agromix

Practice Abstracts (batch 2)

Deliverable D7.7

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Deliverable 7.7	Practice Abstracts (batch 2)
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[1] **R**=Document, report; **DEM**=Demonstrator, pilot, prototype; **DEC**=website, patent fillings, videos, etc.; **OTHER**=other
[2] **PU**=Public, **CO**=Confidential, only for members of the consortium (including the Commission Services), **CI**=Classified

1 Executive Summary

Deliverable D7.7 of the AGROMIX project reunites the second batch out of three of the practice abstracts (PAs) derived from the AGROMIX project. Deliverable D7.6 was presented during month 12 of the project (October 2021) and included 8 PAs on a summary of the need to define 'resilience' in the agricultural context; the need to present the current policy situation as analysed during the first months of the project; and the main challenges faced by the first round of pilot projects located in Belgium, Switzerland, France, Italy, the Netherlands and Germany; while Deliverable D7.8 will be presented in month 36 (October 2023). In this occasion, D7.7 include texts referring to some of the most relevant outcomes of the second year such as summaries of the deliverables on Climate resilience concept in farming (D3.6), Methodological approaches to assess climate resilience (D3.7), Report on ecosystem services and disservices from Mixed Farming (MF) and Agroforestry (AF) systems for climate-smart agriculture (D1.2), Assessment of the farm level financial and socioeconomic performance of selected MF/AF systems (D5.1) and Inventory report of current MF/AF policy instruments (D6.1). The main objective of this deliverable is to ensure the results of the projects are not only available at the website of the project in a report format but can also be accessed by other audiences in a simpler format through EIP-AGRI website.

All the texts are envisaged to be available on the AGROMIX project page on the EIP-AGRI website:

https://ec.europa.eu/eip/agriculture/en/find-connect/projects/agroforestry-and-mixed-farming-systems

2 Expected impact

The incorporation of these texts into the EIP-AGRI database will make the documents more accessible and readable to a broader audience than the deliverables alone could reach. The EIP-AGRI common format facilitates knowledge flows on innovative and practice-oriented projects from the start till the end of the project. In this sense, the usage of this format will allow farmers, advisers, researchers and other EU actors to learn more about the project and its results. It will also help locating the main outcomes in addition to support the interaction of the targeted audiences.

3 Introduction

The European Innovation Partnership for Agricultural Productivity and Sustainability (EIP-AGRI) interactive innovation approach fosters the development of demand-driven innovation through projects, transforming new creative ideas into practical applications through interactions between partners, knowledge sharing, and effective intermediation and dissemination. The EIP common format consists of a set of basic elements characterising the project and includes one or more 'practice abstract(s)'. The format was developed with two main objectives:

A) to enable contacting partners and incentivise efficient knowledge exchange, and
B) to disseminate the results of the project in a concise and understandable way to practitioners.

The common format allows the provision of information throughout the project's life-cycle. The content in the common format can be updated at any point in the project's duration. Project information should be available at the beginning (describing the situation at the start of the project, including project title and objectives) and, at the end of the project (describing the results/recommendations resulting from the project, including a final project report and the practice abstracts).

4 Practice Abstracts

This deliverable D7.7 includes 8 practice abstracts. These texts describe some of the most relevant outcomes of the second year of the AGROMIX project, such as summaries of the deliverables on: Climate resilience concept in farming (D3.6), Methodological approaches to assess climate resilience (D3.7), Report on ecosystem services and disservices from Mixed Farming and Agroforestry systems for climate-smart agriculture (D1.2), Assessment of the farm level financial and socioeconomic performance of selected MF/AF systems (D5.1) and Inventory report of current MF/AF policy instruments (D6.1). The main objective of this deliverable is to guarantee that the project's results are not only available on the project's website in report format but can also be accessed by other audiences in a simpler format through the EIP-AGRI database.

4.1 Methodological approaches to assess climate resilience

'Resilience' is simultaneously key to establishing sustainable agricultural systems, and notoriously difficult to define and measure. Based on the field work in 9 experimental sites, researchers from AGROMIX concluded that resilience can be assessed by answering the following six questions:

1. Resilience of what and for what reason?
2. Resilience to what?
3. What attributes should be considered alongside resilience?
4. What are the forms of resilience?
5. At what scale do we measure resilience?
6. What about the social and economic aspects of resilience?

There are many forms of resilience, and we do not wish for all systems to become resilient (e.g., the resilience of systems that perpetuate environmental degradation and human exploitation are a phenomenon known as 'dark resilience'). However, for the resilience of farming systems, AGROMIX considers that it is "the ability to ensure the provision of the desirable functions of the farming system to climate shocks and stresses". Based on the identified six questions, resilience can be assessed at the field, farm, community, regional, national, continental, or global scales, and there are three types of resilience:

1. Robustness: being able to absorb or resist shocks and stresses
2. Adaptability: being able to adjust to the changes, and
3. Transformability: being able to move the existing system to a stronger one.

Know more about resilience on Deliverable D3.7 of the AGROMIX project **here**

4.2 Assessing the microclimate and animal productivity, welfare and behaviour in mixed farming and agroforestry systems

Climate change alters the thermal environment of animals. It affects their health, reproduction, and feed conversion efficiency, thus disturbing the productivity and stability of farming systems, and potentially impacting farmers' income. The presence of trees in agroforestry systems can alleviate this challenge by moderating (both day- and night-time) temperatures and providing a more comfortable microclimate for animals in extensive farming systems. AGROMIX investigates methods of assessing resilience in individual animals based on the physiological, behavioural, cognitive, health, emotional and production states, utilising indicators such as body temperature, heart rate, circadian ethogram, feed intake, growth rate, and production levels. To measure these animal responses to microclimates, AGROMIX set up three experiments in Italy, France, and Northern Ireland, with weather stations to measure solar radiation, air temperature and humidity, rainfall, wind, and other variables.

The AGROMIX research team tested this hypothesis by monitoring animal behaviour on some of the 9 experimental agroforestry and mixed farming sites. Smart collars with sensors were used to collect data on body temperature, animal activity, and position in the grazing area, without disturbing the animals. Additional information was also gathered through animal hair and blood samples to evaluate cortisol concentration, as an indicator of chronic stress.

Know more about the results obtained on WP3 of the AGROMIX project **here**

4.3 Methods to assess biodiversity in agroforestry systems

Wild species play important roles in food production. Insects pollinate many crops, wild plants support animal feed, soil microorganisms recycle nutrients for crop growth, and certain organisms facilitate natural pest control. Thus, there is a need to transform farming systems to reverse the decline of biodiversity that has been observed in agricultural landscapes in recent decades. Agroforestry is one technique for reconciling biodiversity and food production by integrating crops or livestock with trees, and the AGROMIX project is quantifying the benefits of agroforestry systems to biodiversity to illustrate this potential. AGROMIX's research methods include recording the activity of birds and bats, quantifying herbaceous plants, pollinating insects, spiders, beetles and soil microorganisms. The data gathered is then compared with data gathered on the same variables from non-agroforestry systems, to assess the differences, and evaluate the benefits of agroforestry systems for biodiversity. To standardise data and ensure minimal subjective interference, AGROMIX is using independent methods such as autonomous audio recordings; soil organisms are identified using DNA sequencing; and plant biodiversity is recorded using a standardised sampling protocol.

According to AGROMIX researchers, although agroforestry is receiving increasing attention from stakeholders of all types (including farmers, researchers, and policymakers), the challenge is that newly established agroforestry systems take decades to reach their full potential in supporting biodiversity, and there are very few fully mature agroforestry systems to provide solid evidence of the benefits of agroforestry for biodiversity.

Know more about biodiversity in agroforestry systems **here**

4.4 Numerical models to assess resilience in mixed farming and agroforestry systems

The introduction of trees on farms can provide economic and environmental benefits such as the harvesting and additional income from tree products, shelter for animals and crops, water purification, and increased biodiversity. An additional benefit of trees is their ability to sequester carbon from the earth's atmosphere to counter the impacts of climate change. However, quantifying these benefits through field research is time consuming, and dependent on the slow development of newly established agroforestry systems. To overcome this challenge, researchers have developed a numerical computer simulation model of how trees interact with their environment, gaining insights on the effects of incorporating trees on farms. These models are being used in the AGROMIX project to predict how trees and crops in agroforestry systems will respond to climate change, and how trees can provide benefits for crops and livestock. The computer simulation models being used include:

a) Yield-SAFE, that provides long-term predictions of tree and crop growth for a variety of species, globally. It has been upgraded in recent years to include soil carbon impacts, livestock carrying capacity, and microclimatic effects.

b) Hi-sAFe that is a 3D model that simulates crop and tree growth in agroforestry, forestry, and arable systems and where the trees are represented as geometric shapes above ground, and as a 3D representation of root structures below ground.

c) Farm-SAFE that is a cost-benefit analysis model that compares the performance of different land use systems and that can be operated at a variety of scales to provide a summary of future revenue and costs, transformed to a net present value.

Know more about resilience on Deliverable D3.7 of the AGROMIX project **here**

4.5 The Knowledge Exchange Hub of the AGROMIX project

The AGROMIX project developed the Knowledge Exchange Hub (KEH), an online tool to gather information about agroforestry and mixed farming practices in Europe. The KEH is an open-access platform that is continuously updated with new content including educational materials, cutting-edge research, relevant related projects, books, videos, photos, events, publications, and datasets, all related to the project's interest areas: agroforestry, mixed farming, regenerative agriculture, climate change resilience, and sustainable land use. Using the page's dropdown menu, the user can navigate between the 12 different hubs, including 11 country-specific hubs, and one international hub. The information is shared in English and in the corresponding country's local language. In the future, the Hub will be adapted to allow users to upload their own material, with a validation process in place to ensure the quality of the information shown. As the volume of materials expand, the KEH is becoming a key platform for all stakeholders interested in agroforestry and mixed farming, thus establishing a dynamic exchange of information that will progress over time, bringing together the diverse realities of farming across Europe.

Know more about the Knowledge Exchange Hubs **here**

4.6 Climate smart agriculture: ecosystem services in mixed farming and agroforestry systems. A farmer's perspective

Deliverable 1.2 of the AGROMIX project aimed at evaluating the ecosystem services and disservices present in mixed farming and agroforestry systems and, to assess their relative importance in relation to climate smart agriculture, from a farmers' perspective. To gather farmer perceptions of agricultural practices in relation to on-farm resilience, ecosystem services and contribution to climate change mitigation, an online survey was conducted. Despite the small data set (44 responses), some preliminary conclusions can be drawn. Almost all farms had experienced extreme weather in the last five years and the vast majority of farmers were planning to improve ecosystem services on their farm being the top 5 services: carbon sequestration; carbon cycling; enhanced soil fertility; education value; and nitrogen fixation. Farmers cited money and time as the top two requirements for improving ecosystem services on farm. The top 5 practices cited by all farm types to reduce the effects of extreme weather were: keeping the soil covered; increasing diversity of crops; rotational grazing; incorporating trees; and growing indigenous species.

More information about the survey report can be found **here.**

4.7 Report on the assessment of the farm-level financial and socio-economic performance of selected mixed farming and agroforestry systems

Actors within the agri-food systems face risks due to changes in the climate, market, regulation, and socio-ecological conditions. The portfolio of functions maintained within Mixed Farming and Agroforestry (MF/AF) systems should help minimise these risks. Deliverable 5.1 of the AGROMIX project collected farm information from the Farm Accountancy Data Network (**FADN**) to understand the current diffusion of these systems as well as their socio-economic performance. The data collected showed that de-mixing (a reduction of complexity, diversity, and mixed systems) is ongoing in many parts of Europe. The picture is, however, itself more diversified than assumed, with some areas getting still de-mixed, which were previously highly mixed (Eastern Europe), while others are not de-mixing and, on the contrary, gaining complexity and diversity, e.g., parts of Greece, Northern Portugal, Alpine and mountainous regions, certain European islands. Therefore, in order to grasp the integration and complexity of the agricultural system, this data must be collected in a more efficient manner. The analysis claimed that to better understand the evolution of the 'mixedness' of farms, it is needed to integrate spatial data analysis (i.e., LUCAS) with structural and productive factors information as well as better understand the income information.

More information on this deliverable **here.**

4.8 Global inventory of current policy contexts, instruments and operational means for the support of mixed farming and agroforestry systems

Agroforestry and mixed farming are multifunctional systems that have been in use for centuries but represent untapped potential for modern solutions. These systems were severely neglected in policy-making during the last 50 years for further industrialisation in agricultural systems. The negative consequence of this industrialisation on biodiversity, pollution to water, soil and air are becoming more apparent, as well as the need for more radical re-designs of farming systems. Despite the numerous benefits of agroforestry and mixed agricultural systems, direct policies focused at supporting and promoting these systems remain in the minority, both in Europe and globally. Agroforestry and mixed farming systems could be at the centre of this transformation routed in a food systems approach and the principles of agroecology for Europe.

Deliverable D6.1 of the AGROMIX project provides an inventory of the current agroforestry and mixed farming policies available in 19 different European countries and 5 international examples. Over 100 policy documents were reviewed showing that all countries have numerous national policy goals concerning health, environment, economy and society, with a recognition of explicit connections between the overarching policy goals. Despite this, policies and actions designed to address these challenges often conflict and undermine each other. Therefore, joined-up policy connecting food systems, agriculture and rural development with animal and human health is required in order for food systems to emerge as a potential common space for advancing co-benefits, for all of these policy goals efficiently and effectively.

Know more about this report **here.**