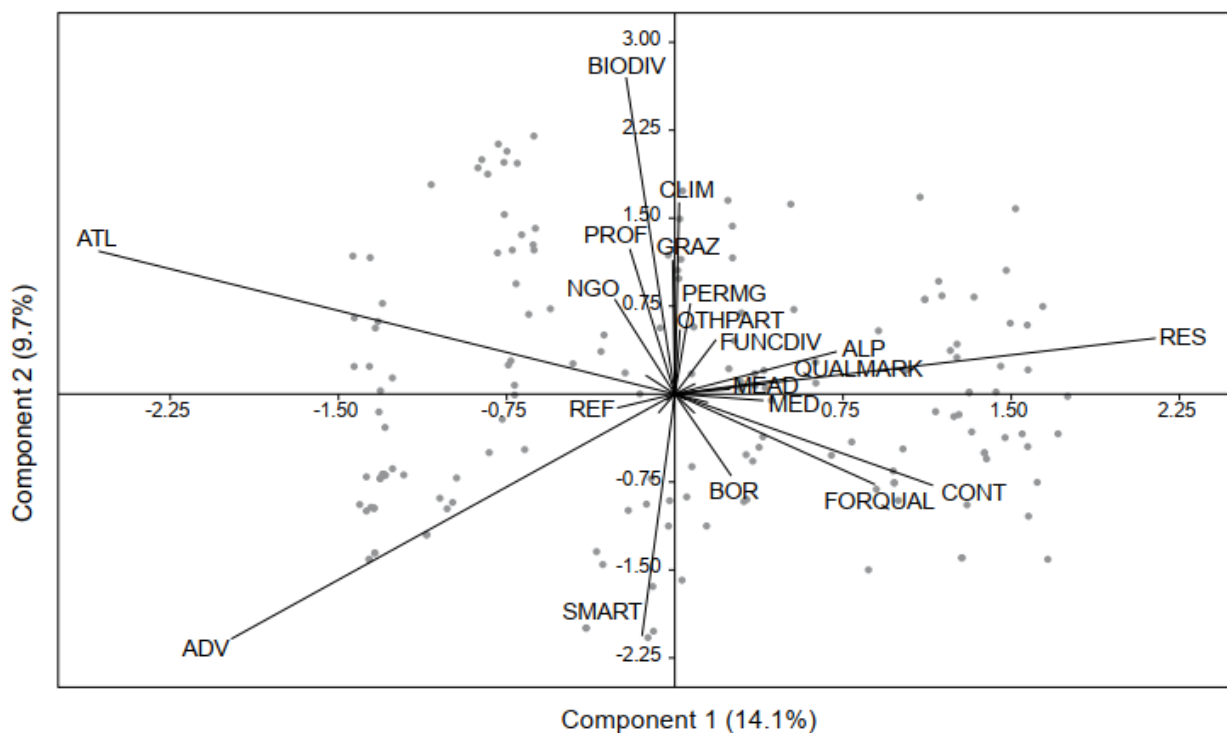


Figure 1. PCA biplot of the first two components, accounting for the region, the lead partner category and the addressed topics according to the short description of the OG in the EIP-AGRI database. The results are shown on eigenvalue scale. The labels of short vectors at axes intersection are omitted for better readability. Biogeographic region: ALP = Alpine, ATL = Atlantic, BOR = Boreal, CONT = Continental, MED = Mediterranean; Topic: BIODIV = biodiversity and/or nature protection, CLIM = climate change mitigation, FORQUAL = forage quality, FUNCNDIV = functional diversity, GRAZ = grazing management, MEAD = meadows management, PERMG = permanent grassland, PROF = profitability of grassland farming, QUALMARK = quality and marketing of animal products, REF = grassland refinery; Lead partner category: ADV = advisers, OTHPART = other partner, NGO = representative of an NGO, RES = researcher.

The online survey allowed us to gain a more detailed insight. There was a total of 49 respondents to the online survey, corresponding to 29.9% of the total number of grassland-related OG. An acceptable proportion of respondents took part in the survey for each start year (ranging within relatively similar proportions of between 20.0 and 34.8%, without any consistent temporal trend), suggesting that the results of the survey might be representative for the grassland-related OG screened from the EIP-AGRI database (Table 2). However, we decided not to attempt an interpretation of the evaluations (mean scores: 8.3 ± 1.2 standard deviation (SD) for the achievement of the stated aims and 7.1 ± 1.9 SD for the achievement of the targeted impact on the local agricultural practice), as they were just 11.0 and 10.4%, respectively ($n=18$ and $n=17$) of the total number of grassland-related OG and, most of all, because a high proportion of OG after 2017 was still running at the time of the survey, resulting in their missing evaluation and leading to a temporal bias in the data set.

Cattle was the animal category most frequently addressed (in about three-quarters of cases), followed by sheep, and other animal species, with similar frequencies (15.6 and 17.8%, respectively). The percentage of grassland-related OG not addressing any animal species was low (11.1%). This was in line with expectations, because there is an obvious link between forage production and its utilization by ruminants.

There was a relatively high number of stakeholder categories per OG (4.9 ± 1.9 SD). Farmers were represented (either as farmers themselves or as farmers unions) in each OG, as their involvement in the OG was indeed required by OG definition (Table 6). It is striking, nevertheless, that they seldom acted as lead partner (Table 5). Most OG are coordinated by researchers (mainly in the Alpine and Mediterranean biogeographical regions) or by advisers (mainly in the Atlantic region). Researchers and advisers were the second and third most represented category (80.0 and 62.2%, respectively, but veterinarians with 15.6% also could be ascribed to the category of advisers). It is notable that developers of the innovation and industry were frequently involved in the OG (53.3 and 40.0%). NGOs and educational institutions (also including students/pupils) relatively often took part in the OG, with frequencies ranging between 28.9% for the agricultural schools and 15.6% for students/pupils. All in all, the data suggest that a good connection of scientific and practice-oriented institutions, covering the production chain up to industry, was achieved. It has to be taken into account that higher values for all stakeholder categories are observed

Table 6. Stakeholder categories acting within the Operational Groups according to the online survey.

Stakeholder category	Survey (n)	Survey (%)
Farmer	44	97.8
Researcher	36	80.0
Extension service/adviser	28	62.2
Developer of innovation	24	53.3
Industry (supply and processing)	18	40.0
Professional school for agriculture	13	28.9
Non-governmental organization (NGO)	9	20.0
Other unknown categories	8	17.8
Facilitator agent/innovation broker	7	15.6
Veterinarian	7	15.6
Student/pupil	7	15.6
Farmers union	6	13.3
Local administration	5	11.1
Other known categories ¹	9	20.0

¹ The category 'others' includes 'policy maker', 'marketing organization', 'consumers' organisation', 'journalist' and 'retail', all with two observations each, except the latter with just one observation.

in the OG survey in comparison to those extracted from the EIP-AGRI database due to the fact that in the OG survey not only the lead partner is listed, but all stakeholder categories taking part in the OG.

An encouraging figure was found also for transnational cooperation, which was implemented in slightly more than a quarter of cases (28.9%). OG also involved, on average, 1.2 ± 0.4 SD other countries besides that of the lead partner.

Consideration of grasslands in the EIP-Agri: MAP, TN and grasslands

From 2016 onwards, Horizon 2020 (H2020) introduced MAP and TN following the interactive model promoted by the EIP-AGRI. This puts farmers at the centre of practice-based innovation in research projects. New and existing scientific knowledge was used to produce implementable solutions for farmers that were shared across a broad network. The H2020 programme supported research related to grassland via several TN and MAP:

- EuroDairy (TN, 2016-2019) was a Europe-wide thematic network supporting a sustainable future for EU dairy farmers. It mobilized 120 innovating Pilot Farmers to increase the economic, social and environmental sustainability of dairy farming. It focused on four key issues: socio-economic resilience, resource efficiency, animal care and biodiversity (Keatinge and Korevaar, 2017).
- HNV-Link (TN, 2016-2019; High Nature Value Farming: Learning, Innovation and Knowledge) was dedicated to developing and sharing innovations that support high nature value farming systems and communities by simultaneously improving their socio-economic viability and environmental efficiency. Poux *et al.* (2018) concluded that the success of HNV innovation brokering was depending on the available means (financial allocation and thus human means for accompanying the local dynamics).
- SheepNet (TN, 2016-2019; Sharing Expertise and Experience towards sheep Productivity through NETworking) was designed to stimulate knowledge exchange between research and stakeholders to widely disseminate best practices and innovations with the objective of increasing ewe productivity. Nutrition/grassland management was identified as the most important challenge for reaching this aim (Keady *et al.*, 2018).
- Inno4Grass (TN, 2017-2019; Shared Innovation Space for Sustainable Productivity of Grasslands in Europe) aimed to bridge the gap between practice and science communities to ensure the implementation of innovative systems on productive grasslands. Grassland-related knowledge was made available for local conditions by a methodology to collect farmers' innovative ideas and to stimulate collaboration among various stakeholders (farmers' groups, extension services, education and research) (Krause *et al.*, 2018).
- The main topic of AFINET (TN, 2017-2019; Agroforestry Innovation Networks) was the promotion of agroforestry to foster climate change. AFINET followed a multi-actor approach linked to nine Regional Innovation Networks (Villada *et al.*, 2018).
- EuroSheep (TN, 2020-2023; European Network for interactive and innovative knowledge exchange on animal health and nutrition between the sheep industry actors and stakeholders) is about dairy and meat sheep production with the objective to exchange existing knowledge between farmers and stakeholders at all stages of the supply chain.
- iSAGE (MAP, 2016-2020; Innovation for Sustainable Sheep and Goat Production in Europe) was set up to improve the sustainability and innovative capacity of the sheep and goat sector in Europe. It was shown that all farm types in all countries are facing challenges regarding their overall sustainability (Paraskevopoulou *et al.*, 2020).
- SUPER-G (MAP, 2018-2023; Developing SUSTainable PERmanent Grassland systems and policies) co-develops permanent grassland systems that will be effective in optimizing productivity, whilst supporting biodiversity and delivering a number of other ecosystem services. It applies a multi-actor approach, working with farmers; land owners/managers and their advisers; third sector and

civil society groups; non-governmental organizations (NGOs) and researchers, policy and business (Newell-Price *et al.*, 2022; in these proceedings)

- The GO-GRASS (MAP, 2019-2023: Grass-based circular business models for rural agri-food value chains) project aims to unlock the overlooked potential of grassland across Europe and to create new business opportunities in rural areas by developing a set of small-scale bio-based solutions to produce protein concentrates, biochar, animal bedding and paper and carton products from grass and green fodder. Orozco *et al.* (2021) conclude that capacity building and alignment efforts need to be strengthened and coordinated at local and higher levels to enable the replication and scale-up of these novel grass-based businesses in Europe and beyond.

Conclusions

Grassland is one of the many agricultural topics covered by the EIP-AGRI key building blocks. In FG, grassland topics are well represented. This is in contrast to OG, where grassland topics only have a marginal number. The discrepancies between the topic frequencies of FG and OG might be due to the fact that the FG calls often required some set of topics to be mandatorily addressed and that they are usually related to the EU policies like the European Green Deal. This is also true for the OG calls within the frame of the Rural Development Programs of some member states. The topics addressed in the FG, OG, MAP and TN show that grassland is an environmentally friendly sector of agriculture that meets the expectations and objectives of the agricultural policy in the new EU financial perspective.

Acknowledgements

We would like to thank the respondents to the online survey on OG.

References

- EC (2013) *Innovation Union, A pocket guide on a Europe 2020 initiative*. Publications Office of the European Union, Luxembourg, Luxembourg, 16 pp. Available at: https://ec.europa.eu/eip/agriculture/sites/default/files/innovation-pocket-book_en.pdf
- EIP-AGRI (2021) EIP-AGRI Focus Groups state of play December 2021, 4 pp. Available at: https://ec.europa.eu/eip/agriculture/sites/default/files/focus_groups_state_of_play_december_2021_final.pdf
- European Environment Agency (2017) *Biogeographical regions in Europe*. Available at: <https://www.eea.europa.eu/data-and-maps/figures/biogeographical-regions-in-europe-2>.
- Focus Groups (2016) *Focus Groups: Sharing knowledge to inspire action*. EIP-AGRI Service Point, 4 pp. Available at: https://ec.europa.eu/eip/agriculture/sites/default/files/eip-agri_brochure_focus_groups_2016_en_web.pdf
- Faure G., Knierim A., Koutsouris A., Ndah H., Audouin S., Zarokosta E. and Heanue K. (2019) How to strengthen innovation support services in agriculture with regard to multi-stakeholder approaches. *Journal of Innovation Economics and Management* 28, 145-169.
- Goliński P., van den Pol-van Dasselaar A., Golińska B., Paszkowski A., Nilsdotter-Linde N., O'Donovan M., Melis R.A.M., Czerwińska A., Delaite B., Bauer A., Florian C., Baste F., Fradin J., Gauder P., de Kort H. and Krause A. (2018) Analysis of innovation brokering systems related to grasslands across Europe. *Grassland Science in Europe* 23, 983-985.
- Guyomard H., Bureau J.-C. *et al.* (2020) *Research for AGRI Committee – The Green Deal and the CAP: policy implications to adapt farming, practices and to preserve the EU's natural resources*. European Parliament, Policy Department for Structural and Cohesion Policies, Brussels, Belgium, 162 pp.
- Huyghe C., De Vlieghe A. and Goliński P. (2014) European grasslands overview: temperate region. *Grassland Science in Europe* 19, 29-40.
- ISS (2014) *Innovation Support Service*. EIP-AGRI Service Point, 12 pp. Available at: https://ec.europa.eu/eip/agriculture/sites/default/files/eip-agri_brochure_innovation_support_services_2014_en_web.pdf
- Keady T.W.J., Gautier J.M., Morgan-Davies C., Carta A., Gavojdian D., Ocak S., Corbière F., Ruiz R. and Beltrán de Heredia I. (2018) What are the main challenges to improve ewe productivity in Ireland and Europe? *Grassland Science in Europe* 23, 986-989.
- Keatinge R. and Korevaar H. (2017) EuroDairy – a European thematic network for dairy farming. *Grassland Science in Europe* 22, 170-172.

- Kelly T. (2020) Knowledge exchange approaches for better decision-making and innovation processes. *Grassland Science in Europe* 25, 697-703.
- Knotter S., Kretz D. and Zeqo K. (2019) *Operational Groups Assessment 2018*. IDEA Consult nv, Brussels, Belgium.
- Krause A., Becker T., Feindt, P.H., Huyghe C., O'Donovan M., Peeters A. and Van den Pol-van Dasselaar A. (2018) Towards sustainable European grassland farming with Inno4Grass: an infrastructure for innovation and knowledge sharing. *Grassland Science in Europe* 23, 925-936.
- Newell-Price J.P., Bufo C., Frewer L., Hejduk S., Hunter E., Klopčič, Lively F., Lombardi G., Mulvenna C., Rankin J., Ravetto Enri S., Schils R.L.M., Smith K., ten Berge H., Tindale S., Tonn B. and Williams J.R. (2022) An overview of European permanent grasslands: SUPER-G proposals to improve their sustainability and multifunctionality. In: *Grassland at the heart of circular and sustainable food systems* (eds. L. Delaby, R. Baumont, V. Brocard, S. Lemauiel-Lavenant, S. Plantureux, F. Vertes and J.L. Peyraud). *Grassland Science in Europe* 27, 781-790.
- Operational Groups (2016) *Operational Groups: Turning your idea into innovation. Update 2016*. EIP-AGRI Service Point, 12 pp. Available at: https://ec.europa.eu/eip/agriculture/sites/default/files/eip-agri_brochure_operational_groups_update_2016_2016_en_web.pdf
- Orozco R., Mosquera-Losada M.R., Rodriguez J., Adamseged M.E. and Grundmann P. (2021) Supportive business environments to develop grass bioeconomy in Europe. *Sustainability* 13, 12629. <https://doi.org/10.3390/su132212629>
- Paraskevopoulou C., Theodoridis A., Johnson M., Ragkos A., Arguile L., Smith L., Vlachos D. and Arsenos G. (2020) Sustainability assessment of goat and sheep farms: a comparison between European countries. *Sustainability* 12(8), 3099.
- Poux X., Bernard-Mongin C., Dumitras D., Ferraz de Oliveira M.I., Gouriveau F., Goussios D., Herzon I., Jitea M., Kazakova Y., Lerin F., Ljung M., Lomba A., Mihai V., Moran J., Pinto-Correia T. and Vlahos G. (2018) What is the relevant approach for engaging territorial actors in a HNV innovation project? A strategic perspective – findings from HNV-Link H2020 Thematic Network. SISA International Workshop (6-8/11/2018, Riga).
- Villada A., Verdonck P., Ferreiro-Domínguez N., Rodríguez-Rigueiro F.J., Arias-Martínez D., Rois-Díaz M., den Herder M., Paris P., Pisanelli A., Reubens B., Nelissen V., Paulo J.A., Palma J.H.N., Vityi A., Szigeti N., Borek R., Galczynska M., Balaguer F., Smith J., Westaway S., Rigueiro-Rodríguez A. and Mosquera-Losada M.R. (2018) AFINET: agroforestry innovation thematic network. *4th European Agroforestry Conference Agroforestry as Sustainable Land Use*, pp. 355-359.
- Wielinga E. (2014) Concepts for co-creating innovations in the EIP. In: Aenis T., Knierim A., Riecher M.C., Ridder R., Schobert H. and Fischer H. (eds.) *11th European IFSA symposium, farming systems facing global challenges: capacities and strategies, proceedings*. Berlin, Germany, 1-4 April 2014, pp. 824-834.