Research needs from practice

REPORT

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Why collect research needs from practice?

Many research results are translated into practical applications very slowly, or not at all. On the other hand, professionals such as farmers and foresters may have the impression that research does not meet their needs. Defining "research needs from practice" can help solve this, by facilitating dialogue between researchers and those that can use research results in practice.

This report defines "research needs from practice" as problems which professionals from the farming and forestry sectors come across in their daily work, and for which research may provide solutions. These may include:

- New ways of working, which have been tested in practice and would benefit from further research.
- Inventions or innovative solutions discovered by farmers or foresters, which could be improved or adapted with further research.

The EIP-AGRI Service Point collects research needs from practice during workshops, seminars, Focus Group meetings and other networking activities, through activity reports of agricultural or forestry organisations and also via a dedicated online form on the EIP-AGRI website.

By making these research needs visible via the EIP-AGRI website, others with an interest in the same issue can review them and provide an answer to the problem. They can also decide to take up the question and try to solve it, for instance by setting up an innovative project with other partners.
These research needs will also become visible for national and regional policy makers and authorities, who may decide to take up specific topics in their calls for innovative projects. Of course this information is also feeding into the programming of European Research and Innovation activities.

Scope of this summary report

This report takes into account the outcomes of a number of EIP-AGRI Focus Groups, workshops and seminars. These were completed by information submitted via the EIP-AGRI online form. It covers the period between 15 November 2018 – 14 November 2019 and comprises the following agricultural topics:

- Nutrient recycling (FG 19) (final report), (factsheet)
- Dairy production systems (FG 21) (final report), (factsheet)
- Diseases and pests in viticulture (FG 23) (final report), (factsheet)
- Forest practices and climate change (FG 24) (final report), (factsheet)
- Grazing for carbon (FG 25) (final report), (factsheet)
- Carbon storage in arable farming (FG 26) (final report), (factsheet)
- Circular horticulture (FG 27) (final report), (factsheet)
- Renewable energy on the farm (FG 28) (final report), (factsheet)

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Analysis of common themes

This report shows the **diversity of needs** for research from practice, but it also shows **similarities and connections** between the different agricultural sectors. Several issues appear to be important for different sectors and have been discussed in different Focus Groups:

RECURRING THEMES AND NEEDS	DISCUSSED BY
Different climate conditions / climate change Climate change – opportunities for farmers; Optimal soil carbon levels for different cropping systems and pedoclimatic conditions; Synthesis of knowledge from other climatic regions; Effects of climate change on pests and diseases / life cycles of pests and diseases / the emergence of new pests and diseases.	• FG 26 on "Carbon storage in arable farming" • FG 23 "Diseases and pests in viticulture"
Carbon loss and sequestration Cost-benefit analyses of keeping crop residues on the field or using it for other purposes; Storing more carbon; Values of soil carbon to farmers and society; Systems approach on the carbon that is produced locally: When the demand for local biomass increases will this mean a loss of biomass in other parts of the region or even other parts of the world? The allocation of carbon for different purposes needs to be treated in a systems approach where the soil carbon and the above ground carbon are regarded in one system; Role of root exudates in soil carbon modelling; Optimal soil carbon levels for different cropping systems and pedoclimatic conditions; Cost-benefit analysis of carbon sequestration; Decision making tool to quantify effect of grazing on ecosystem services; Robust monitoring system with common protocols and simultaneously locally adapted where needed (in order to get information about soil organic content for different regions of Europe, to optimise soil organic content in different regions of Europe and to reach equilibrium of soil organic content through optimal grazing management in different soil conditions); C sequestration in different grazing systems and under different pedoclimatic zones; Insight in C:N:P:S ratios; Understand the effect of incentives on long-term C sequestration; Methods to manage soil organic matter; Carbon dynamics (biomass/fuel) related to the fire regime.	• FG 26 on "Carbon storage in arable farming" • FG 25 on "Grazing for carbon" • FG 23 on "Diseases and pests in viticulture" • FG 24 on "Forest practices and climate change"
Managing nutrients Impacts of organic contaminants from different sources on food safety; Specific LCA for agricultural systems; Composition of biobased fertilisers; Composition, speciation and ratios of nutrients and organic carbon in manure storage or storage of derived products; Xenobiotic compounds; Organic contaminants from different sources; Alternative constituents for growing media/ nutrients from alternative sources (e.g. compost); N management in growing media; technologies to recover nutrients; Life cycle assessment of C in cropping systems; The allocation of carbon for different purposes (systems approach incl. food safety).	• FG 19 on "Nutrient recycling" • FG 27 on "Circular horticulture" • FG 26 on "Carbon storage in arable farming"
Soil ecology Impacts of organic contaminants on soil ecology; Biodiversity of soil organisms / How do biodiversity of soil organisms and plants interact / How to enhance the diversity of the soil microbiome through different agricultural practices / Soil	• FG 19 "Nutrient recycling" • FG 26 on "Carbon storage in arable farming"

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organisms as an indicator of soil health; Trade-off between soil nutrients and carbon and nitrogen content in soil amendments.	
Adaptability to local conditions Optimised ecosystem services for local conditions; Identify region-specific appropriate species / cultivars of species / mixtures of species for grazing; Selection and breeding of grape varieties and heterogeneous planting materials fitting local conditions; Locally adapted varieties; Adoption of local forecasting models; Locally adapted IPM implementation strategies; Local/regional guidelines for the implementation of innovative silvicultural practices; DSS at the local scale (farm) (How is the forest today and what will be expected in the future - with a risk assessment tool regarding changing species, practices and economics); Participatory research on climate change effects and measures that can be taken at local farm and forest-owner level (quick surveys and reports).	• FG 25 on "Grazing for carbon" • FG 23 on "Diseases and pests in viticulture" • FG 24 on "Forest practices and climate change"
Disease control / resistance Locally adapted grape varieties tolerant to pests and diseases; Make viticulture more resilient, starting from planting materials and nursery methods; Research on overall IPM strategy to efficiently manage pests and diseases and to reduce pesticide use on table grapes - and at the same time - reduce resistance risks; Management strategies to control powdery mildew in viticulture; Methods to manage soil organic matter, soil fertility and the soil microbiome that will reduce the impact of pest and diseases; Strategies to manage Grapevine Trunk Diseases (GTDs); Biocontrol agents (their mode of action); Connection between genetics and R&R (robustness & resilience) in dairy production systems: To achieve genetic progress for resilience and efficiency it is necessary to have a balanced breeding goal. (A balanced breeding goal will ensure progress for productivity as well and cost-reducing traits).	• FG 23 on "Diseases and pests in viticulture" • FG 21 on "Dairy production systems"
Plant/animal breeding Breeding of grape varieties fitting local conditions; Connection between genetics and R&R (robustness & resilience) in dairy production systems: To achieve genetic progress for resilience and efficiency it is necessary to have a balanced breeding goal. (A balanced breeding goal will ensure progress for productivity and cost-reducing traits); Development of locally adapted animals: New parameters for breeding indices should be considered: easy management, food conversion efficiency, health…; In which respect can breeding contribute e.g. to the resistance of crops/cultivars to salinity and diseases?	• FG 23 on "Diseases and pests in viticulture" • FG 21 on "Dairy production systems" • FG 27 on "Circular horticulture"
Data standardisation / data access / databases Standardisation and model calibration in the field of nutrient use efficiency; Database on grazing systems and soil organic C across environments and under different grazing / climatic conditions in order to compile current knowledge on how different grazing systems affect soil C sequestration and to determine the best grazing systems for C storage under different pedoclimatic conditions; Standardised metrics and effective use of sensors for greenhouse horticulture and other intensive farming systems; The collection of reliable data and the adoption of effective monitoring systems is currently limited by many factors at country and EU levels that could be	• FG 19 on "Nutrient recycling" • FG 25 on "Grazing for carbon" • FG 27 on "Circular horticulture"

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addressed in specific research programmes focusing on standardised procedures of big data analysis (autonomous data analysis software) to help farmers; Database and web app on new technologies, techniques and practices for implementing circular horticulture.	
Decision support tools Development of easy-to-use and affordable tools which can be applied at the farm: e.g. to maintain an overview of composition, speciation and ratios of nutrients and organic carbon in manure storage or storage of derived products; Software tool that links farm management to changes in soil C.; DSS at the local scale (farm) with a risk assessment tool regarding changing species, practices and economics.	• FG 19 on "Nutrient recycling" • FG 25 on "Grazing for carbon" • FG 24 on "Forest practices and climate change" • FG 27 on "Circular horticulture"
Digital-based solutions / sensors / precision farming Developing and applying smart systems based on (remote) sensing and integration of various nutrients as well as organic matter (to get a better understanding and matching of fertilisation with crop requirements); Bringing real-time analysis into precision farming e.g. for phosphorus management for which to date, only non-instant sample soil tests exist; Precision viticulture applicable in small-sized and scattered vineyards / farms; Drone use on small scale; Low cost technology solutions for measuring nutrients, salinity etc. (drones).	• Submission via online form on behalf of FG "Nutrient recycling" • FG 23 on "Diseases and pests in viticulture" • FG 27 on "Circular horticulture"
Working together / peer learning Farmer discussion groups; Motivation through demonstrations with early adopters; Showing success cases; Demonstration/pilot farms; Peer-to-peer knowledge exchange; Demonstration plots network of silvicultural practices; Forester exchange programme.	• FG 25 on "Grazing for carbon" • FG 23 on "Diseases and pests in viticulture" • FG 24 on "Forest practices and climate change"
Farmers' motivation / behaviour Mechanisms to encourage farmers to adopt practices that sequester C.; Type of "message" farmers respond to / What motivates a farmer to change a method or practice; Identification of barriers that prevent farmers to adopt the best management practices; Understand how farmers can be motivated; Under which conditions (social, political, and economic) do forest owners initiate change?; Farmer attitudes to fulfil social demands (demands of consumers).	• FG 25 on "Grazing for carbon" • FG 24 on "Forest practices and climate change" • FG 21 on "Dairy production systems"
Small farms Varieties that are easy to grow in site-specific conditions, including in small vineyards; IPM and precision viticulture applicable in small-sized and scattered vineyards / farms; Mating disruption systems (adapted to small scale); Drone use on small scale; Participatory research on climate change effects and measures that can be taken at local farm and forest-owner level (quick surveys and reports); Due to scaling-up effect, an efficient wood production/carbon sequestration in the multitude of small holdings could provide a considerable contribution to rural livelihood, employment and biodiversity: What is needed for making cooperations of (small) holdings successful?	• FG 23 on" Diseases and pests in viticulture" • FG 24 "Forest practices and climate change"

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The following overview clusters the identified research needs according to the priorities and cross-cutting issues that have been identified by the EC strategy for agricultural research and innovation.

Priorities and cross cutting issues	Research needs identified
Resource management (See *1, *2, 3*, 4*, 5*, 6*, *7)	Development and adaptation of specific LCA (Life Cycle Assessment) and environmental risk assessment methodologies for agricultural systems (as the current methods were designed particularly for industrial processes); Optimal concentration and ratio between N-P-K and other nutrients in relation of the targeted crop requirements; Solve uncertainties at farm level regarding composition (variability) and speciation of nutrients and organic carbon in manure, materials such as digestates or composts and in soil – in order to implement nutrient recycling schemes; Application of renewable nutrient resources; Xenobiotic compounds; Nutrient use efficiency (→ standardisation and model calibration); How can associations of trees and crop species that benefit each-other be managed in order to optimise production and store more carbon; Life cycle assessment of C in cropping systems; Soil carbon content; Tradeoff between nutrients, carbon and nitrogen content in soil amendments; Are there priming effects so that soil microorganisms will degrade carbon at low nutrient levels?; Role of root exudates in soil carbon modelling; Optimal carbon levels for different cropping systems and pedoclimatic conditions; Insight in C:N:P:S ratios; Robust (soil) monitoring system with common protocols and simultaneously locally adapted where needed - to get information about soil organic content for different regions of Europe & to optimise soil organic content; Soil organic matter and soil fertility management; Using the diversity of soil organisms as an indicator of soil health; Reliable methods to monitor parameters related to good utilisation of resources at farm level; Forage alternatives in case of severe drought; How to find new ways of removing accumulation like potassium, sodium, macro-organisms and metals (chemical bottlenecks of circularity) - Which are the limits?; Nutrients from alternative materials; Water quality and water availability of circular horticulture systems: Novel and cheap solutions for water storage to achieve a smart storing of water; (Bioenergy from forest/woody biomass).
Healthier plants and animals (See *8, *2, *4, *5, *7)	Hygienic watering place for laying hens; Changing climate → benefits at cropping systems level, e. g. disease management; Strategies to manage Grapevine Trunk Diseases (GTDs); Role of biocontrol agents; Influence of clime change on pest and disease life cycles; Emergence of new pests and diseases; Resistance of pest and diseases under climate change; The role of organic matter, soil fertility and soil microbiome on plant health; Strategies to control powdery mildew; IPM overall strategy on table grapes – locally adapted; Locally adapted varieties / selection and breeding of grape varieties and heterogeneous planting materials fitting local conditions; Increase health in planting materials by improving nursery management; How to make viticulture more resilient; Connection between genetics and R&R (robustness & resilience) in dairy production systems: To achieve genetic progress for

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	resilience and efficiency it is necessary to have a balanced breeding goal. (A balanced breeding goal will ensure progress for productivity and cost-reducing traits); Reduce pesticide use to reduce resistance risks; In which respect can breeding contribute e.g. to the resistance of crops/cultivars to salinity, diseases.
Integrated ecological approaches from farm to landscape levels (see *9, *2, *3)	The challenges posed by climate change, although global, show strong regional differences / improvement of forest management at stand level with special attention to small scale forests needed; Carbon dynamics (biomass/fuel) related to the fire regime as these are affected by forest species (fire prone to fire resistant), land uses (monocultures, rewetting wetlands, reforestation and practices (agroforestry), and management options (e.g. wildfires versus prescribed burning); How can combinations of agroforestry and e.g. conservation agriculture, organic farming or eco-intensive farming provide benefits to the environment and to climate change; Best grazing management to optimise ecosystem services for local conditions; Robust indicators to monitor different ecosystem services at the same time / long-term cooperation between universities / science sector and farmers in specific regions.
New openings for rural growth (see *8, *6, *9)	Specific cultivation methods to grow hop in Greece (locally grown hop for locally brewed beer); Opportunities and possible settings for renewable energy production on-farm; Due to scaling-up effect, an efficient wood production/carbon sequestration in the multitude of small holdings could provide a considerable contribution to rural livelihood and employment and biodiversity: What's needed for making these cooperations successful?
Enhancing the human and social capital in rural areas (see *9, *3, *4, *7)	How to mainstream knowledge exchange, including a forester exchange programme? What's needed for making forest management associations / cooperatives successful?; There's a need of future local/regional guidelines for the implementation of innovative silvicultural practices towards adaptation, covering for example: DSS at the local scale (farm): How is the forest today and what will be expected in the future - with a risk assessment tool regarding changing species, practices and economics); Need to understand farmer behaviour, farmer motivation and decision making in the adoption of grazing systems that preserve or sequester C (measures: Farmer discussion groups; Peer interaction / motivation through demonstrations with early adopters); Demonstration/pilot farms to increase trust.
Systems approaches (see *9, *2, *4)	Conditions (social, political, and economic) that persuade forest owners to initiate change; The allocation of carbon for different purposes needs to be treated in a systems approach where the soil carbon and the above ground carbon are regarded in one system; Main factors of vine decline; Biomass mapping of the main European products and analysing the logistics, streams, potential and risks of dynamic biomass streams.
Societal engagement (see *10, *4, *5, *7, *6)	'Choice experiments' to identify the willingness to accept & pay for novel types of biobased fertilisers; Social acceptance studies in order to investigate the entire value chain of novel types of biobased fertilisers; Varieties and heterogeneous planting materials fitting local conditions and market demands; Surveys

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	about social demands / opinion of consumers about dairy farming; Farmer attitudes to fulfil these demands; Consumers' perception of circularity; How far can consumers understand and give value to the growing conditions, LCA, nutritional properties, environmental aspects, limits set by nature against benefitting from a low price and an all year-round supply?; Public perception on the use of recycled wastewater; Factors influencing adoption of reuse technologies; Social acceptance of energy production in rural areas.
Information and Communication Technologies (ICT) as an enabler (see *10, *2, *3, *4, *7)	Smart systems based on (remote) sensing; Precision farming that combines environmental with agronomic benefits; How to bring real-time analysis into precision farming?; Tools and models to estimate more clearly the value of soil carbon; Software tool that links farm management to changes in soil C; Tool to quantify effect of grazing on ecosystem services that can be used for decision making; Downscale precision viticulture in order to make it applicable to small-sized and scattered vineyards and farms; Drone use on small scale; Development of sensors that will easily measure the concentration of the different nutrients in the nutrient solution of hydroponic crops and thus be able to increase the reuse of drainage solution of hydroponic crops more efficiently plus share/read these results online; Effective use of sensors for greenhouse horticulture and other intensive farming systems; Autonomous data analysis software / standardised procedures of big data analysis have to be implemented to help farmers; Database and web app on new technologies, techniques and practices for implementing circular horticulture.
Socio/economic research (see *9, *2, *3, *5, *7)	Long term commitments and funding for integrated forest management adaptation in small landownership / efficient economic incentives to promote the adaptation to climate change; Conditions that persuade forest owners to initiate change; Values of soil carbon to society: can be done with cost-benefit analyses, testing different types of incentives (economic, legislative); Understand how farmers can be motivated to manage grassland for C sequestration by monitoring incentives in order to assess their effectiveness - including cost-benefit analysis; How to link labelling (circularity/sustainability) with marketing? →The added value in circularity/sustainability labelled products only works for the early adopters, and if more and more producers adopt these new practices, the added value for doing things "better" disappears; Value of immaterial flows such as ecosystem services and social cohesion; Total balance of benefits.

*1 FG 19 on "Nutrient recycling"
*2 FG 26 on "Carbon storage in arable farming"
*3 FG 25 on "Grazing for carbon".
*4 FG 23 on "Diseases and pests in viticulture"
*5 FG 21 on "Dairy production systems"
*6 FG 28 on "Renewable energy on the farm"
*7 FG 27 on "Circular horticulture"
*8 online
*9 FG 24 on "Forest practices and climate change"
*10 FG 19 on "Nutrient recycling"

Browse the research needs online:
https://ec.europa.eu/eip/agriculture/en/find-connect/needs-for-research

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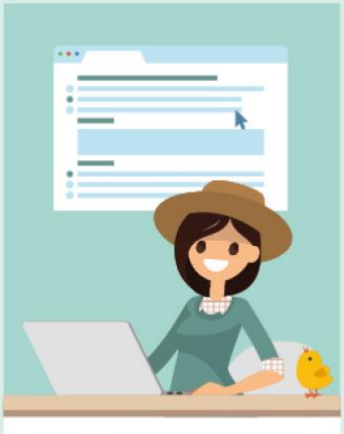
Finding solutions for research needs from practice

Identify your research need from practice

Register to the EIP-AGRI homepage and fill in the form



Discuss your research needs from practice during EIP-AGRI seminars or workshops ...

... or with other experts in an EIP-AGRI Focus Group

Perhaps somebody else has already found a solution?

Perhaps a researcher will take it up?

SOLUTION FOUND

Join the EIP-AGRI Network at www.eip-agri.eu

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