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 2019 – 14 November 2020 and comprises the following agricultural topics:

- FG 30 on "Frost damage" (**final report**)
- FG 33 on "Pest and diseases of the olive tree" (**final report**)
- FG 37 on "Contaminated Soil" (**final report**)
- FG 36 on "Soil salinisation" (**final report**)
- FG 35 on "Plant-based medicinal and cosmetic products" (**final report**)
- FG 29 on "New feed for pigs and poultry"(**final report**)
- FG 32 on "Non-chemical weed management" (**final report**)
- FG 34 on "Bee health" (**final report**)
- FG 31 on "Reducing food loss on the farm" (**final report**)

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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	
Behaviour and phenology of cultivars under different climate conditions;	• FG 30 on "Frost damage",
Effect of climate change on olive pests and pathogens; **C**over crops: knowledge gaps concerning selection of species compositions for different agro-climatic areas;	• FG 33 on "Pest and diseases of the olive tree",
Local plant species for different climatic conditions and specific for each soil remediation method;	• FG 37 on "Contaminated Soil",
Improving the profiling of nutritional content of crops grown under saline conditions – for two reasons: to define commercial return for quality improvements and to allow information sharing on accumulation of sodium in food products (NB with climate change it is anticipated that agricultural systems may change to include more crops grown under saline conditions); **S**alinisation risk in critical areas considering different climate change scenarios;	• FG 36 on "Soil salinisation",
Climate change adaptation of medicinal plant species (effects of climate change on medicinal flora in terms of their life cycle, secondary metabolites and the distribution of specific plant species).	• FG 35 on "Plant-based medicinal and cosmetic products"
Plant/animal breeding	
Breeding schemes of Black Soldier Flies;	• FG 29 on "New feed for pigs and poultry",
Potential of evolutionary breeding (composite cross-populations[1]) to breed for competitiveness; **B**reeding for short season crop varieties; **B**reeding for allelopathic crop varieties; **B**reeding for weed-suppressive and tolerant varieties/crops: Screening programme for crop variety suppressiveness;	• FG 32 on "Non-chemical weed management",
Introducing tolerance traits in high yielding lines; **P**hysiological and molecular basis of crop tolerance to salinity;	• FG 36 on "Soil salinisation",
Molecular markers as a tool for exploring genetic diversity for crop improvement; **E**ffects of commercial captive breeding and artificial propagation on wild species conservation;	• FG 35 on "Plant-based medicinal and cosmetic products",

[1] A composite cross population (CCP) is created by crossing a number of plants from different lines, and subsequently bulking seeds from the resulting offspring. This makes a CCP a population of plants with a lot of inherent genetic diversity, in contrast to monocultures. (from Wikipedia)

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Breeding efforts in all countries in order to maintain the local populations of honeybees, as well as to identify resistant populations to Varroa. **B**reeding local honeybees and honeybees that are well adapted to their climatic conditions and will improve resilience.	• FG 34 on "Bee health"
Data standardisation / data access & exchange **D**atabase on potential yields for different species/varieties and critical temperatures on species/variety level; **S**tandardisation of analytical methods - European guidelines on harmonised methods for measuring, mapping and monitoring soil salinity; **D**atabase on production of MAP (Medicinal and aromatic plant) species; **D**atabase on the moisture sorption isotherms of important MAP species; **E**uropean platform better connecting research and practice and contributing to efficiently gathering and exchanging knowledge (on beekeeping and bee health).	• FG 30 on "Frost damage", • FG 36 on "Soil salinisation", • FG 35 on "Plant-based medicinal and cosmetic products", • FG 34 on "Bee health"
Decision support tools **A**pp for assessing frost protection measures considering risk (simulation tool); **D**igital agriculture - full agri-food chain monitoring and control; **M**ulti-actor and interdisciplinary decision support tools that are easy-to-use and help farmers and decision makers to implement sustainable soil management technologies; **D**ecision support systems to support decision making - develop a practical tool for growers or cooperatives growing plants for medicinal and cosmetic products (decisions related to on-farm production and processing operations based on multi-source data integration).	• FG 30 on "Frost damage", • FG 31 on "Reducing food loss on the farm", • FG 37 on "Contaminated Soil", • FG 35 on "Plant-based medicinal and cosmetic products"
Digital-based solutions / sensors / precision farming **I**ntelligent intra-row weeding technologies to operate in direct-sown row crops; **I**ndividual plant recognition for more precision in weeding; **F**or single plant weed control, detection and control must be performed in a one-stage setup. Improving camera and detection systems is an important research need; **N**ew systems for pests and diseases monitoring: Specifically making use of new technologies (IT tools and Internet of Things technologies);	• FG 32 on "Non-chemical weed management", • FG 33 on "Pest and diseases of the olive tree",

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Soil (contamination) monitoring on farm level - Development of smart sensors and/or affordable tools for fast determination methods; **A**lternative systems for soil scanning and monitoring (of contamination) using state of the art technologies such as remote sensing and drones; **P**recision agriculture - technology for precise use of chemical inputs at the right spot and the right time to minimise the impact on the environment and soil quality; **P**recision agriculture technology affordable and usable also for small scale farmers;	• FG 37 on "Contaminated Soil",
Smart flushing – "leaching" /specific tools based on models, sensors, weather forecasts, climate and soil data in models (to reduce soil salinisation); **M**ethodologies (sensors, remote sensing, GIS…) to identify sustainable and non-profit agriculture areas that should go through a land-use change; **C**heap but reliable sensors for salinity measurement; **U**se and integration of satellite data: satellite images of higher spatial and spectral resolution to map soil salinity at farm level;	• FG 36 on "Soil salinisation",
Sensors and digital tools to support decision making - develop a practical tool for growers or cooperatives growing plants for medicinal and cosmetic products (decisions related to on-farm production and processing operations based on multi-source data integration.	• FG 35 on "Plant-based medicinal and cosmetic products"
Farmers' motivation	
Increase farmers' awareness on the importance of honeybees and pollinators;	• FG 34 on "Bee health",
Farmers' risk perception and subsequent decision making on weed management needs to be integrated in the process of developing weed control strategies that work on the farm, in terms of economics, timing, labour availability.	• FG 32 on "Non-chemical weed management"
Long term research	
Weed biology: long-term experiments with integration of preventive and direct methods;	• FG 32 on "Non-chemical weed management",
Long-term experiments for validation of the (biological) remediation techniques for contaminated soil;	• FG 37 on "Contaminated Soil",
Long-Term Experiments (LTEs) to obtain the crop and soil data needed for model parameters for simulation tools, so these tools can become operational innovations in agriculture.	• FG 36 on "Soil salinisation"
Soil contamination	
Sources of contamination of agricultural soil: long-term build-up of persistent organic contaminants in agricultural soils, accumulation, bioavailability, effects on soil biota, interactions with soil constituents, potential leaching and runoff; **S**ources of contamination of agricultural soil: pesticides: environmental risk assessment of their interaction, and the establishment of	• FG 37 on "Contaminated Soil",

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threshold values in soils for approved currently used pesticides; **S**ources of contamination of agricultural soil: biochar and compost: potential absorption and adsorption of contaminants, specific mechanisms in soils amended with biochar and compost on the (im)mobilisation of organic and inorganic contaminants, on the modification of their (eco)toxic effects, on the translocation of these contaminants from roots to shoots, and on the migration towards groundwater; **B**iological remediation - strategies for new pollutants: microplastics, fluorinated compounds, endocrine disruptors, drug residues; **B**iological remediation - strategies for mixed combined contamination: organic and inorganic pollutants, or heavy metals and metalloids; **B**iological remediation - criteria for remediated soils: pollutant bioavailability, risk assessment, soil health and biodiversity; **D**ata on the Pyrrolizidine Alkaloids identified, understand the mechanism of contamination, sources of exposure, level of toxicity and updated risk management.	• FG 35 on "Plant-based medicinal and cosmetic products"
Food/non-food value chains **M**ulti-actor 'value chain approach' to research on food loss and waste on the farm with an integrated mix of researchers, businesses (large and SME) and the citizen (consumer); **V**alue chain analysis in terms of a life cycle assessment; Improved quality assurance along the value chain.	• FG 31 on "Reducing food loss on the farm", • FG 35 on "Plant-based medicinal and cosmetic products"

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 • FG 36 on "Soil salinisation"	**W**ater harvesting - Natural water resources, such as rainfall, should be better managed; **S**mart flushing – "leaching" guidelines for soils prone to salinisation; **A**daptive drainage; **M**ixing irrigation water, including closing water cycles; **N**ew irrigation systems for field crops, major crops, extensive crops, such as micro-irrigation for field crops;
Healthier plants and animals See • FG 36 on "Soil salinisation",	**S**tudies on microbiota functions under different naturally-salt affected soil as model system --> microbiome or belowground biodiversity can contribute to improve plants´ resistance to salinity; **S**elect the most (salinity) tolerant commercial varieties and start from those to improve them; **P**hysiological and molecular basis of crop tolerance to salinity;

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• FG 34 on "Bee health",	**I**ndex to synthesise the health status of individual honeybees and their colonies; **B**ees: effects of exposure to stressors from agriculture, including e.g.: knowledge of the effect of novel chemicals, including their sublethal effects and interactions with other chemicals or stressors such as flowering resource quality and quantity; **B**reeding efforts in all countries in order to maintain the local populations of honeybees, as well as to identify resistant populations to Varroa. (Breeding local honeybees and honeybees that are well adapted to their climatic conditions will improve resilience.);
• FG 30 on "Frost damage",	**E**ffectiveness of different chemicals used for frost protection (enhancing frost resistance, delaying budbreak or bloom) under different field conditions; **F**rost protection: reliable monitoring and alarm system that relies both on surface and profile information of temperature, humidity and wind speed; **F**rost protection: below-ground sprinkling (in combination with hot air machines) for stone fruit;
• FG 29 on "New feed for pigs and poultry",	**N**utrient requirements of black soldier fly (BSF); Limits of inclusion levels of novel feedstuff - palatability, health, body composition (e.g. of BSF larvae); **R**ight level and way to include green protein (grass/clover) in feed? Effect on performance, microbiota, health, animal welfare; **N**ew feeds for pigs and poultry: balanced diets with amino acids and novel feedstuff;
• FG 32 on "Non-chemical weed management",	**B**reeding for weed-suppressive and tolerant varieties/crops - screening programme for crop variety suppressiveness; **B**reeding for weed-suppressive and tolerant varieties/crops - breed for competitiveness; **B**reeding for allelopathic varieties - traits and the combination of traits for weed suppression and tolerance to weeds, both by individual crops and crop mixtures;
• FG 33 on "Pest and diseases of the olive tree"	**E**ffect of Climate Change on olive pests and pathogens; **N**ew systems for pests and diseases monitoring: specifically making use of new technologies (IT tools and Internet of Things technologies); **N**ew biotechnological phytosanitary tools (semiochemicals, attractants, deterrents, repellents, etc.) to control olive pests; **U**nderstanding on how enhancement of the functional biodiversity can affect potential natural enemies of the key pest of the olive tree.
Integrated ecological approaches from farm to landscape levels See • FG 33 on "Pest and diseases of the olive tree", • FG 36 on "Soil salinisation"	**C**ost/feasibility of cover crop establishment/improvement and the associated benefits (ecosystem services); **A**ssess soil salinisation impact off-site, environmental impact and ecosystem services.

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New openings for rural growth See • FG 35 on "Plant-based medicinal and cosmetic products"	**P**otential of non-wood forest products (e.g. forest fruits, mushrooms, cork, pine nuts medicinal plants, essential oils etc.) in rural development; **F**armer-led and low-cost green biorefineries in the MAP (Medicinal and aromatic plant) sector.
Enhancing the human and social capital in rural areas See • FG 35 on "Plant-based medicinal and cosmetic products" • FG 37 on "Contaminated Soil",	**F**arm demonstrations of state-of-the-art and emerging drying technologies; **S**ustainable farm management - farm-centered approach to incorporate wider biophysical, socio-economic and business components into the farming system.
Information and Communication Technologies (ICT) as an enabler See • FG 30 on "Frost damage", • FG 29 on "New feed for pigs and poultry", • FG 32 on "Non-chemical weed management" • FG 33 on "Pest and diseases of the olive tree", • FG 31 on "Reducing food loss on the farm", • FG 37 on "Contaminated Soil",	**D**atabase on potential yields for different fruit crop species/varieties and critical temperatures on species/variety level; **A**pp for assessing frost protection measures considering risk (simulation tool). - related to need for database for potential yield/loss in different conditions; **F**eed reference database for novel feedstuff (linked with substrate used); **F**ield based artificial intelligence multivariable metabolomics, big data, faeces, saliva, blood, biomarkers; **I**ntelligent intra-row weeding technologies to operate in direct-sown row crops; **I**ndividual plant recognition for more precision - large numbers of weed example images are necessary; **N**ew systems for pest and disease monitoring: specifically making use of new technologies (IT tools and Internet of Things technologies); **I**CT applied to agricultural production systems and full agri-food chain monitoring and control; **S**mart sensors and/or affordable tools for fast determination methods and with improved resolution and accuracy to allow farmers to conduct in-situ field monitoring of the fundamental parameters' contents, mainly the macronutrient concentrations (N, P and K) and organic carbon; **A**lternative systems for soil scanning and monitoring (besides the laboratory analysis) using state of the art technologies such as remote sensing and drones; **T**echnology for precise use of chemical inputs at the right spot and the right time to minimise the impact on the environment and soil quality;

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• FG 36 on "Soil salinisation",	**S**pecific tools based on models, sensors, weather forecasts, climate and soil data in models; **M**ethodologies (sensors, remote sensing, GIS…) to identify sustainable and non-profit agriculture areas that should go through a land-use change; **D**evelopment of cheap but reliable sensors for soil salinity measurement; **N**ew modelling approaches combining multiple sources of data (remote sensing, terrain attributes, geological maps, land use, meteorological data, irrigation water quality, groundwater level and quality, etc.) for mapping soil salinisation and assessing salinity risk at regional levels;
• FG 35 on "Plant-based medicinal and cosmetic products",	**D**atabase on production of MAP (Medicinal and aromatic plant) species; Decision support systems, sensors and digital tools to support decision making for growers or cooperative;
• FG 34 on "Bee health",	**E**uropean platform better connecting research and practice and contributing to efficiently gathering and exchanging knowledge on beekeeping and bee health;
• online	**D**igitally connected supply chain.
Socio/economic research See • FG 32 on "Non-chemical weed management",	**T**ransdisciplinary weed research (TWR) *(-->TWR is defined as an integrated process of inquiry and action that addresses complex weed problems in the context of broader efforts to improve economic, environmental and social aspects of ecosystem sustainability*); **I**n NCWM (non-chemical weed management), economic costs can mainly be related to the cost of tillage practices, which includes higher labour costs, cost of cover crops and the indirect costs related to less effective weed control and yield loss due to changes in crop rotation. --> It is especially important that farmers' risk perception and subsequent decision making on weed management is integrated in the process;
• FG 31 on "Reducing food loss on the farm",	**M**ulti-actor 'value chain approach' to research on food loss and waste on the farm with an integrated mix of researchers, businesses (large and SME) and the citizen (consumer);
• FG 37 on "Contaminated Soil",	**S**ocial costs of delaying remediation of brownfields or in urban areas; **S**ustainable farm management - farm-centered approach to incorporate wider biophysical, socio-economic and business components into the farming system;
• FG 35 on "Plant-based medicinal and cosmetic products"	**M**arketing and consumer studies - country specific marketing and consumer research to identify consumer perceptions of different plant-based products.

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

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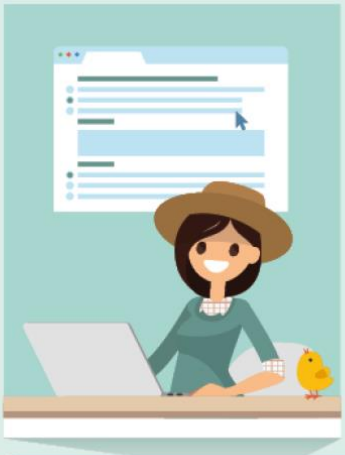
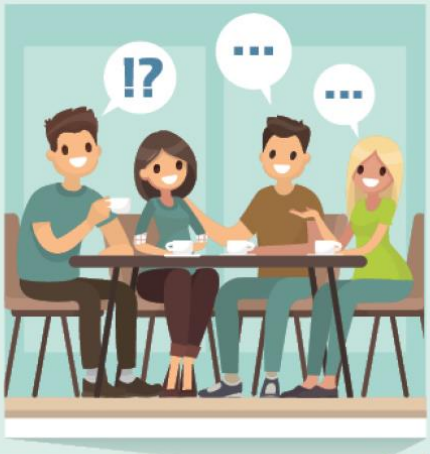
Identify your research need from practice

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

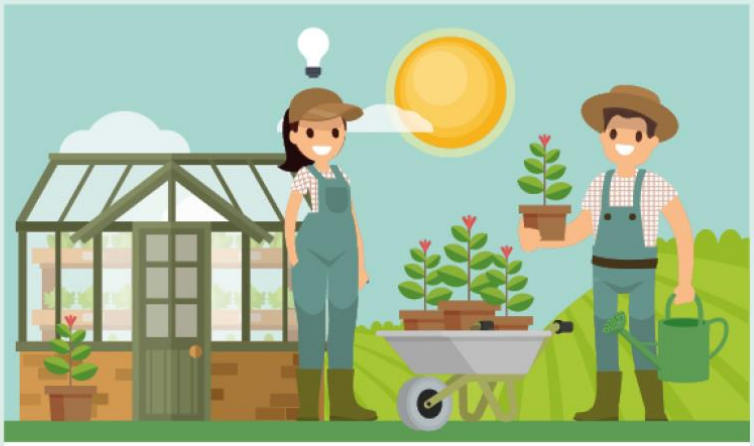


Discuss your research needs from practice during EIP-AGRI seminars or workshops ...



... 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

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