EU CAP NETWORK

Research needs from practice 2024

Funded by the European Union

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1. Why collect research needs from practice?

Many research findings are only slowly translated into practical applications, or not at all. Conversely, professionals such as farmers, foresters and other rural actors frequently feel that research does not sufficiently address their needs. Identifying 'research needs from practice' is crucial for fostering dialogue between researchers and practitioners, ensuring that research outcomes are effectively used. This direct engagement not only bridges the gap between research and practical application in agriculture but also enhances innovation by aligning research efforts with the real challenges faced by practitioners.

There are several key reasons why gathering research needs from practice is important:

1. **Insight into emerging issues**: Practitioners often encounter new problems and challenges in agriculture first-hand. Engaging directly with them allows researchers to gain insights into the most urgent issues that require attention.
2. **Understanding practical realities**: Practitioners possess in-depth insights into the practical aspects of agriculture and the factors influencing decision-making. Their input is essential to ensure that research findings are translated into effective and feasible solutions.
3. **Efficient resource allocation**: By focusing on practitioners' needs, researchers can avoid wasting time and resources on projects that do not address pressing challenges. This leads to a more efficient and effective use of funds.
4. **Building trust and collaboration**: Gathering research needs from practice helps build trust between researchers and practitioners. When practitioners see that their concerns are being addressed, they are more likely to support and collaborate with researchers, fostering a collaborative and productive research environment.

2. How is it done?

A 'research need from practice' is defined as:

a) A challenge faced by professionals in farming, forestry and rural sectors, such as farmers, foresters and advisers, that may be addressed through multi-actor research or innovative projects, such as EIP-AGRI Operational Groups.

b) A potential solution, method or new approach identified by a farmer, forester or adviser, or other relevant rural actor, including those in agribusiness, which requires further development, research or refinement for broader implementation.

c) New knowledge, technology or inventions discovered by a farmer, forester, adviser or any other relevant rural actor, including those in agribusiness or non-food sectors, which could benefit from research or innovation to improve, commercialise or adapt it for broader application.

The Support Facility for 'Innovation & knowledge exchange | EIP-AGRI' collects research needs from practice during workshops, seminars, Focus Group meetings, and other networking activities and compiles them into a yearly report.

This report makes the research needs from practice accessible to researchers and practitioners, enabling them to review and steer their work towards providing solutions. It also provides the opportunity to initiate innovative projects with other partners to address these challenges.

These research needs from practice are also visible to national and regional policymakers and authorities, who can incorporate specific topics into their calls for innovative projects. This information also feeds into the programming of the EU research and innovation programmes.

To better understand the context of each research need from practice, we advise reading the report of the event where it was identified. Links to these sources are provided, both in the Excel table and in this report.

3. Scope of this summary report

This draft report follows the previous 'Research needs from practice 2023' report published in March 2025, which covered 82 research needs from practice. It was prepared by the Support Facility for Innovation & Knowledge Exchange | EIP-AGRI.

The current report presents 96 research needs from practice, resulting from three EU CAP Network Focus Groups (FG), three workshops and one seminar that took place between November 2023 and June 2024, including:

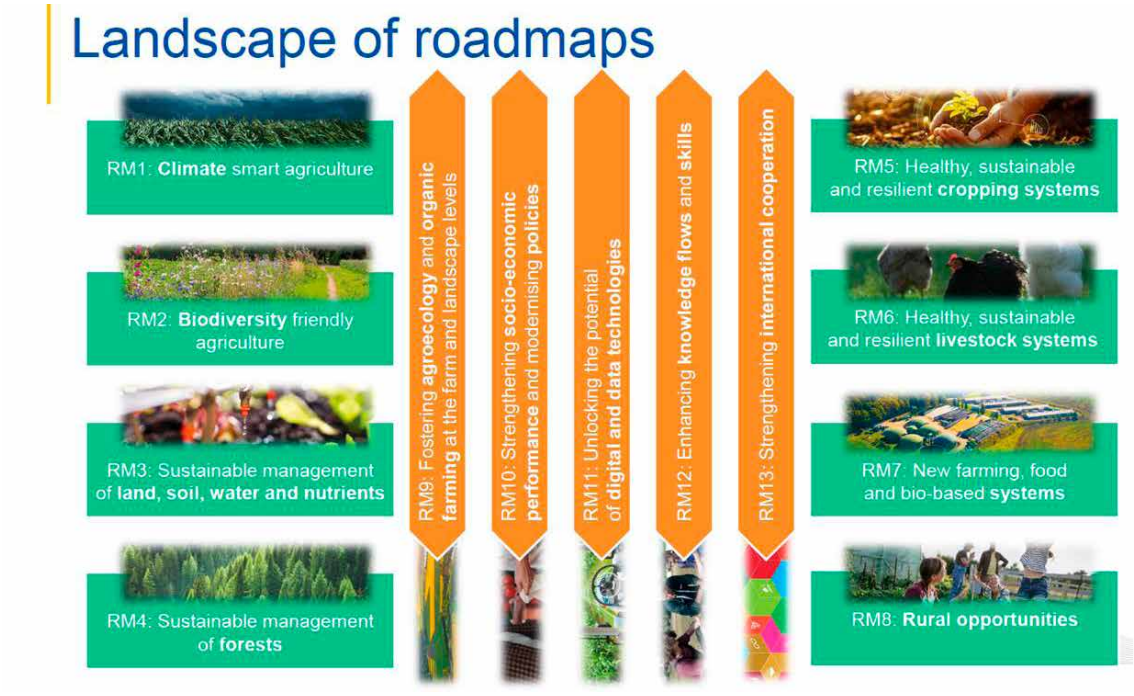
- EU CAP Network workshop 'Circular water management'
- EU CAP Network workshop 'Women-led innovations in agriculture and rural areas'
- EU CAP Network workshop 'Promoting pollinator-friendly farming'
- EU CAP Network seminar 'Skills and lifelong learning for agricultural advisory and training service providers'
- Focus Group 'Regenerative agriculture for soil health'
- Focus Group 'Crop associations including Milpa and protein crops'
- Focus Group 'Competitive and resilient mountain areas'

The Excel table dated April 2025, included with this report, lists all 96 research needs from practice. It outlines the relevance of each research need to the European Commission's Directorate-General for Agriculture and Rural Development (DG AGRI)'s landscape of roadmaps and CAP objectives. All the entries have been cross-checked [1] for accuracy.

4. Analysis following the DG AGRI landscape of roadmaps

Following DG AGRI's recommendation, the research needs below have been clustered according to their landscape of roadmaps.

Figure 1. Landscape of roadmaps



Source: European Commission

DG AGRI's roadmap 13 on international cooperation outside the EU has not been considered in the clustering, as it falls outside the scope of EIP-AGRI.

Table 1 summarises the total number of research needs identified per roadmap (RM) and lists the sources.

1 The identified research needs have been validated through cross-checking by participants from all Focus Groups, workshops and seminars. This process ensures that each research need is relevant for farmers, foresters, agribusiness and other rural stakeholders, preferably across multiple geographical areas in Europe. In some network activities, cross-checking is an integral part of the process.

Table 1. Number of research needs per roadmap

Roadmap	Number of cases	Sources
RM1: **Climate**-smart agriculture	27	EU CAP Network workshop 'Circular water management' Focus Group 'Regenerative agriculture for soil health' Focus Group 'Crop associations including Milpa and protein crops' Focus Group 'Competitive and resilient mountain areas'
RM2: **Biodiversity** and genetic resources in agriculture and forestry	19	EU CAP Network workshop 'Promoting pollinator-friendly farming' Focus Group 'Regenerative agriculture for soil health' Focus Group 'Crop associations including Milpa and protein crops'
RM3: Sustainable management of **land, soil, water and nutrients**	42	EU CAP Network workshop 'Circular water management' Focus Group 'Regenerative agriculture for soil health' Focus Group 'Crop associations including Milpa and protein crops'
RM4: Sustainable management of **forests**	0	
RM5: Healthy, sustainable and resilient **cropping systems**	9	EU CAP Network workshop 'Circular water management' EU CAP Network workshop 'Promoting pollinator-friendly farming' Focus Group 'Regenerative agriculture for soil health' Focus Group 'Crop associations including Milpa and protein crops' Focus Group 'Competitive and resilient mountain areas'
RM6: Healthy, sustainable and resilient **livestock systems**	9	Focus Group 'Regenerative agriculture for soil health'
RM7: New farming, food and biobased **systems**	12	EU CAP Network workshop 'Circular water management' EU CAP Network workshop 'Promoting pollinator-friendly farming' Focus Group 'Regenerative agriculture for soil health' Focus Group 'Crop associations including Milpa and protein crops' Focus Group 'Competitive and resilient mountain areas'
RM8: **Rural opportunities**	31	EU CAP Network workshop 'Circular water management' EU CAP Network workshop 'Women-led innovations in agriculture and rural areas' Focus Group 'Regenerative agriculture for soil health' Focus Group 'Competitive and resilient mountain areas'

RM9: Fostering **agroecology** and **organic farming** at farm and landscape levels	52	EU CAP Network workshop 'Circular water management' EU CAP Network workshop 'Promoting pollinator-friendly farming' Focus Group 'Regenerative agriculture for soil health' Focus Group 'Crop associations including Milpa and protein crops' Focus Group 'Competitive and resilient mountain areas'
RM10: Strengthening **socio-economic performance** and modernising **policies**	42	EU CAP Network workshop 'Circular water management' EU CAP Network workshop 'Women-led innovations in agriculture and rural areas' EU CAP Network workshop 'Promoting pollinator-friendly farming' EU CAP Network seminar 'Skills and lifelong learning for agricultural advisory and training service providers' Focus Group 'Regenerative agriculture for soil health' Focus Group 'Crop associations including Milpa and protein crops' Focus Group 'Competitive and resilient mountain areas'
RM11: Unlocking the potential of **digital and data technologies**	9	EU CAP Network workshop 'Women-led innovations in agriculture and rural areas' EU CAP Network workshop 'Promoting pollinator-friendly farming' EU CAP Network Seminar 'Skills and lifelong learning for agricultural advisory and training service providers' Focus Group 'Regenerative agriculture for soil health' Focus Group 'Competitive and resilient mountain areas'
RM12: Enhancing knowledge flows and skills	51	EU CAP Network workshop 'Circular water management' EU CAP Network workshop 'Women-led innovations in agriculture and rural areas' EU CAP Network workshop 'Promoting pollinator-friendly farming' EU CAP Network Seminar 'Skills and lifelong learning for agricultural advisory and training service providers' Focus Group 'Regenerative agriculture for soil health' Focus Group 'Crop associations including Milpa and protein crops' Focus Group 'Competitive and resilient mountain areas'

Annex I presents all 96 research needs, indicating which of the roadmaps they are relevant to. While many of these are probably relevant to other roadmaps as well, three and, in some cases, four of the most pertinent roadmaps have been indicated per research need.

In principle, the networking events in the annual work programme align with the roadmap themes outlined by DG AGRI. However, it is evident that the number and distribution of cases are not evenly spread across these areas. In fact, this year, no research needs were identified for 'RM4: Sustainable management of forests' as there were no Focus Groups or events focusing specifically on sustainable forest management. Nevertheless, the spread across thematic areas is expected to balance out when considered on a multi-annual basis.

This year, the roadmap with the highest number of research needs was 'RM9: Fostering **agroecology** and **organic farming**', with a total of 52 research needs identified. All three Focus Groups and two workshops – one on pollinator-friendly farming and another on circular water management – contributed to this number. The workshop on pollinator-friendly farming focused on two main areas: knowledge of pollinators and pollination ecology, and support for farmers adopting pollinator-friendly farming practices. The Focus Group on regenerative agriculture for soil health identified the majority of these needs, partially overlapping with those identified in the mini-papers. Given that the mini-paper research needs include important nuances, they were also included in this report.

This was closely followed by the 51 research needs identified for 'RM12: Enhancing **knowledge flows and skills**'. All three workshops, the seminar and the Focus Groups contributed to the research needs for this roadmap. These ranged from very practical and specific needs, such as solutions for regenerative agriculture mechanisation, to calls for long-term experiments to assess long-term trends and effects on pollinators or of the use of different water sources. Additionally, the need for multi-actor approaches involving farmers and advisors, incorporating gender and age considerations, and ways to strengthen links, such as between value chain actors or national advisory networks, was highlighted in several of the research needs identified.

All the events considered research needs on 'Strengthening **socio-economic performance** and modernising **policies**' (RM10) important, with a total number of 42. These included policy implementation studies to assess the uptake of EU gender-supportive policies, developing value chains for rural women or mountain areas and cost-benefit analyses of public goods delivered by mountain areas, pollinators or regenerative farming practices.

Finally, 'RM3: Sustainable management of **land, soil, water** and **nutrients**' also saw 42 research needs identified, mainly from the workshop on circular water management, and two of the Focus Groups: regenerative agriculture for soil health, and crop associations including Milpa and protein crops.

5. Analysis per CAP objective

According to the preliminary assessment conducted by the Support Facility for Innovation & Knowledge Exchange EIP-AGRI, many of the identified research needs from practice address multiple CAP objectives, including the nine Specific Objectives (SO) and the Cross-cutting Objectives (CCO).

In the Excel table, all research needs from practice were categorised under three CAP objectives, ranked from 1 to 3 based on their relevance, with 1 indicating the most pertinent. While other CAP objectives may also be relevant, only the top three have been ranked and indicated.

Table 2 presents the distribution of the 96 research needs from practice based on the most relevant (ranked 1) CAP objective. The sum of the number of research needs ranked 1, 2 and 3 is given between brackets. Annex II provides a detailed categorisation of research needs related to the three most relevant CAP objectives.

Table 2. The division of research needs from practice by CAP objective

CAP Objective	**Number of the most relevant research needs from practice, ranked 1** (the sum of research needs ranked 1, 2 and 3 between brackets)	Source
CCO – Building up a well-functioning AKIS, including digitalisation	**1** (18)	EU CAP Network workshop 'Women-led innovations in agriculture and rural areas'
CCO – Modernising the sector by fostering and sharing knowledge, innovation and digitalisation in agriculture and rural areas, and encouraging their uptake	**11** (44)	EU CAP Network workshop 'Circular water management' EU CAP Network workshop 'Women-led innovations in agriculture and rural areas' EU CAP Network Seminar 'Skills and lifelong learning for agricultural advisory and training service providers' Focus Group 'Regenerative agriculture for soil health' Focus Group 'Crop associations including Milpa and protein crops' Focus Group 'Competitive and resilient mountain areas'
SO1 – Support viable farm income and resilience across the EU territory to enhance food security	**9** (29)	EU CAP Network workshop 'Women-led innovations in agriculture and rural areas' Focus Group 'Regenerative agriculture for soil health' Focus Group 'Crop associations including Milpa and protein crops'
SO2 – Enhance market orientation and increase competitiveness including greater focus on research, technology and digitalisation	**3** (13)	EU CAP Network workshop 'Circular water management' Focus Group 'Crop associations including Milpa and protein crops' Focus Group 'Competitive and resilient mountain areas'
SO3 – Improve farmers' position in the value chain	**6** (17)	EU CAP Network workshop 'Circular water management' Focus Group 'Regenerative agriculture for soil health' Focus Group 'Competitive and resilient mountain areas'
SO4 – Contribute to climate change mitigation and adaptation, as well as sustainable energy	**10** (31)	EU CAP Network workshop 'Circular water management' Focus Group 'Regenerative agriculture for soil health' Focus Group 'Competitive and resilient mountain areas'

SO5 – Foster sustainable development and efficient management of natural resources such as water, soil and air	**14** (43)	EU CAP Network workshop 'Circular water management' Focus Group 'Regenerative agriculture for soil health'
SO6 – Contribute to the protection of biodiversity, enhance ecosystem services, and preserve habitats and landscapes	**17** (37)	EU CAP Network workshop 'Circular water management' EU CAP Network workshop 'Promoting pollinator-friendly farming' Focus Group 'Regenerative agriculture for soil health' Focus Group 'Competitive and resilient mountain areas'
SO7 – Attract young farmers and facilitate business development in rural areas	**3** (11)	Focus Group 'Regenerative agriculture for soil health' Focus Group 'Competitive and resilient mountain areas'
SO8 – Promote employment, growth, social inclusion and local development in rural areas, including bioeconomy and sustainable forestry	**16** (27)	EU CAP Network workshop 'Women-led innovations in agriculture and rural areas' Focus Group 'Regenerative agriculture for soil health' Focus Group 'Competitive and resilient mountain areas'
SO9 – Improve the response of EU agriculture to societal demands on food and health, including safe, nutritious and sustainable food, food waste, as well as animal welfare	**6** (18)	EU CAP Network workshop 'Circular water management' Focus Group 'Regenerative agriculture for soil health' Focus Group 'Competitive and resilient mountain areas'
Total	**96**	

This distribution is determined by the topics covered annually through Focus Groups and other networking events, such as seminars and workshops, which are correlated to specific CAP priorities. Over multiple years, as a broader range of topics is covered, the overall distribution is expected to become more balanced. The figures in brackets in the table above show the number of research needs per CAP objective, including the second and third priorities. It should be noted that most of the research priorities clearly address several CAP objectives, often more than three, even if this is not reflected in the table above and the Excel.

This year, research needs were identified considering the CAP objectives, indicating the broad range of topics covered by the innovation events. While only one research need was considered most relevant to the CCO for building a well-functioning AKIS, including digitalisation, one could say that addressing all the different research needs through multi-actor projects would significantly contribute to achieving this objective. When including the second and third priority research needs for this CAP objective, the total increases to 18, reflecting its importance.

Overall, there seems to be a fair balance between research needs for economic, ecological, technical, social and cross-cutting CAP objectives.

The highest number of research needs (17) were those considered most relevant to 'SO6 – Contribute to the protection of biodiversity, enhance ecosystem services, and preserve habitats and landscapes'. It is worth noting that both the workshop on circular water management and the Focus Group on regenerative agriculture for soil health point to the need for research on soil biota. The circular water workshop identifies a need for long-term research to assess the impact of various water types on soil health, with a focus on soil biota, while the Focus Group emphasises the importance of developing simple and reliable indicators of soil biota, specifically proportion and quantity, to measure soil health. Also, cost-benefit analyses were mentioned twice, addressing the benefits of pollinator conservation and the public goods of mountain areas.

SO6 is closely followed by the 16 research needs identified as most relevant for 'SO8 – Promote employment, growth, social inclusion and local development in rural areas, including bioeconomy and sustainable forestry'. Most of these needs were identified by the workshop on women-led innovation and by the Focus Group on competitive and resilient mountain areas. Both indicate the need to focus on the gender dimension in different research areas, in addition to specific policy research needs.

ANNEX I. The research needs from practice per roadmap category

RESEARCH NEEDS FROM PRACTICE	RM1	RM2	RM3	RM4	RM5	RM6	RM7	RM8	RM9	RM10	RM11	RM12
EU CAP Network workshop 'Circular water management'												
Test and implement agronomic practices to enhance green water storage in the soil for rainfed crops, such as using composts and agroforestry systems.	x		x		x				x			
Quantify water consumption within farming systems, specifically analysing the proportions of total evapotranspired water sourced from 'blue', 'green' and 'grey' water, as a **first step to establish priority uses for non-conventional water sources** to avoid overexploitation of water resources.	x		x									x
Implement accounting mechanisms to establish limits on water allocation among sectors based on socioeconomic, environmental, efficiency and productivity aspects as a **second step to establish priority uses for non-conventional water sources** to avoid overexploitation of water resources.	x		x									x
Conduct long-term experiments and integrate experimental research with model simulations to derive robust trends and validate these with field data **to predict the long-term effects of using different water sources**.	x		x									x
Use **big data and artificial intelligence tools**, along with open-access databases, **to enhance long-term predictions on the effects of using different water sources**.	x		x									x
Conduct long-term experiments to assess the effects of non-conventional waters on the physical, chemical and biological status of soils, with a particular focus on soil microbiota.	x		x									x
Investigate the fate of potential contaminants (including emergent contaminants) from treated wastewater or runoff within the soil-plant-atmosphere continuum **as a first step toward achieving social acceptance among consumers and farmers for using treated wastewater in agriculture**.	x		x							x		
Conduct risk-assessment studies to evaluate the potential effects of non-conventional water sources on the environment and human health, specifically concerning food production and consumption, and as a **second step to achieve social acceptance among consumers and farmers for using treated wastewater in agriculture**.	x		x							x		

Design **new commercialisation mechanisms** (e.g. water credits) **to assign environmental value to primary products and integrate circular water management into the entire agri-food value chain**.			x				x	x				
Incorporate **research on social science and behaviour change to influence consumers, farmers and companies to adopt new practices, integrating circular water management into the entire agri-food value chain**.			x					x		x		
Develop **new mechanisms to involve farmers in the innovation process through a comprehensive co-creation approach** tailored to the specific needs of each target group **to promote knowledge exchange and uptake**.										x		x
Conduct detailed innovation activities, including comprehensive **cost-benefit analyses and life cycle assessments,** to promote knowledge exchange and uptake.										x		x
EU CAP Network workshop 'Women-led innovations in agriculture and rural areas'												
Integrate the gender dimension into research projects to enhance the quality of results and their societal significance, empowering rural and farm women to engage in innovation and entrepreneurship, thereby impacting gender equality and the long-term viability of rural areas and the future of farming.								x		x		x
Promote research on gender-sensitive financial instruments to address challenges of limited access to finance and tailored funding for rural women innovators.								x		x		x
Conduct research on effective mentorship and networking models to create conditions for rural women to innovate.								x		x		x
Develop **tailored impact evaluation methods,** including tools to assess the social, environmental, and economic impact of **women-led innovations**.								x		x		x
Explore **resilient, localised value chains suited to rural women-led enterprises** to address marketing and viability challenges faced by rural women innovators.								x		x		x
Analyse the uptake of EU gender-supportive policies at national/local levels to find ways to improve their effect in practice.								x		x		x
Find ways to **specifically assess the training needs of rural women innovators** to identify specific education and training gaps in areas like digital skills, marketing and farm diversification.								x			x	x

Study **land access and inheritance rights** to **address structural barriers** in land ownership and succession **affecting women's ability to innovate**.								x		x		x
Develop **inclusive innovation frameworks to recognise and support social innovations alongside technological ones**.								x		x		x
Study **effective strategies to shift societal and media narratives about women in agriculture** to **improve the visibility of women's roles and contributions in agriculture and rural areas**.								x		x		x
Study how **digitalisation** (e.g. smart farming) can be **adapted to small women-led farms**.								x			x	x
EU CAP Network workshop 'Promoting pollinator-friendly farming'												
Conduct evidence-based research to support farmers through knowledge exchange and training, demonstrating the **co-benefits of pollinator conservation actions**. This will empower farmers to make informed decisions about managing their land. This research should also **include a cost-benefit analysis of pollinator-friendly farming conducted at a European level, ensuring relevance to all farm types**.		x			x				x			
Knowledge of pollinators and pollination ecology: expand and disseminate knowledge on **wild bee populations** in terms of nesting and floral requirements, plant-pollinator interactions and pollination service delivery.		x							x			x
Knowledge of pollinators and pollination ecology: improve understanding of **hoverflies and other lesser-known pollinator populations**.		x							x			x
Knowledge of pollinators and pollination ecology: improve knowledge of **at-risk pollinators**.		x							x			x
Knowledge of pollinators and pollination ecology: improve **understanding of the interactions between managed and wild pollinators**.		x							x			x
Identify and monitor flower species, richness and abundance, and collect data on flower distributions, thus **helping identify and test locally appropriate solutions that would ensure flowers are available throughout the local pollinators' flight periods**.		x					x		x			
Farmer support for pollinator-friendly farming practices: promote **locally-led community engagement through citizen science** by encouraging local communities to participate in monitoring and mapping activities.		x							x			x

Farmer support for pollinator-friendly farming practices: develop training for advisors and policymakers to **integrate more functional biodiversity information into farmer training, based on locally relevant research**.		x							x			x
Farmer support for pollinator-friendly farming practices. Facilitate **peer-to-peer learning with trials where benefits can be observed and recreated**.		x							x			x
Farmer support for pollinator-friendly farming: promote **locally-led multi-actor partnerships to design and test policies that reflect farmers' capacity to implement pollinator-friendly farming practices**, such as results-based agri-environment payment schemes.		x							x	x		
Support multi-actor monitoring for long-term observation of pollinators on farmland. Such a project could address the challenge of acquiring data to determine priority actions for pollinator-friendly farming practices at farm and landscape levels.		x							x			x
Study the effectiveness of conservation actions for pollinator populations and communities. Research is developing a simple tool to assess the benefit of pollinator conservation actions in terms of providing floral resources and nesting habitats. This could be conducted at a European level but led at a national level.		x							x	x		
EU CAP Network Seminar 'Skills and lifelong learning for agricultural advisory and training service providers'												
Involve farmers in the design of projects and promote farmer-led trials to ensure that farmers' knowledge is integrated in research projects and peer-to-peer learning is encouraged. This is important to ensure that the results of research projects can be put into practice to achieve the twin digital and green transitions.										x	x	x
Integrate national advisory networks, particularly through networks established under Horizon Europe. This was highlighted as a promising area of new activity. These initiatives aim to upskill advisors to enhance their impact in supporting skills development and lifelong learning of farmer clients. The results from such projects should be learner-oriented and easy to interpret. This approach aims to value the reservoirs of knowledge developed to ensure greater impact on the ground.										x	x	x

Focus Group 'Regenerative agriculture for soil health'												
Find and test ways to scale up regenerative agriculture through better consumer engagement. This may involve working towards a clearly shared definition of regenerative agriculture in Europe. There is also a need to understand how to engage consumers as broadly and quickly as possible, in order to scale up regenerative agriculture.									x	x		
Develop and define soil health indicators usable in practice. Many soil health indicators exist, but they are often not designed for practical use, or it is not well understood how they reflect the impact of soil management practices (in this case, sets of regenerative agriculture practices). They also need to be fine-tuned for specific combinations of climate-soil-crop rotations. They should also indicate the side effects of practices (e.g. nutrient use efficiency, nitrogen losses, greenhouse gas emissions, etc.) and provide this information in a way that is easily accessible to farmers.			x						x			
Assess the impact of regenerative agriculture on the microclimate, particularly on the water cycle and clouds reflecting the link between vegetation, photosynthesis and biomass, and climate. This could be assessed across Europe or in pilot projects in different regional contexts.	x		x						x			
Find the best way to link agricultural actors for the further development of regenerative agriculture. Currently, farmers are not sufficiently connected with advisors, scientists and decision-makers. Understanding the language of scientific knowledge is often a challenge for farmers. Advisors and the farm advisory system could provide a bridge between science and farming practice. Additionally, farmers' needs do not always reach decision-makers. Therefore, there is a need to develop and assess methodologies for engaging multi-stakeholders in the further development of regenerative agriculture across Europe.			x									x
Optimise cover crop management. There is limited knowledge on the design of cover crop-based systems: what species, seeding timing, termination timing and methods are adapted to different soils, climatic conditions and farmer objectives, e.g. weed control, pest management and soil building. There is a lack of overall understanding of the effects of cover crops on soil quality, biology, water management and nutrient cycling. Methods for integrating livestock into cover crop management need to be developed. This is important for arable crops, tree crops, vegetables and livestock.		x	x			x			x			
Promote comprehensive research efforts **to understand the complex interaction between grazers and grasslands**. Grazing outcomes vary greatly based on initial conditions, implementation methods and subsequent feedback mechanisms, influencing management decisions. With climate change exacerbating weather extremes and seasonal shifts, there is a pressing need for studies investigating grazing effects across diverse climatic contexts.	x		x			x			x			

Study the **impacts of regenerative grazing on resources and ecosystem processes, including carbon sequestration, biodiversity, soil fertility and water storage capacity**. **Long-term studies are crucial** to validate the positive effects of regenerative grazing, informing future climate assessments.	x		x			x			x			
Assess nutrient use efficiencies, nutrient losses and greenhouse gas emissions from regenerative grazing systems compared to traditional husbandry practices. This is essential for a comprehensive understanding of their potential.	x		x			x			x			
Assess its economic performance, alongside environmental impacts, to understand the full scope of regenerative grazing. Conducting life cycle assessments (LCAs) can provide insights into the overall sustainability of regenerative grazing systems, considering factors such as resource use, emissions and economic viability. By integrating economic analyses with environmental assessments, researchers can better evaluate the holistic benefits and trade-offs associated with regenerative grazing practices.	x		x			x			x			
Assess the enviro-economic performance of regenerative grazing systems. This is essential to inform stakeholders and policymakers, thus encouraging adoption by farmers through appropriate policies.	x		x			x			x	x		
Assess the farm-specific work distribution over the year to identify bottlenecks in the transition to regenerative grazing systems and solutions.	x		x			x			x			
Assess the occurrence and distribution of regenerative grazing practices in Europe, e.g. via citizen science.	x		x			x			x			
Link agricultural actors to further develop and mainstream regenerative agriculture. Currently, farmers are not sufficiently connected with advisors, scientists and decision-makers. Understanding the language of research is often challenging for farmers. Furthermore, farmers' needs do not always reach decision-makers. Advisors and the farm advisory system could provide a bridge between science and farming practice. A more effective, trust-based relationship between agricultural actors could also contribute to more impactful on-farm research, resulting in successful on-farm trials to advance regenerative practices. Further research and strategic development are needed to understand and improve the dynamics between agricultural actors, identifying existing obstacles and developing the most effective forms of collaboration to advance regenerative agriculture.			x						x			x

Find ways to connect regenerative farmers with consumers, bring regenerative products to the market and reward farmers' efforts. Currently, average consumers rarely have reliable knowledge about or access to products from regenerative farms, which also results in regenerative farmers not being sufficiently recognised and their products not having the deserved visibility and demand. More research is needed on how to create a win-win situation where both consumers and regenerative farmers benefit from an increased demand and improved access to high-quality regenerative products. This could be achieved by better prices and placements for such products, developing and promoting short food supply chains, as well as by establishing a reliable and transparent certification system and labelling for regenerative products.					x	x	x		x			
Define and measure 'improved soil health' and 'more biodiversity'. While the potential positive impact of regenerative farming practices on soil health and biodiversity is well-known and widely advocated, farmers at various levels of transitioning to regenerative agriculture need clear, science-based, locally validated and measurable indicators to assess the impact of their farming practices on soils and biodiversity. Research is needed in order to define what exactly 'improved soil health' and 'more biodiversity' mean on a farm level, how much the identified indicators are country, region and farm type specific, what user-friendly, accessible and reliable methods exist to monitor and measure farms` performance against these indicators and, how various practices impact soil health and biodiversity, and how to make this impact positive for regenerative systems.		x	x						x		x	
Develop simple and reliable indicators of soil biodiversity, describing the proportion and quantity of microorganisms or soil biota key to soil health. Soil microorganisms contribute to several ecosystem functions in the soil, including nutrient cycling, the transformation of organic matter and the storage of stable forms of carbon. They also play a role in forming stable soil aggregates, which has a positive effect on soil physical properties. However, the main challenge is to understand what defines an optimal state in terms of the quantitative and qualitative representation of soil microorganisms and soil biota and which simple yet reliable indicators can assess the state of soil biodiversity in terms of optimal impact on soil health and soil ecosystem functions. Perspective indicators could be, for example, the quantification of the ratios of the main functional groups of soil microorganisms through the analysis of phospholipid-derived fatty acids (PLFA) or metabarcoding.		x	x						x			

Develop methods to monitor large-scale changes in soil health using remote sensing and fixed sampling points. Assessing positive or negative changes in soil health is very difficult at large spatial scales due to the high heterogeneity of soils. However, the ability to monitor changes in soil health over large areas is a potentially important tool for assessing the success of regenerative agriculture practices or, conversely, an early indicator of the need to adapt these practices to specific local conditions. The potential for large-scale monitoring of soil health is provided, for example, by remote sensing methods, but due to the possible influence of several factors and therefore the lower reliability of remote sensing approaches, it is necessary to ensure their calibration, for example by analyses at fixed sampling points.	x								x		x	
Study the impact of regenerative agriculture on all three pillars of sustainability. To date, research on regenerative agricultural practices has primarily focused on the **ecological dimension** of sustainability. More research is needed on how the transition to regenerative agriculture affects the **social and economic dimension** of sustainability as well as on the advantages/disadvantages/**trade-offs of all three dimensions** of sustainability in different types of farms (e.g. arboriculture, market gardening, field crops and livestock) at the different stages of transition within different socio-economic and biophysical contexts.							x	x	x			
Study the impact of climate change on regenerative agricultural practices. Accelerating climate change will impact regenerative agricultural practices. Promising approaches that have been implemented in recent years may not be suitable for the near future, shaped by higher temperatures and increased weather uncertainty due to climate change (e.g. due to mild winters, longer vegetation periods, etc.). Data is needed to understand the impact of climate change on regenerative agricultural practices.			x		x				x			x
Conduct research on investments in regenerative agriculture. The implementation of regenerative agricultural practices requires new machinery, tools and methods. Purchasing, for example, a new seeder or minimum-tillage machinery is a huge hurdle for many farmers. Research is needed on **low input investments to make implementation of regenerative agriculture less cost intensive**.			x				x		x			
Make organic no-till systems the number one choice. Organic direct seeding does not require the use of pesticides and synthetic fertilisers, which allows the accumulation of a broad variety of environmental benefits. However, further understanding is needed regarding the **interactions between regenerative practices and organic production systems**. The aim is to combine the benefits of organic farming and regenerative agriculture, based on a better understanding of interactions between these two agricultural practices.									x	x		
Ensure long-term comparability of soil samples. Across the EU and within Member States, different methods are used for soil sampling. To increase knowledge on soil quality and dynamics, the quality and comparability (between regions but also between years) need to be increased, especially if long-term comparisons are pursued.			x									x

Study the impact of regenerative agriculture on the environment. There is a significant need for better and consolidated access to public data on the environmental benefits of regenerative agricultural practices (e.g. humus, water, air and biodiversity) based on measurements in different agricultural regions and farm types. This information is very necessary to communicate the value added towards consumers/society, demanding higher product prices from downstream supply chain partners and monetising the environmental services provided by implementing regenerative agricultural practices.			x						x	x		x
Study the impact of regenerative agriculture on the water cycle. Research is still needed to identify the impact of and interactions between regenerative agricultural practices and the water cycle. More knowledge is needed on the infiltrability of water in soils, links between vegetation and groundwater, the levels of evapotranspiration of different crops, and the impact of regenerative agricultural practices on infiltration, retention and water availability.	x		x						x			
Find ways to safeguard soil fertility in times of accelerating climate change. The climate has a crucial influence on soil fertility. As human-induced climate change accelerates, knowledge is necessary on how it affects the soil fertility of agricultural land (e.g. due to heavy rain showers, drought, etc.). It is not enough to increase soil fertility in the short term; high levels of soil fertility need to be maintained in the long term despite changing external factors like climate. Knowledge is needed on how to achieve this.	x		x						x			
Study ways to maintain already high humus content in soils. In several agricultural areas of the EU, especially in areas with a long tradition of organic farming or reduced tillage and catch crops, a high/optimal humus content has already been reached. Knowledge is needed on appropriate management practices and ways to encourage farmers to maintain the high humus content in these agricultural areas.	x		x						x	x		
Explore ways to generate added value for regenerative agricultural practices from the supply chain. Regenerative agriculture has great marketing potential for downstream supply chain partners, which is so far widely unused. To accelerate the uptake and implementation of regenerative agriculture in the EU, concepts are needed on how to increase revenue for farmers applying regenerative agricultural practices and communicate the benefits of those practices to consumers.	x		x				x		x			
Study regenerative practices' impact on productivity. There is still insufficient information available on whether and under what conditions regenerative agricultural practices increase or decrease productivity and yield per hectare compared to conventional farming practices. Research should focus on how to reduce yield/productivity reduction and increase higher yield/productivity.			x						x			

Find cost and time-efficient practices for mechanical removal of catch crops. Currently, the most 'efficient' practice for the removal of catch crops and their residues is the use of chemical herbicides (e.g. glyphosate), which have many disadvantages for the environment, such as harming non-target species. To make regenerative agriculture more sustainable, alternative practices for removing catch crops need to be developed that are not harmful for the environment while being economically attractive.			x		x				x			
Collect data on farm performance as leverage for success. To accelerate the implementation of regenerative agriculture, technical and economic farm data are needed along with their in-depth analysis to obtain key insights e.g. risk aversion, debt dependence and willingness to invest in regenerative agriculture. This data will also enable the measurement of potential gains and losses associated with the transition, as well as reductions and increases in costs, productivity and investments.			x						x	x	x	x
Find solutions for regenerative agriculture mechanisation. One of the main reasons why the transition to regenerative agriculture has been slow is the availability of machinery adapted to the system. There are direct seeding machines that do not disturb the soil surface, but they are not always well adapted to the crops and practices of regenerative agriculture. The high cost of purchase or low availability of machinery from service providers can also be a barrier to adoption for regenerative agriculture. Innovation in the development of more versatile and economical machinery, as well as encouraging farmer associations to share machinery, should be explored.			x						x		x	x
Assess the economic and social benefits of adopting regenerative agriculture practices. One of the reasons for rural depopulation is the loss of economic capacity of farmers. Assessing the socioeconomic impact of introducing large-scale and small-scale regenerative agriculture can encourage farmers to adopt this system, thereby maintaining rural activity.			x				x	x	x			
Assess the impact of adopting regenerative agriculture on ecosystem services. The impact of different combinations of regenerative farming practices on ecosystem services other than soil health needs to be addressed. Establish indicators tailored to the area's climatic characteristics, which will facilitate farmers' decision-making and add value to the products obtained from a regenerative agricultural system.		x	x						x	x		
Identify and develop cover crop mixtures for arid and semiarid regions. Introducing cover crops in areas with low water availability and the impossibility of frost termination is challenging for southern European areas. Therefore, it is necessary to develop cover crop mixtures for herbaceous crops that can be mechanically terminated and adapted to local pedoclimatic conditions, e.g. by selecting species, cultivars, sowing dates, and flowering stages to achieve optimal termination times. There is also a need to develop mixtures of species for use as groundcover for perennial crops, well adapted to local conditions.	x	x	x						x			

Develop weed management strategies in no-till that reduce or eliminate herbicide use. Typically, no-till farming uses herbicides to control weeds. One of the EU's objectives is to improve soil health and reduce the use of pesticides. It is therefore necessary to investigate different strategies for combining practices to reduce or eliminate the use of herbicides, while also examining the impact of varying dose reductions on soil biodiversity and ecosystems, without compromising farm productivity and profitability.	x	x	x						x			
Design crop rotations for regenerative agriculture. The effects of climate change on temperature and rainfall patterns could make traditional crop rotations difficult. Designing crop rotations that integrate cover crops with annual crops is essential for the successful introduction of regenerative agriculture. Developing crop rotation strategies adapted to the different soil and climate conditions of European regions would facilitate the integration of regenerative agriculture.	x		x						x			
Focus Group 'Crop associations including Milpa and protein crops'												
Identify basic principles for growing crop associations. To address the lack of standard advice on crop associations, agronomic recipes or guidelines need to be developed describing the basic principles of each crop association type with examples of how they are applied for specific crop combinations and pedoclimatic or market contexts.		x	x		x				x			
Develop innovation pathways to make mechanisation affordable. Applied research is needed to develop innovative pathways for making equipment for crop associations accessible and affordable, whether through adaptations to existing machinery, hiring contractor equipment, sharing equipment or examining new technologies that create efficiencies. This includes economic analyses (i.e. cost-effectiveness of options) and developing business models, as well as using rural development funding to ensure innovations are more economically viable.							x			x		
Formulate guidelines on selecting crop varieties suited to crop associations. To support decisions about which crop varieties to choose for crop associations, more needs to be known about the varietal traits that lead to better crop association performance, along with a better understanding of how these traits support the mechanisms underpinning crop association outcomes. Guidelines are needed on how to interpret existing information of pure stand variety trials for variety performance in crop associations. This might take the form of an app or online decision aid. Further development could include the inclusion of crop associations in variety testing trials to test varietal performance in these cropping systems, along with research to identify varietal traits that contribute towards better performance.	x				x							x

Develop markets for crop association produce. Market research should examine social and economic factors affecting the attractiveness and value of crop association products to processors, retailers and consumers, particularly their 'ecosystem service' credentials. To maximise their contribution to the farm business, crop association products should be evaluated for their nutrient content, the ability to process the produce and their contribution to dietary health, alongside their environmental credentials, ethical acceptability and profitability, as a means of adding value to produce. Consumer education is a key part of breaking down barriers to transformation and behaviour change along the supply and value chain.							x		x	x		
Explore novel research approaches. Initiatives are needed that regularly bring together different actors to condense and transfer their knowledge into research programmes. This may occur through multi-actor workshops, living labs and participatory research projects that involve end users in the research process, thereby expanding the knowledge base, accessing a greater breadth of resources (e.g. crop landraces and trial sites) and translating results into real-world conditions.	x				x							x
Focus Group 'Competitive and resilient mountain areas'												
Conduct cost/benefit analyses of public goods. There is a need to **develop a simple and scientifically sound methodology to incorporate the positive externalities of mountain products in the final price**. Currently, stakeholders often overlook the benefits of providing public services in these areas, leading to misallocation of resources. Research is needed to identify public goods, estimate costs and propose fair policies, as well as new business models. Understanding the economic benefits of agroecology activities and diversifying traditional practices can enhance competitiveness and resilience.								x		x		x
Analyse the cost/benefit of short value chains. Understand cost and benefit at different chain levels in a comparative approach, i.e. showing the advantages and disadvantages of short (regional) and long (global) value chains. Such results can help stakeholders better engage in collective short production and marketing chains.								x		x		x
Develop and test new business models. Analysis of needs, testing diversified business models, seeking innovative solutions for sustainable development and increased income, and optimising natural and human resources are required. This is necessary as agricultural holdings in mountains face specific challenges of competitiveness, profitability and market access due to higher production costs and lower implementation of technological innovation.								x		x		x

Work on marketing for mountain products. Persuading customers to pay a premium for mountain products, which offer greater quality, authenticity, sustainability, health advantages and cultural value, is a challenge for producers in mountainous areas. The producers lack the expertise, information, aptitude and skills necessary to research, evaluate, comprehend and, ultimately, affect consumers' purchasing decisions. To overcome these obstacles, producers will need evidence-based research findings to assist them in transferring soft skills and knowledge, as well as receiving training in communications and marketing. This will enable them to capitalise on the perceived quality of their products and make well-informed business management decisions.							x		x		x
Study the willingness to pay for mountain products. Assess customer willingness to pay for mountain products and associated positive externalities. Consumers will remain loyal only if authenticity and quality justify a territorial solidarity. EU-wide studies on how consumers value the positive externalities associated with mountain products are mostly missing and should be conducted.							x		x		x
Study economic models of small-scale processing facilities. Propose replicable models of small-scale processing facilities adapted to short value chains. In mountain areas, farmers work in remote areas where farms are usually smaller in size, when compared with lowland farming. The existing solutions for processing are not adapted to local needs in different regions and countries.							x	x		x		
Conduct research on participatory methodologies governing mountain communities. Addressing the knowledge gap on participatory methodologies and their use, including participatory action research (PAR), participatory rural appraisals (PRAs), rapid rural appraisals (RRAs), participatory needs-based assessments, and community asset assessments and participatory governance, is essential for fostering inclusive, resilient and effective engagement processes in farming communities.								x		x		x
Analyse emigration and immigration in mountain areas. Surveying mountain area migrants to identify reasons for leaving their homelands and assess their quality of life compared to expectations. It should explore succession by young farmers, long-term experiences of migrants across social statuses and life stages, and strategies for integrating forcefully distributed migrants into mountain communities.								x		x		x
Study relations between rural and urban milieus to address the challenge of balancing the demands for recognition of mountaineers' or mountain dwellers' work with the need for ecological conservation/protection amid urban demands. This research should explore how to shift regional development strategies from product multiplication to demand-oriented approaches, focusing on safe and sustainable food production. It should also explore the integration of second-home owners into the daily lives of permanent residents and foster their engagement as active citizens in community affairs.							x	x	x			

Explore collaborative networks. Understanding how to build and foster collaboration and knowledge exchange among stakeholders, including farmers, researchers, policymakers and industry representatives, is essential to facilitate learning and innovation in agro-ecological diversification in mountain areas.								x		x		x
Study ways to **ensure generational succession in agricultural and livestock farms**. Resolving the problem of generational replacement in the primary sector has become a recurring issue. But, interestingly, it seems that we have not found effective solutions, or at least solutions that significantly improve the current problem. **Starting from effective examples**, research must look for **standardised but adaptive models**.								x		x		x
Find ways to mainstream gender and youth. Incorporate gender and age considerations to address diverse needs and roles throughout several project cycles. Analysing gender norms and age impacts helps mitigate inequalities. Developing Education and Training tools is crucial for successful implementation, involving all stakeholders.								x		x		x
Explore ways to implement modern ways of life without damaging traditional and seemingly 'retro' agro-ecological and cultural practices. Mountain communities benefit from modern civilisation, but face challenges such as youth migration to urban areas, resulting in the loss of traditions and cultural values. Rural and Alpine gentrification, fuelled by property purchases by outsiders, threatens local culture. **Research is required to guide mountain development, preserving regional identity and values**. **Incorporating local knowledge and sustainable agricultural practices can mitigate environmental impact while maintaining cultural heritage**.								x	x	x		
Assess how agro-ecological practices can help build climate resilience and mitigate climate-related risks such as extreme weather events, pests and diseases. Further investigation and analysis are required to assess the potential for introducing climate-resilient species of crops and adapting management practices for the agricultural and forestry sectors in mountain contexts.	x				x				x			
Develop information technology systems. Testing more and **better information technology systems and artificial intelligence (AI) that can support sustainable agriculture and forestry in mountain areas**. This includes precision agriculture technologies, GIS and remote sensing mapping for land use change and climate disaster impact, agroforestry systems and value-added processing techniques tailored to the specific conditions of mountain regions.							x				x	x

Support long-term monitoring and evaluation of sustainable initiatives in mountain area integration. Monitor the long-term impact of initiatives that promote balanced development, conserving resources and enhancing well-being in mountain communities. Assessing their success in fostering cooperation, exchanging best practices and addressing shared challenges is vital. Research should develop new monitoring programmes to track outcomes, evaluate strategies, identify successful case studies at national and EU levels and adjust policies for sustainable development in EU mountain regions.								x		x		x
Conduct a comparative analysis of governance models. Comparing governance models in mountain regions is crucial for tailored strategies addressing challenges such as biodiversity conservation and disaster risk. It aims to foster sustainable development, resilient economies and cross-border collaboration, while considering emerging policies impacting agroecology.								x		x		x
Analyse the potential for collaborations between different mountain regions with similar specificities. Assessing the success of existing collaborative initiatives in European mountain areas to share common challenges and priorities. Fostering cooperation, exchanging best practices and addressing shared challenges is crucial for future efforts. Evaluating policy and institutional frameworks for cross-border cooperation is essential for identifying areas which need improvement and guidance for further research on a European scale.								x		x		x

ANNEX II. Research needs from practice categorised by the most relevant CAP objectives

RESEARCH NEEDS FROM PRACTICE	CAP Objectives (titles slightly shortened)										
	CCO AKIS	CCO – Knowledge sharing, innovation, digitalisation	SO1 – Viable farm income and resilience	SO2 – Market orientation and competitiveness	SO3 – Improve farmers' position in the value chain	SO4 – Climate change mitigation and adaptation	SO5 – Sustainable dev and efficient management of natural resources	SO6 – Biodiversity, ecosystem services, habitats and landscapes	SO7 – Attract young farmers and business dev in rural areas	SO8 – Rural employment, growth, inclusion and local dev, incl bioeconomy and forestry	SO9 – Societal demands for safe, nutritious, sustainable food and animal welfare
EU CAP Network workshop 'Circular water management'											
Test and implement agronomic practices to enhance green water storage in the soil for rainfed crops, such as using composts and agroforestry systems.			3			2	1				
Quantify water consumption within farming systems, specifically analysing the proportions of total evapotranspired water sourced from 'blue', 'green' and 'grey' water, as a **first step to establish priority uses for the non-conventional water sources** to avoid overexploitation of water resources.						2	1	3			
Implement accounting mechanisms to establish limits on water allocation among sectors based on socioeconomic, environmental, efficiency and productivity aspects, as a **second step to establish priority uses for non-conventional water sources** to avoid overexploitation of water resources.						3	1	2			

Conduct long-term experiments and integrate experimental research with model simulations to derive robust trends, and validate these with field data **to predict the long-term effects of using different water sources**.						1	2	3			
Use **big data and artificial intelligence tools**, along with open-access databases, **to enhance long-term predictions on the effects of using different water sources**.	2					1	3				
Conduct long-term experiments to assess the effects of non-conventional waters on the physical, chemical and biological status of soils, with a particular focus on soil microbiota.						3	2	1			
Investigate the fate of potential contaminants (including emergent contaminants) from treated wastewater or runoff within the soil-plant-atmosphere continuum, **as a first step in to achieve social acceptance among consumers and farmers for using treated wastewater in agriculture**.			3				2				1
Conduct risk-assessment studies to evaluate the potential effects of non-conventional water sources on the environment and human health, specifically concerning food production and consumption, as a **second step to achieve social acceptance among consumers and farmers for using treated wastewater in agriculture**.			3				2				1
Design **new commercialisation mechanisms** (e.g. water credits) **to assign environmental value to primary products and integrate circular water management into the entire agri-food value chain**.					1	3	2				
Incorporate **research on social science and behaviour change to influence consumers, farmers and companies to adopt new practices, integrating circular water management into the entire agri-food value chain**.					2	3	1				
Develop **new mechanisms to involve farmers in the innovation process through a comprehensive co-creation approach**, tailored to the specific needs of each target group, **to promote knowledge exchange and uptake**.		1	3	2							
Conduct detailed innovation activities, including comprehensive **cost-benefit analyses and life cycle assessments,** to promote knowledge exchange and uptake.		3	2	1							

EU CAP Network workshop 'Women-led innovations in agriculture and rural areas'											
Integrate the gender dimension into research projects to enhance the quality of results and their societal significance, empowering rural and farm women to engage in innovation and entrepreneurship, thereby impacting gender equality and the long-term viability of rural areas and the future of farming.		2							3	1	
Promote research on gender-sensitive financial instruments to address challenges of limited access to finance and tailored funding for rural women innovators.		3							2	1	
Conduct research on effective mentorship and networking models to create conditions for rural women to innovate.		2							3	1	
Develop **tailored impact evaluation methods,** including tools to assess the social, environmental, and economic impact of **women-led innovations**.	1							3		2	
Explore **resilient, localised value chains suited to rural women-led enterprises** to address marketing and viability challenges faced by rural women innovators.			1	3						2	
Analyse the uptake of EU gender-supportive policies at national/local levels to find ways to improve their effect in practice.	2	3								1	
Find ways to **specifically assess the training needs of rural women innovators** to identify specific education and training gaps in areas like digital skills, marketing and farm diversification.	2	1								3	
Study **land access and inheritance rights** to **address structural barriers** in land ownership and succession **affecting women's ability to innovate**.		2							3	1	
Develop **inclusive innovation frameworks to recognise and support social innovations alongside technological ones**.		2							3	1	
Study **effective strategies to shift societal and media narratives about women in agriculture** to **improve the visibility of women's roles and contributions in agriculture and rural areas**.	2	3								1	

Study how **digitalisation** (e.g. smart farming) can be **adapted to small women-led farms**.	3	1								2	
EU CAP Network workshop 'Promoting pollinator-friendly farming'											
Conduct evidence-based research to support farmers through knowledge exchange and training, demonstrating the **co-benefits of pollinator conservation actions**. This will empower farmers to make informed decisions about managing their land. This research should also **include a cost-benefit analysis of pollinator-friendly farming conducted at a European level, ensuring relevance to all farm types**.			2					1			3
Knowledge of pollinators and pollination ecology: expand and disseminate knowledge on **wild bee populations** in terms of nesting and floral requirements, plant-pollinator interactions and pollination service delivery.		3					2	1			
Knowledge of pollinators and pollination ecology: improve understanding of **hoverflies and other lesser-known pollinator populations**.		3					2	1			
Knowledge of pollinators and pollination ecology: improve knowledge of **at-risk pollinators**.		3					2	1			
Knowledge of pollinators and pollination ecology: improve **understanding of the interactions between managed and wild pollinators**.		3					2	1			
Identify and monitor flower species, richness and abundance, and collect data on flower distributions, thus **helping identify and test locally appropriate solutions that would ensure flowers are available throughout the local pollinators' flight periods**.			2				3	1			
Farmer support for pollinator-friendly farming practices: promote **locally-led community engagement through citizen science** by encouraging the local communities to participate in monitoring and mapping activities.		3						1			2
Farmer support for pollinator-friendly farming practices: develop training for advisors and policymakers to **integrate more functional biodiversity information into farmer training - based on locally relevant research**.		2	3					1			

Farmer support for pollinator-friendly farming practices: facilitate **peer-to-peer learning with trials where benefits can be observed and recreated**.		3	2					1			
Farmer support for pollinator-friendly farming: promote **locally led multi-actor partnerships to design and test policies that reflect farmers' capacity to implement pollinator-friendly farming practices**, such as results-based agri-environment payment schemes.			2					1			3
Support multi-actor monitoring for long-term observation of pollinators on farmland. Such a project could address the challenge of acquiring data to determine priority actions for pollinator-friendly farming practices at farm and landscape levels.		3	2					1			
Study the effectiveness of conservation actions for pollinator populations and communities. Research is developing a simple tool to assess the benefit of pollinator conservation actions in terms of providing floral resources and nesting habitats. This could be conducted at a European level but led at a national level.	3	2						1			
EU CAP Network Seminar 'Skills and lifelong learning for agricultural advisory and training service providers'											
Involve farmers in the design of projects and promote farmer-led trials to ensure that farmers' knowledge is integrated into research projects and peer-to-peer learning is encouraged. This is important to ensure that the results of research projects can be put into practice to achieve the twin digital and green transitions.	2	1	3								
Integrate national advisory networks, particularly through networks established under Horizon Europe. This was highlighted as a promising area of new activity. These initiatives aim to upskill advisors to enhance their impact in supporting skills development and lifelong learning of farmer clients. The results from such projects should be learner-oriented and easy to interpret. This approach aims to value the reservoirs of knowledge developed to ensure greater impact on the ground.	2	1	3								

Focus Group 'Regenerative agriculture for soil health'											
Find and test ways to scale up regenerative agriculture through better consumer engagement. This may involve working towards a clearly shared definition of regenerative agriculture in Europe. There is also a need to understand how to engage consumers as broadly and quickly as possible, in order to scale up regenerative agriculture.		3			1						2
Develop and define soil health indicators usable in practice. Many soil health indicators exist, but they are often not designed for practical use, or it is not well understood how they reflect the impact of soil management practices (in this case, sets of regenerative agriculture practices). They also need to be fine-tuned for specific combinations of climate-soil-crop rotations. They should also indicate the side effects of practices (e.g. nutrient use efficiency, nitrogen losses, greenhouse gas emission, etc.) and provide this information in a way that is easily accessible to farmers.		3				2	1				
Assess the impact of regenerative agriculture on the microclimate, particularly on the water cycle and clouds reflecting the link between vegetation, photosynthesis and biomass, and climate.						1	2	3			
Find the best way to link agricultural actors for the further development of regenerative agriculture. Currently, farmers are not sufficiently connected with advisors, scientists, and decision-makers. Understanding the language of scientific knowledge is often a challenge for farmers. Advisors and the farm advisory system could provide a bridge between science and farming practice. Additionally, farmers' needs do not always reach decision-makers. Therefore, there is a need to develop and assess methodologies for engaging multi-stakeholders in the further development of regenerative agriculture across Europe.	2	1				3					

Optimise cover crop management. There is limited knowledge on the design of cover crop-based systems: what species, seeding timing, termination timing and methods are adapted to different soils, climatic conditions and farmer objectives (e.g. weed control, pest management and soil building). There is a lack of overall understanding of the effects of cover crops on soil quality, biology, water management, and nutrient cycling. Methods for integrating livestock into cover crop management need to be developed. This is important for arable crops, tree crops, vegetables, and livestock.						2	1	3			
Promote comprehensive research efforts **to understand the complex interaction between grazers and grasslands**. Grazing outcomes vary greatly based on initial conditions, implementation methods and subsequent feedback mechanisms, influencing management decisions. With climate change exacerbating weather extremes and seasonal shifts, there is a pressing need for studies investigating grazing effects across diverse climatic contexts.						1	2	3			
Study the **impacts of regenerative grazing on resources and ecosystem processes, including carbon sequestration, biodiversity, soil fertility and water storage capacity**. **Long-term studies are crucial** to validate the positive effects of regenerative grazing, informing future climate assessments.						1	3	2			
Assess nutrient use efficiencies, nutrient losses, and greenhouse gas emissions from regenerative grazing systems compared to traditional husbandry practices. This is essential for a comprehensive understanding of their potential.						2	1				3
Assess its economic performance, alongside environmental impacts to understand the full scope of regenerative grazing. Conducting life cycle assessments (LCAs) can provide insights into the overall sustainability of regenerative grazing systems, considering factors such as resource use, emissions and economic viability. By integrating economic analyses with environmental assessments, researchers can better evaluate the holistic benefits and trade-offs associated with regenerative grazing practices.			1		3		2				
Assess the enviro-economic performance of regenerative grazing systems. This is essential to inform stakeholders and policymakers, thus encouraging adoption by farmers through appropriate policies.			1			3	2				

Assess the farm-specific work distribution over the year to identify bottlenecks in the transition to regenerative grazing systems and solutions.			1						2		3
Assess the occurrence and distribution of regenerative grazing practices in Europe, e.g. via citizen science.		3								2	1
Link agricultural actors to further develop and mainstream regenerative agriculture. Currently, farmers are not sufficiently connected with advisors, scientists and decision-makers. Understanding the language of research is often challenging for farmers. Furthermore, farmers' needs do not always reach decision-makers. Advisors and the farm advisory system could provide a bridge between science and farming practice. A more effective, trust-based relationship between agricultural actors could also contribute to more impactful on-farm research, resulting in successful on-farm trials to advance regenerative practices. Further research and strategic development are needed to understand and improve the dynamics between agricultural actors, identifying existing obstacles and developing the most effective forms of collaboration to advance regenerative agriculture.	2	1				3					
Find ways to connect regenerative farmers with consumers, bring regenerative products to the market and reward farmers' efforts. At the moment, average consumers rarely have reliable knowledge about or access to products from regenerative farms which also results in regenerative farmers not being sufficiently recognised, and their products not having the deserved visibility and demand. More research is needed on how to create a win-win situation where both consumers and regenerative farmers benefit from an increased demand and improved access to high-quality regenerative products. This could be achieved by better prices and placements for such products, developing and promoting short food supply chains, as well as by establishing a reliable and transparent certification system and labelling for regenerative products.					2					3	1

Define and measure 'improved soil health' and 'more biodiversity'. While the potential positive impact of regenerative farming practices on soil health and biodiversity is well-known and widely advocated, farmers at various levels of transitioning to regenerative agriculture need clear, science-based, locally validated and measurable indicators to assess the impact of their farming practices on soils and biodiversity. Research is needed in order to define what exactly 'improved soil health' and 'more biodiversity' mean on a farm level, how much the identified indicators are country, region and farm type-specific, what user-friendly, accessible and reliable methods exist to monitor and measure farms` performance against these indicators and how various practices impact soil health and biodiversity and how to make this impact positive for regenerative systems.							2	1			3
Develop simple and reliable indicators of soil biodiversity describing the proportion and quantity of microorganisms or soil biota key to soil health. Soil microorganisms contribute to several ecosystem functions in the soil, including nutrient cycling, the transformation of organic matter and the storage of stable forms of carbon. They also play a role in forming stable soil aggregates, which has a positive effect on soil physical properties. However, the main challenge is to understand what defines an optimal state in terms of the quantitative and qualitative representation of soil microorganisms and soil biota and which simple yet reliable indicators can assess the state of soil biodiversity in terms of optimal impact on soil health and soil ecosystem functions. Perspective indicators could be, for example, the quantification of the ratios of the main functional groups of soil microorganisms through the analysis of phospholipid-derived fatty acids (PLFA) or metabarcoding.	3						2	1			
Develop methods to monitor large-scale changes in soil health using remote sensing and fixed sampling points. Assessing positive or negative changes in soil health is very difficult at large spatial scales due to the high heterogeneity of soils. However, the ability to monitor changes in soil health over large areas is a potentially important tool for assessing the success of regenerative agriculture practices or, conversely, an early indicator of the need to adapt these practices to specific local conditions. The potential for large-scale monitoring of soil health is provided, for example, by remote sensing methods, but due to the possible influence of several factors and therefore the lower reliability of remote sensing approaches, it is necessary to ensure their calibration, for example by analyses at fixed sampling points.	3					2	1				

Study the impact of regenerative agriculture on all three pillars of sustainability. To date, research on regenerative agricultural practices has primarily focused on the **ecological dimension** of sustainability. More research is needed on how the transition to regenerative agriculture affects the **social and economic dimension** of sustainability as well as on the advantages/disadvantages/ **trade-offs of all three dimensions** of sustainability in different types of farms (e.g. arboriculture, market gardening, field crops and livestock) at the different stages of transition within different socioeconomic and biophysical contexts.					2		3			1	
Study the impact of climate change on regenerative agricultural practices. Accelerating climate change will impact regenerative agricultural practices. Promising approaches that have been implemented in recent years may not be suitable for the near future, shaped by higher temperatures and weather uncertainty due to climate change (e.g. due to mild winters, longer vegetation periods, etc.). Data is needed to understand the impact of climate change on regenerative agricultural practices.			2			1	3				
Conduct research on investments in regenerative agriculture. The implementation of regenerative agricultural practices requires new machinery, tools and methods. Purchasing, for example, a new seeder or minimum-tillage machinery is a huge hurdle for many farmers. Research is needed on **low input investments to make implementation of regenerative agriculture less cost intensive**.		3			2				1		
Make organic no-till systems the number one choice. Organic direct seeding does not require the use of pesticides and synthetic fertilisers, which allows the accumulation of a broad variety of environmental benefits. However, further understanding is needed regarding the **interactions between regenerative practices and organic production systems**. The aim is to combine the benefits of organic farming and regenerative agriculture based on a better understanding of interactions between these two agricultural practices.		3			1						2
Ensure long-term comparability of soil samples. Across the EU and within Member States, different methods are used for soil sampling. To increase knowledge on soil quality and dynamics, the quality and comparability (between regions but also between years) need to be increased, especially if long-term comparisons are pursued.	3					2	1				

Study the impact of regenerative agriculture on the environment. There is a significant need for better and consolidated access to public data on the environmental benefits of regenerative agricultural practices (e.g. humus, water, air and biodiversity) based on measurements in different agricultural regions and farm types. This information is very necessary to communicate the value added towards consumers/society, demanding higher product prices from downstream supply chain partners and monetising the environmental services provided by implementing regenerative agricultural practices.			3					1			2
Study the impact of regenerative agriculture on the water cycle. Research is still needed to identify the impact of and interactions between regenerative agricultural practices and the water cycle. More knowledge is needed on the infiltrability of water in soils, links between vegetation and groundwater, the levels of evapotranspiration of different crops and the impact of regenerative agricultural practices on infiltration, retention and water availability.						2	1	3			
Find ways to safeguard soil fertility in times of accelerating climate change. The climate has a crucial influence on soil fertility. As human-induced climate change accelerates, knowledge is necessary on how it affects soil fertility of agricultural land (e.g. due to heavy rain showers, drought, etc.). It is not enough to increase soil fertility in the short term; high levels of soil fertility need to be maintained in the long term despite changing external factors like climate. Knowledge is needed on how to achieve this.						1	2	3			
Study ways to maintain already high humus content in soils. In several agricultural areas of the EU, especially in areas with a long tradition of organic farming or reduced tillage and catch crops, a high/optimal humus content has already been reached. Knowledge is needed on appropriate management practices and ways to encourage farmers to maintain the high humus content in these agricultural areas.			3			1	2				

Explore ways to generate added value for regenerative agricultural practices from the supply chain. Regenerative agriculture has great marketing potential for downstream supply chain partners, which is so far widely unused. To accelerate the uptake and implementation of regenerative agriculture in the EU, concepts are needed on how to increase revenue for farmers applying regenerative agricultural practices and communicate the benefits of those practices to consumers.					1	3	2				
Study regenerative practices' impact on productivity. There is still insufficient information available on whether and under what conditions regenerative agricultural practices increase or decrease productivity and yield per hectare compared to conventional farming practices. Research should focus on how to reduce yield/productivity reduction and increase higher yield/productivity.			1				2	3			
Find cost and time-efficient practices for mechanical removal of catch crops. Currently, the most 'efficient' practice for the removal of catch crops and their residues is the use of chemical herbicides (e.g. glyphosate), which have many disadvantages for the environment, such as harm to non-target species. To make regenerative agriculture more sustainable, alternative practices for removing catch crops need to be developed that are not harmful for the environment while being economically attractive.			1				3	2			
Collect data on farm performance as leverage for success. To accelerate the implementation of regenerative agriculture, technical and economic farm data are needed, along with in-depth analysis to obtain key insights e.g. risk aversion, debt dependence and willingness to invest in regenerative agriculture. This data will also enable the measurement of potential gains and losses associated with the transition, as well as reductions and increases in costs, productivity and investments.		3	1				2				

Find solutions for regenerative agriculture mechanisation. One of the main reasons why the transition to regenerative agriculture has been slow is the availability of machinery adapted to the system. There are direct seeding machines that do not disturb the soil surface, but they are not always well adapted to the crops and practices of regenerative agriculture. The high cost of purchase or low availability of machinery from service providers can also be a barrier to adoption for regenerative agriculture. Innovation in the development of more versatile and economical machinery, as well as encouraging farmer associations to share machinery, should be explored.			2	3			1				
Assess the economic and social benefits of adopting regenerative agriculture practices. One of the reasons for rural depopulation is the loss of economic capacity of farmers. Assessing the socioeconomic impact of introducing large-scale and small-scale regenerative agriculture can encourage farmers to adopt this system, thereby maintaining rural activity.			2						3	1	
Assess the impact of adopting regenerative agriculture on ecosystem services. The impact of different combinations of regenerative farming practices on ecosystem services other than soil health needs to be addressed. Establish indicators tailored to the area's climatic characteristics, which will facilitate farmers' decision-making and add value to the products obtained from a regenerative agricultural system.			3		2	1					
Identify and develop cover crop mixtures for arid and semiarid regions. Introducing cover crops in areas with low water availability and the impossibility of frost termination is challenging for southern European areas. Therefore, it is necessary to develop cover crop mixtures for herbaceous crops that can be mechanically terminated and adapted to local pedoclimatic conditions e.g. by selecting species, cultivars, sowing date and flowering stages to achieve optimal termination times. There is also a need to develop mixtures of species for use as groundcover for perennial crops, well adapted to local conditions.						3	1	2			

Develop weed management strategies in no-till that reduce or eliminate herbicide use. Typically, no-till farming uses herbicides to control weeds. One of the EU's objectives is to improve soil health and reduce the use of pesticides. It is therefore necessary to investigate different strategies for combining practices to reduce or eliminate the use of herbicides, while also examining the impact of varying dose reductions on soil biodiversity and ecosystems, without compromising farm productivity and profitability.						3	1	2			
Design crop rotations for regenerative agriculture. The effects of climate change on temperature and rainfall patterns could make traditional crop rotations difficult. Designing crop rotations that integrate cover crops with annual crops is essential for the successful introduction of regenerative agriculture. Developing crop rotation strategies adapted to the different soil and climate conditions of European regions would facilitate the integration of regenerative agriculture.						2	1	3			
Focus Group 'Crop associations including Milpa and protein crops'											
Identify basic principles for growing crop associations. To address the lack of standard advice on crop associations, agronomic recipes or guidelines need to be developed describing the basic principles of each crop association type with examples of how they are applied for specific crop combinations and pedoclimatic or market contexts.		1	3				2				
Develop innovation pathways to make mechanisation affordable. Applied research is needed to develop innovative pathways for making equipment for crop associations accessible and affordable, whether through adaptations to existing machinery, hiring contractor equipment, sharing equipment or examining new technologies that create efficiencies. This includes economic analyses (i.e. cost-effectiveness of options) and developing business models, as well as using rural development funding to ensure innovations are more economically viable.		3	1	2							

Formulate guidelines on selecting crop varieties suited to crop associations. To support decisions about which crop varieties to choose for crop associations, more needs to be known about the varietal traits that lead to better crop association performance, along with a better understanding of how these traits support the mechanisms underpinning crop association outcomes. Guidelines are needed on how to interpret existing information of pure stand variety trials for variety performance in crop associations. This might take the form of an app or online decision aid. Further development could include the inclusion of crop associations in variety testing trials to test varietal performance in these cropping systems, along with research to identify varietal traits that contribute towards better performance.			1	2			3				
Develop markets for crop association produce. Market research should examine social and economic factors affecting the attractiveness and value of crop association products to processors, retailers and consumers, particularly their 'ecosystem service' credentials. To maximise their contribution to the farm business, crop association products should be evaluated for their nutrient content, the ability to process the produce and their contribution to dietary health, alongside their environmental credentials, ethical acceptability and profitability, as a means of adding value to produce. Consumer education is a key part of breaking down barriers to transformation and behaviour change along the supply and value chain.				1	2						3
Explore novel research approaches. Initiatives are needed that regularly bring together different actors to condense and transfer their knowledge into research programmes. This may occur through multi-actor workshops, living labs and participatory research projects that involve end users in the research process, thereby expanding the knowledge base, accessing a greater breadth of resources (e.g. crop landraces and trial sites) and translating results into real-world conditions.	2	1		3							

Focus Group 'Competitive and resilient mountain areas'											
Conduct a cost-benefit analysis of public goods. There is a need to **develop a simple and scientifically sound methodology to incorporate the positive externalities of mountain products in the final price**. Currently, stakeholders often overlook the benefits of providing public services in these areas, leading to misallocation of resources. Research is needed to identify public goods, estimate costs and propose fair policies, as well as new business models. Understanding the economic benefits of agroecology activities and diversifying traditional practices can enhance competitiveness and resilience.		3			2			1			
Analyse the cost/benefit of short value chains. Understand cost and benefit at different chain levels in a comparative approach, i.e. showing the advantages and disadvantages of short (regional) and long (global) value chains. Such results can help stakeholders better engage in collective short production and marketing chains.				2	1					3	
Develop and test new business models. Analysis of needs, testing diversified business models, seeking innovative solutions for sustainable development and increased income, and optimising natural and human resources are required. This is necessary as agricultural holdings in mountains face specific challenges of competitiveness, profitability and market access due to higher production costs and lower implementation of technological innovation.				2	3					1	
Work on marketing for mountain products. Persuading customers to pay a premium for mountain products, which offer greater quality, authenticity, sustainability, health advantages and cultural value, is a challenge for producers in mountainous areas. The producers lack the expertise, information, aptitude and skills necessary to research, evaluate, comprehend and, ultimately, affect consumers' purchasing decisions. To overcome these obstacles, producers will need evidence-based research findings to assist them in transferring soft skills and knowledge, as well as receiving training in communications and marketing. This will enable them to capitalise on the perceived quality of their products and make well-informed business management decisions.				3	1						2

Study the willingness to pay for mountain products. Assess customer willingness to pay for mountain products and associated positive externalities. Consumers will remain loyal only if authenticity and quality justify a territorial solidarity. EU-wide studies on how consumers value the positive externalities associated with mountain products are mostly missing and should be conducted.				2	3						1
Study economic models of small-scale processing facilities. Propose replicable models of small-scale processing facilities adapted to short value chains. In mountain areas, farmers work in remote areas where farms are usually smaller in size, when compared with lowland farming. The existing solutions for processing are not adapted to local needs in different regions and countries.		3			2					1	
Conduct research on participatory methodologies governing mountain communities. Addressing the knowledge gap on participatory methodologies and their use, including participatory action research (PAR), participatory rural appraisals (PRAs), rapid rural appraisals (RRAs), participatory needs-based assessments, and community asset assessments and participatory governance, is essential for fostering inclusive, resilient and effective engagement processes in farming communities.		3								2	1
Analyse emigration and immigration in mountain areas. Surveying mountain area migrants to identify reasons for leaving their homelands and assess their quality of life compared to expectations. It should explore succession by young farmers, long-term experiences of migrants across social statuses and life stages, and strategies for integrating forcefully distributed migrants into mountain communities.		3							1	2	
Study relations between rural and urban milieus to address the challenge of balancing the demands for recognition of mountaineers' or mountain dwellers' work with the need for ecological conservation/protection amid urban demands. This research should explore how to shift regional development strategies from product multiplication to demand-oriented approaches, focusing on safe and sustainable food production. It should also explore the integration of second-home owners into the daily lives of permanent residents and foster their engagement as active citizens in community affairs.								3		1	2

Explore collaborative networks. Understanding how to build and foster collaboration and knowledge exchange among stakeholders, including farmers, researchers, policymakers and industry representatives, is essential to facilitate learning and innovation in agro-ecological diversification in mountain areas.	3	1						2			
Study ways to **ensure generational succession in agricultural and livestock farms**. Resolving the problem of generational replacement in the primary sector has become a recurring issue. But, interestingly, it seems that we have not found effective solutions, or at least solutions that significantly improve the current problem. **Starting from effective examples**, research must look for **standardised but adaptive models**.		3							1	2	
Find ways to mainstream gender and youth. Incorporate gender and age considerations to address diverse needs and roles throughout several project cycles. Analysing gender norms and age impacts helps mitigate inequalities. Developing Education and Training tools is crucial for successful implementation, involving all stakeholders.		3							2	1	
Explore ways to implement modern ways of life without damaging traditional and seemingly 'retro' agro-ecological and cultural practices. Mountain communities benefit from modern civilisation, but face challenges such as youth migration to urban areas, resulting in the loss of traditions and cultural values. Rural and Alpine gentrification, fuelled by property purchases by outsiders, threatens local culture. **Research is required to guide mountain development, preserving regional identity and values**. **Incorporating local knowledge and sustainable agricultural practices can mitigate environmental impact while maintaining cultural heritage**.		3						2		1	
Assess how agro-ecological practices can help build climate resilience and mitigate climate-related risks such as extreme weather events, pests and diseases. Further investigation and analysis are required to assess the potential for introducing climate-resilient species of crops and adapting management practices for the agricultural and forestry sectors in mountain contexts.						1	3	2			

Develop information technology systems. Testing more and **better information technology systems and artificial intelligence (AI) that can support sustainable agriculture and forestry in mountain areas**. This includes precision agriculture technologies, GIS and remote sensing mapping for land use change and climate disaster impact, agroforestry systems and value-added processing techniques tailored to the specific conditions of mountain regions.		2		1		3					
Support long-term monitoring and evaluation of sustainable initiatives in mountain area integration. Monitor the long-term impact of initiatives that promote balanced development, conserving resources and enhancing well-being in mountain communities. Assessing their success in fostering cooperation, exchanging best practices and addressing shared challenges is vital. Research should develop new monitoring programmes to track outcomes, evaluate strategies, identify successful case studies at national and EU levels and adjust policies for sustainable development in EU mountain regions.											
Conduct a comparative analysis of governance models. Comparing governance models in mountain regions is crucial for tailored strategies addressing challenges such as biodiversity conservation and disaster risk. It aims to foster sustainable development, resilient economies and cross-border collaboration, while considering emerging policies impacting agroecology.						3		2		1	
Analyse the potential for collaborations between different mountain regions with similar specificities. Assessing the success of existing collaborative initiatives in European mountain areas to share common challenges and priorities. Fostering cooperation, exchanging best practices and addressing shared challenges is crucial for future efforts. Evaluating policy and institutional frameworks for cross-border cooperation is essential for identifying areas which need improvement and guidance for further research on a European scale.	3	1								2	

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