



## **D7.3 Coordination with policy makers and operational groups**

**APEMETA**

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## List of Abbreviations & Definitions

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Abbreviation	Definition
AI	Artificial intelligence
AKIS	Agricultural Knowledge and Innovation Systems
AO	Aspirational objective
AOP	Agroecological and Organic Practices
APEMETA	Portuguese Association of Environmental Technologies Companies
BPI	Benaki Phytopathological Institute
CAP	Common Agriculture Policy
CDG	Civil Dialogue Groups
CMC	Component Material Categories
D	Deliverable
DGADR	Portugal's General Directorate of Agriculture and Rural Development
DG-AGRI	Directorate-General for Agriculture and Rural Development
DGAV	Portugal's General Directorate of Food and Veterinary
DIH	Digital Innovation Hubs
DoA	Description of the Action
DSS	Decision Support System
DST	Digital and Space Technologies
EC	European Commission
EGTOP	Expert group for technical advice on organic production
EIP-AGRI	European Innovation Partnership for Agricultural productivity and Sustainability
EIT	European Institute of Innovation & Technology
ENRD	European Network for Rural Development
EO	Earth Observation
EOSC	European Open Science Cloud
ERA	European Research Area
ESA	European Space Agency
ESP	European Soil Partnership
EU	European Union
F2f	Farm2fork
FAIR	Findable, Accessible, Interoperable, Reusable
FAS	Farm Advisory systems

FLW	Food Loss and Waste
FPR	Fertilising Products Regulation
GD	Green Deal
GD-SO	Green Deal Supporting Office
HRI	Harmonised Risk Indicator
IAB	Industry Advisory Board (PestNu's advisory board)
ICT	information and communications technology
INM	Integrated Nutrient Management
IoT	Internet of Things
IPM	Integrated Pest Management
KIC	knowledge & innovation communities
MoU	memorandum of understanding
MS	Member States
NODU	Number of Dose Unit
NRN	National Rural Network
OGs	Operational Groups
PESTLE	Political, Economic, Social, Technical, Legal, Environmental
PPP	Plant protection products
Q	questionnaire
REACH	Registration, Evaluation, Authorisation and Restriction of Chemicals
RT	Roundtable
SCAR	Standing Committee on Agricultural Research
SEVT	Federation of Hellenic Food industries
SFS	sustainable food systems
SME	Small and medium-sized enterprises
T	Task
TFI	Treatment Frequency Index
UVC	ultraviolet C
WP	Work Package
Y	Year

## Executive Summary

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This document is the initial report of Task 7.2 which aims to coordinate synergies with policy makers and operational groups. The main purpose is to achieve an increase in awareness among policy makers of the selected innovative systemic solutions, of their potential and of the requirements to promote and realise their uptake at EU scale and encourage behavioural change. It summarizes the work done up to M12 for such intention, namely that in collaboration with EC services at national level by the consortium. It also compiles relevant evidence aiming at bringing knowledge to such actors, gathered during events promoted by the PestNu consortium and others that were attended. Moreover, it aims at being a useful tool for the consortium to keep up the work foreseen in T7.2.

Lastly, by being a public deliverable reaching also the relevant stakeholders captured by the PestNu project, the deliverable intends at contributing to reaching other expected impacts of the PestNu project, namely the building of an evidence base to better understand the driving factors beyond the various threats to the enforcement of current European policies, the associated risks and enhance access to relevant information with the aim of increasing collaboration and policy coordination among the partners countries.

This document contains, thus, information on:

- Relevant points highlighted by PestNu partners and emerging from PestNu activities asking for coordination with policy makers and operational groups.
- Current relevant instruments at EU level, namely policies, operational groups and relevant actors (non-exhaustive recall) aiming at providing an up-to-date situation on these tools, their crossing points or relevant actions & initiatives relevant for PestNu.
- Main findings of PestNu consortium up to M12 during its activities and targeted actions, namely aspects found relevant to be reported and shared with policy makers and operational groups.
- Recommendations for PestNu, other projects and also policy makers and operational groups to build upon further actions.

This deliverable will be formally updated at M36. It will be complemented by a set of 10 practice abstracts at M18 and another 20 practice abstracts at M36, which will be delivered through the EIP-AGRI platforms for feeding knowledge all along the Farm 2 Fork chain of value.

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# 1. Introduction

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## 1.1. PestNu project overview

Coordination with policy makers and operational groups is a relevant part of an effective Communication, Dissemination & Exploitation strategy for every project<sup>1,2</sup>.

On one hand, it feeds exploitation of results, namely those usually regarded as intangible, thus allowing to make the most out of not only the work and effort of the consortia (contributing to scientific and technical excellence) but also of the related investment (in this case mostly public).

On the other hand, these activities promote projects' engaging in a two-way exchange with its circumambient contributing for continuous adjustment of innovations and research results, identification of further continuity opportunities and to target key exploitable results value and broader impacts.

For a project like PestNu, aimed at the deployment of useful tools for enforcing a all-new set of European policies such as the [EU Green Deal](#) and the [Farm2Fork Strategy](#) these activities are important for the consortium as they are expected to influence the way results can be exploited and the success of activities. Alike, the Project constitutes a useful tool for feeding these same policies and the definition of the framework for its implementation in reality.

[PestNu](#) is a European funded Horizon 2020 Green Deal three-year project (Oct 21-Sep 24) which aims to revolutionize digital technologies and organic farming practices, in order to reduce the dependence on hazardous pesticides and the losses of nutrients of the fertilizers, towards zero pollution of water, soil and air and ultimately fertilizer use, and increase food safety and affordability for all. PestNu uses Digital and Space Technologies (DST) along with Agroecological and Organic Practices (AOP) in systemic innovation under circular economy along the farm to fork food production chain. PestNu is field testing and demonstrating its systemic innovation solutions in aquaponics, closed/semi closed hydroponic greenhouses, and in open field vegetable cultivation, under different conditions, soils and crops (tomato, cucumber, pepper and lettuce).

The consortium brings novel developed DST including AI (artificial intelligence) robotic traps for real time pest monitoring (mainly insects); Autonomous self-navigating robots for pesticide monitoring (fungal diseases, insects) and 3D spot spraying; ESA next-generation Earth Observation (EO) missions with robust Agroradar AI algorithms to map agricultural anomalies through smart sampling and

*"There's a close link between dissemination and exploitation. Dissemination (sharing research results with potential users) ... feeds into exploitation (using results for commercial purposes or in public policymaking)..." - Horizon2020 online manual older version (Dissemination & Exploitation of Results)*

*"Successful D&E activities can pave the way to various tangible benefits:(...) Contributing to societal goals; In the case of policy impact, improving current and/or help shaping future legislation."*  
Funding & Tender Opportunities Online Manual (Annex How to make full use of the results of your Horizon 2020 project)

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<sup>1</sup> European Commission, Directorate-General for Research and Innovation, [Communicating EU Research & Innovation : a guide for project participants](#), Publications Office, Version 1.0, 2014,

<sup>2</sup> European Commission, Directorate-General for Research and Innovation, Funding and tender opportunities online manual, Dissemination & exploitation of project results, [Successful dissemination and exploitation \(D&E\): How to make full use of the results of your Horizon 2020 project](#), 2021

differentiated management using Copernicus programme data/services; and robust in-situ and real-time digital UVC nutrient analysers.

All the DSTs will be interconnected through a robust Decision Support System (DSS) intended for Integrated Pest Management (IPM) and Integrated Nutrient Management (INM). The DSS will integrate Blockchain for DST data evidence, integrity and analytical models for decision making and support and cybersecurity to prevent cyber-attacks and vulnerabilities.

The AOPs consist of on-site production of a biofertilizers under a circular economy approach, including an automated system for the treatment of agricultural wastewaters via an innovative enzymatic hydrolysis procedure and the production of a microalgae based biofertilizer, and also of the production of a novel foliar biopesticide against fungal agents and with nutritional effect from agroindustries biowastes and co-products. Advanced nutritional programs for organic farming alongside the new PestNu bio-products will be field tested.

## 1.2. Purpose and scope of this deliverable

The main purpose of Task 7.2 is to coordinate synergies with policy makers and operational groups for sharing identified barriers to the adoption of existing policies and guidelines. Additionally, T7.2 aims at the identification of the incentives which could encourage EU farmers to adopt those guidelines as well as IPM and INM and, for instance, to what extent should public money be used, in order to promote the adoption of emerging technologies, aiming to reduce the dependence on hazardous pesticides and the losses of nutrients of the fertilizers and increase food safety and affordability for all.

Under this task, the involved partners aim to identify how the applied research and activities of PestNu project could be used, in order to support policy makers to build upon the regulatory frameworks and opportunities at EU and country level. Another group that could be supported, would be the policy supervisors and control entities, in areas different than policy making. Additionally, T7.2 aims to support the establishment of best practices and new regulation, international codes and directives on DST and AOP innovations in the agriculture and agri-food sector and go far beyond the current legislations on organic farming, pesticides and fertilisers use.

This deliverable presents the synergies of PestNu with policy makers and operational groups up to M12 for such intention, namely those in collaboration with EC services at national level by the consortium. It also compiles relevant evidence aiming at bringing knowledge to such actors, gathered during events promoted by the PestNu consortium and others that were attended. Moreover, it aims at being a useful tool for the consortium to keep up the work foreseen in T7.2. The main purpose is to achieve an increase in awareness among policy makers of the selected innovative systemic solutions, their potential and requirements needed to promote and realise their uptake at EU scale and behavioural change.

Lastly, the fact that it is a public deliverable provides support in reaching the relevant stakeholders captured by the PestNu project. The deliverable intends on contributing to reaching other expected impacts of PestNu project, namely the building of an evidence base to better understand the driving factors beyond the various threats to the enforcement of current European policies, the associated risks and enhance access to relevant information with the aim of increasing collaboration and policy coordination among the partners countries.

This deliverable will be formally updated at M36 and will be complemented by a set of 10 practice abstracts at M18 and another 20 practice abstracts at M36 that will be delivered through the EIP-AGRI platforms for feeding knowledge all along the Farm2fork (F2f) chain of value.

### 1.3. Methodology

PestNu approach for T7.2 in Year 1 (Y1) of the project's duration has comprised the mapping of relevant situations and aspects affecting its innovations development and uptake and which are not being properly supported by policies, regulations and other framework tools, and that may care for synergic actions towards change within the scope of the project's goal and partner's expertise.

In addition to the gathering of relevant background issues and opportunities within the partners of PestNu consortium (also further explored in detail under T1.2 and deliverable D1.3), to support the building of knowledge on this area PestNu partners have participated in several conferences, webinars and events (Table 1) where policy, regulatory and other framework issues were addressed such as the opportunities, barriers and challenges to knowledge transfer to farmers.

Table 1 – Events attended by PestNu partners for building up knowledge for Task 7.2 (addressing policy, regulatory and other framework issues such as the opportunities, barriers and challenges to knowledge transfer to farmers)

Date	Location	Title and link to info	PestNu partner attending
Oct 2021	Online	<a href="#">Farm to Fork Conference – Building Sustainable food systems together</a>	CERTH
Nov 2021	Greece	<a href="#">AgriBusiness Thessaly Summit 2021, “The Future of Thessaly plain in the digital era”</a>	UTH
Dec 2021	Online	<a href="#">EIP-AGRI workshop Farm data for better farm performance</a>	GLOBAL 2000
Jan 2022	Online	<a href="#">EURACTIV’s event on Farm to Fork Strategy – What are the policy instruments needed to reach the targets?</a>	APEMETA
Feb 2022	online	<a href="#">Best4Soil conference</a>	GLOBAL 2000
Feb 2022	online	<a href="#">EU Industry Days panel Greening Your Plate: Towards a More Sustainable Agri-food Ecosystem with the EU Code of Conduct</a>	APEMETA
Feb 2022	online	<a href="#">Forum for the Future of Agriculture Annual Conference 2022</a>	APEMETA
Feb 2022	Italy	<a href="#">ReThink Circular Economic Forum</a>	STAMTECH
Mar 2022	Online	<a href="#">The Circular Economy Stakeholder Conference</a>	STAMTECH
Mar 2022	Online	<a href="#">Forum For Agriculture post event - The True Cost of Food – from shifting markets to informing policy</a>	APEMETA
Mai 2022	Portugal	<a href="#">DGAV’s event for celebrating the International Plant Health Day</a>	APEMETA
Jun 2022	France	<a href="#">INRAE’s Workshop “Pesticides and Agriculture: What are urgent research needs to move towards a pesticide free agriculture?”</a>	CERTH
Jun 2022	Online	<a href="#">EURACTIV’s event on “Shaping the CAP - How to ensure food security and green ambitions in times of crisis”</a>	APEMETA
Jun 2022	Online	<a href="#">LFI Farminar "Innovation Farm Days LIVE"</a>	GLOBAL

Jun 2022	Online	<a href="#">i2connect 2nd Regional AKIS Stakeholders Workshop: Southern Europe</a>	APEMETA
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This led to the need of identifying and listing of relevant EU instruments under/with which each action could be coordinated. Also, based on those, relevant entities in terms of the consortium's scope and geographical area, were identified (along with sister and other relevant EU research projects also for fulfilling other WP7 goals).

This ground work resultsthen to target and establish different types of synergies, as already foreseen in the DoA, for exploring/establishing relevant interactions for achieving the goals set for task 7.2, namely via

- Collaboration and involvement with EC services and events (ex: the online meeting of the Food Working Group, promoted by the Green Deal Supporting Office)
- Advisory Board
- Questionnaires to target groups (practitioners, institutions and citizens)
- Direct meetings (ex: with DG-AGRI)
- PestNu national workshops (Portugal, Spain , UK and Sweden)
- Clustering events with sister projects (ex: Clustering event promoted by PestNu in July 2022)

## 1.4. Document structure

Following this introduction, Section 2 provides an overview of what was found to be relevant by PestNu partners and could be addressed in/by PestNu efforts under WP7 activities, namely those foreseen in T7.2 of coordination with policy makers and operational groups. Sections 3 and 4 provide a non-exhaustive snapshot of the relevant instruments at EU level, namely policies, operational groups and relevant actors, aiming at providing a systematized and up-to-date situation on these tools, their crossing points or relevant actions & initiatives that PestNu could build upon further actions. Section 5 presents the actions and activities conducted by PestNu consortium during the first year of the project, and lists the main findings relevant for the purpose of this deliverable. Finally, Section 6 summarizes the main conclusions and displays some recommendations.

## 2. Background issues and opportunities identified in PestNu

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Some relevant points and aspects were found to be relevant by PestNu partners to be reported and/or addressed in/by PestNu efforts under WP7 activities, namely T7.2, of coordination with policy makers and operational groups.

Taking into account the “main areas” covered by PestNu activities – DSTs, AOPs and circular economy - a mapping is presented of relevant situations and aspects affecting PestNu’s innovations development and uptake and which are not being properly supported by policies, regulations and other framework tools, and that may care for action and change within the scope of the project’s goal and partner’s expertise.

### 2.1. Agriculture 4.0 (regarding the reduction of pesticides/fertilisers)

#### 2.1.1. Data sharing mechanisms are needed

The development and enhancement of new precision tools, such as artificial intelligence traps, robots, IoT, drones, path the way for a more efficient farm process, resulting lower preservation cost, improving soil and water quality, reducing the use of fertilisers and pesticides and GHG emissions, improving well-being, and creating a healthier environment for humans and animals.

A fundamental role in the development of the aforementioned ICT tools, plays the data, which originate from multiple sources including sensing platforms, weather forecasting services, market prices and especially from Internet of Things (IoT) sources that gather data directly from the field through sensing devices and connected machines. A new meta is created where business models for agriculture are data-driven, and data sharing is more important than ever to fully exploit the secret value of data for the benefit of agriculture.

To that aid, sharing data that are bound to a specific task (for example an image dataset for object detection), can be of dual importance, not only encouraging competitiveness into better performance, but assuring bias-free models. It is important to note that data sharing includes disclosure to private information. Another aspect of information exchange is the dissemination and exploitation of results. The development of ways to stay informed about relevant works and activities to maximize synergies and make sure results are shared among all stakeholders is of great importance.

However, one of the main restrictions for data sharing among institutions, farmers, advisers and researchers is due to non-standard software and data formatting solutions. The challenge is to properly manage the large data that are acquired by different sensors, and to enable data to be shared easily, irrespective of the sensor model and brand used. As data infiltrate more and more into the agriculture sector, data sharing and interconnectivity strategies are urgently needed.

The main mechanism that handles all the data collected is the Decision Support System (DSS) that constitutes a Farm Management System that not only handles the input (data), but provides

recommendations and best practices to agriculture for efficient decisions and actions, including summaries, predictions, and data and visual analytics. Although DSS have the potential to integrate a unified solution to the aforementioned issues, they appear to have limitations. It is difficult to stimulate farmers to use DSSs as it has been noticed that farmers have different expectations of decision-making tools depending on their farming styles and usual practices due to the fact that researchers focus on specific missions rather than create a global tool more holistic and integrate at least a group of pests (fungi, bacteria and insects). The function of DSSs requires accurate assessments within a field as input data; however, capturing the data can be problematic. On top of that, the lack of constant support due to various reasons (company out of business), widens the gap between technology and farmers. Last but not least, DSS tend to be expensive to develop and maintain, requiring enormous amount of time and money.

### **2.1.2. Easy pathways for assessing farmers need and requirements**

Most European projects that are funded via public resources are performed by research institutes and universities. Most of them are really interesting but are far from the real situation of the primary production sector. Applied research activities that are connected to the agricultural sector and to real farms need to be boosted.

The creation and development of robust agricultural tools relies on the mutual cooperation of both parties: research institutes or academia and farmers and their consultants. Constant feedback is mandatory to gain the best possible outcome during and after the development of the system to properly assess the farmers' needs and requirements and facilitate important pathways. Moreover, DSS must ensure that it is user friendly and easy due to the fact that every day people make use of it on a daily basis otherwise time will go against the targets, as mentioned in 2.1.1.

### **2.1.3. Space for innovative recognition mechanisms for food productivity**

Research in agriculture plays an important role in boosting food productivity to meet the increasing demands via introducing new technologies, inputs, and techniques. To the goal of tool availability, constant research is a one-way road to achieve the target goals. Moreover, research can be a succour not only for collaboration under a common framework, but for awakening the small and medium-sized farms and availability as well.

It would be nice to see a kind of certification entering the agriculture domain when it comes to robotics. For example, a bio certification that a certain number of pesticides have been used for this specific crop, since it was done automatically through the robot and thus easily verified about the quantity.

## **2.2. Pesticides free agriculture & Organic Farming**

### **2.2.1. The “no soil” condition affects aquaponics & hydroponics success**

Plants not naturally growing in water produced through hydroponics & aquaponics systems cannot be certified as organic, according to point 1.2. of Part 1 of Annex II of Regulation (EU) 2018/848. On the other hand, the use of aquaponics systems for producing aquaculture animals is not prohibited by



Regulation (EU) 2018/848. Therefore, the production of fish in facilities using aquaponics systems could be considered as organic only when done in compliance with the production rules set out in Part 3 of Annex II of Regulation (EU) No 2018/848.

This “no soil” condition stated in the EU organics legislation, is an important barrier for increasing sustainable food production through novel food production systems such as hydroponics and aquaponics. As reviewed elsewhere<sup>3</sup> the global food industry searches for more sustainable and accessible systems for the production of healthy food, particularly fresh vegetables and fruit and being hydroponics and aquaponics techniques that maximise output and minimise the use of resources (space, soil and water) they emerge as the best candidates to address this problem. In Europe the reputation of aquaponics as a sustainable food production system has increasingly improved greatly due to European Parliament and European Commission efforts.

However regulative barriers such as this one hinder product marketability, profit increase and replication of these novel approaches. Moreover, they bias competition as this reality is not shared by countries like USA and Canada, where hydroponic/aquaponic products can be certified as organic.

Although modifications for fitting the EU legal framework, like the use of soil in the hydroponic section, could be done in the future it could be worthy to explore, within PestNu activities, this barrier and to what extent it could be overcome in the near future. This could include debating it with other research projects, innovation groups, associations, consumer associations and with EC services.

### 2.2.2. The restrictive rules of N application [on the Mar Menor Region (Spain)]

Tests already performed under PestNu activities reveal difficulties in adapting fertilization plans to the new restrictions on application of nutrients for the Mar Menor region in Spain (new regulation<sup>4</sup> stricter than most European EU countries) and this is a problem to the availability of N, especially for pepper, where worst results were observed (compared to tomato) in PestNu experiments. Fertinagro has performed metagenomic analysis to see if something happened on soil biodiversity that is blocking those nutrients, and results are expected to shed some light on the possible causes by M18.

In PestNu we are developing nutritional programs that will combine different organic products including organic fertilizers and biostimulants to face this problematic, specially to fulfil with the most restrictive regulation existing in Europe. The challenge is to reduce the application of fertilizing units (mainly N, P K) having the same yields of productions and maintaining (or even increasing) the quality of the products, by a completely organic approach. In this first experience we have seen that some difficulties appeared, especially for nutritionally demanding crops such as pepper (not for tomatoes), and in the coming months a less demanding crop will be tested, lettuce, where we expect not to see any nutritional problem due to lack of nutrients on the crop. This situation shows us that products based on biostimulants are very important to face the difficulties of restriction in the use of nutrients.

However, such a restrictive regulation can induce big problems in production fields, especially those of organic farming. This was the first test done, so it was useful to see what things need to be changed.

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<sup>3</sup> Fruscella, L., Kotzen, B. and Milliken, S. (2021), [Organic aquaponics in the European Union: towards sustainable farming practices in the framework of the new EU regulation](#). Rev. Aquacult., 13: 1661-1682.

<sup>4</sup> [Ley 3/2020, de 27 de julio](#), de recuperación y protección del Mar Menor



### 2.2.3. The harmonised risks indicators assessment may not fit organic food production systems

Under the Commission Directive (EU) 2019/782, recently adopted, Harmonised Risk Indicators (HRI) are used to estimate the trends in risk from pesticide use.

The Harmonizing Factor 1 is used as the main tool to evaluate the progress in reaching the goal of the reduction of pesticides. However, HRI-1 shows a reduction in risk mainly due to a decrease in sales of pesticide active ingredients that are no longer approved, rather than an actual decrease in pesticide use. In addition, a PestNu partner's [press release](#) (GLOBAL 2000) points out that the HRI-1 systematically overestimates the risk of natural substances used in organic agriculture compared to synthetic substances. The HRI-1 attributes exactly the same risk to one kilogram of silica sand - just enough to protect five trees from deer browsing - as to one kilogram of a pyrethroid insecticide - enough for 200 acres (!) to kill every living insect."

Information on how much pesticides are used in agriculture is needed to be able to monitor if there is a decrease in there. For instance, the Treatment Frequency Index (TFI) established in Denmark and the Number of Dose Unit (NODU) used in France are considered to be well suited to depict the intensity of pesticide use in the areas. Moreover, they already allow an estimation of the burden on the environment. The progress measurement for the EU regulation could be based on these indicators.

Problems of the HR-1:

- It uses the sales figures instead of the amount of the actually used pesticides.
- It measures the decline in sales of pesticide active ingredients that are no longer approved, rather than an actual decline in pesticide use.
- It does not differentiate between synthetic active ingredients and naturally occurring active ingredients.
- It establishes causality between the amount of pesticide applied and the resulting risk, while largely ignoring existing differences in toxicity and area that is treated.
- The HRI-1 is particularly discriminatory against organic agriculture, where synthetic pesticides are banned and only substances found in nature may be used as a last resort after preventive crop protection measures. With the biased methodology of the HRI-1, any conversion from conventional to organic agriculture would be portrayed as an increase in risks from pesticide use, not corresponding to the truth.

## 2.3. Circular economy

### 2.3.1. Very long time to market for new bioproducts

The protocols to develop a new fertilizer or biostimulant based in new substances or microorganisms is long and expensive (for example, REACH regulation). We need to have easier procedures and legislations that help to put new products in the market.

Concerning both, fertilizers and pesticides, the procedures to accept a new molecules, substance or microorganism to be used as fertilizer or pesticide for biocontrol are too long and expensive. The

administrative procedures can take up to 8-10 years for substances to be used as pesticides and many times, the companies decide not to put the effort on them because of the "difficulties" on that, as they have to spend a lot of money, time and skilled staff with the risk that, after 10 years, it may not be profitable.

### **2.3.2. Connecting the chain and facilitating (food) waste usage as raw material is need**

For waste producers (like retailers that are food waste producers) the most significant problem is the availability of specific companies to utilize specific types of waste like those of plant origin (fruits, vegetables, cereals and their products). This needs local solutions to overcome transportation and stability issues and costs.

On the other hand, for producers of new bioproducts (like biofertilizers and biostimulants) the main issue is the recovery of waste and being able to use it. For example, for vegetable residues there is no problem, but for products derived from animals, specific regulations need to be fulfilled. Mainly the one on animal by-products not intended for human consumption. There is actually technology that allows to avoid hazardous molecules and others, but they are not included in the actual regulations. In contrast, and for the specific application of new biofertilizers and biostimulants production there is concern about the quality of incoming wastes, regarding for instance the presence of pesticides or chemicals that could interfere with the new products. Emerging techniques like multi-residual analysis have already allowed PestNu partners, namely Fertinagro, to detect, sometimes, pesticides that are not allowed in the EU and even at high rates. These are used as decision support system for electing waste streams as raw materials under a Circular Economy.

Thus, tools that can facilitate connecting the actors and increase knowledge of waste are important for making circular economy approaches more common within industry.

### 3. Overview of relevant related EU instruments

In line with the [EU Green Deal](#) and the [Farm2Fork Strategy](#) there are several political, regulatory and operational EU instruments that were found relevant for PestNu. Thus, a systematic overview of the current stage surrounding these instruments was performed and is presented, highlighting relevant aspects in which they intersect the activities/objectives of the project and identifying relevant points for actions & initiatives for PestNu to build upon further coordination activities. It should be stressed that this is a non-exhaustive list, mainly based upon what was brought to our knowledge in events the consortium has attended or in the several synergic actions performed and reported later on this report. Whereas the first set of 6 refer to already in force the remaining shed light on emerging initiatives.

#### 3.1. Common Agriculture Policy (CAP)

##### Brief overview

The CAP is focused on consolidating the role of European agriculture for the future, and the most recent efforts outlined a simpler and more efficient policy that will incorporate the sustainable ambitions of the European Green Deal and act as a key tool in reaching the ambitions of the F2f and Biodiversity strategies. The legislative proposals were negotiated between 2018-2020 and the new CAP was formally adopted on 2 December, 2021 and is due to be implemented from 1 January 2023. For assuring its implementation EU Member States (MS) have designed national [CAP strategic plans](#), combining funding for income support, rural development, and market measures. During 2021/2022 a transitional regulation is in force, extending most of the CAP rules that were in place during the 2014-2020 period, while also ensuring a smooth transition to the future framework of the CAP strategic plans. Figure 1 gives a schematic overview of the CAP development timeline.

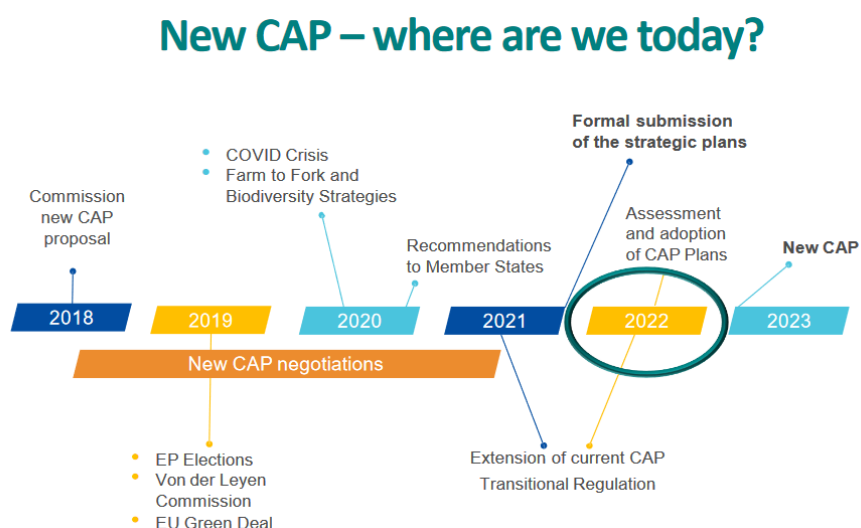


Figure 1 – Schematic overview of the new CAP development timeline

The New CAP will seek to ensure a sustainable future for European farmers, provide more targeted support to smaller farms, and allow greater flexibility for EU countries to adapt measures to local conditions addressing 10 specific objectives:

- It discusses which combination of measures are needed to support viable farm income and the resilience of the agricultural sector across the EU, in order to enhance long-term food security and agricultural diversity, as well as to ensure the economic sustainability of agricultural production.
- To increase competitiveness, it outlines a number of drivers and policy tools that are available to trigger productivity gains in EU agriculture, such as research and innovation programs, new technologies, rural development and infrastructure, efficient advisory systems and continuous training for farm managers.
- To improve the position of farmers in the food chain by strengthening the cooperation among them, increasing market transparency and ensuring effective mechanisms against unfair trading practices.
- It examines the role that agriculture can play to climate change mitigation and adaptation, including by reducing greenhouse gas emissions and enhancing carbon sequestration, as well as promoting sustainable energy through new farm and soil management techniques. Additionally, it explores the risk that climate change poses to agriculture.
- For fostering environmental care, namely sustainable development and efficient management of natural resources such as water, soil and air, including by reducing chemical dependency, examining concerns related to soil health and highlighting the importance of policies which promote soil protection.
- In order to contribute to halting and reversing biodiversity loss, enhance ecosystem services and preserve habitats and landscapes, it addresses the topic of biodiversity within the EU, with a particular focus on its links to farmed landscapes and landscape features, recounting some of the changes needed in the farm sector and (CAP) tools currently available, while leaving it open about how the CAP should be developed in the future.
- To support generational renewal, namely by attracting and sustaining young farmers and new farmers and facilitating sustainable business development in rural areas, it identifies the challenges and needs of young farmers and outlines a more targeted system of support, based on needs assessment and more quantifiable expected results.
- For promoting vibrant rural areas, it addresses employment, growth, gender equality, including the participation of women in farming, social inclusion and local development in rural areas, as well as the circular bio-economy and sustainable forestry through income support and rural development spending.
- To protect food and health quality, namely high-quality, safe and nutritious food produced in a sustainable way; reduction of food waste, improvement of animal welfare and combat to antimicrobial resistance.
- To modernise agriculture and rural areas through fostering and sharing knowledge, innovation and digitalisation, and by encouraging their uptake by farmers through improved access to research, innovation, knowledge exchange and training.

Advancing research, knowledge-sharing, and innovation will, therefore, be essential for securing a smart and sustainable agricultural sector. The reformed CAP will benefit from increased investment for that, incorporating stronger agricultural knowledge and innovation systems (AKIS) to boost the development of innovation projects, disseminate their results, and encourage their use as widely as possible. Farm advisory services will be a key tool in sharing new knowledge and ideas.

Each CAP strategic plan will include a section on how to stimulate the exchange of knowledge and innovation & the development of digital technologies in agriculture. Advice, training, innovation and knowledge support are also foreseen in/for Rural Development. According to EIP-AGRI, this will help advisors to become more competent on economic, environmental and social issues, more up-to-date regarding knowledge and innovation and also bring researchers more closely involved in the AKIS and (inter)acting on farmers' needs, and to be rewarded to do so. Member States CAP networks will have tasks and objectives such as:

- Provide for more learning & knowledge exchange among MS.
- Be more active on linkages between Operational Groups (OG) and the Horizon Europe projects: to capture the results and added value of the policy at European level.
- Fostering innovation (support to OGs) and supporting the inclusion of all stakeholders in the knowledge- exchange and knowledge-building process.

Key contributors to the CAP include civil dialogue groups and agricultural committees (see Section 4) to best shape law and policies governing agriculture.

### Relevant or crossing points for PestNu

- Key objectives focused on
  - increasing competitiveness by fostering increased productivity through new technologies, advisory systems and training of farmers,
  - strengthening of cooperation among farmers,
  - promoting new farm and soil management techniques.
  - reducing chemical dependency and promote soil protection
  - high-quality, safe and nutritious food produced in a sustainable way; alongside with reduction of food waste;
  - modernisation of agriculture and rural areas through fostering and sharing knowledge, innovation and digitalisation, and by encouraging their uptake by farmers through improved access to research, innovation, knowledge exchange and training
- Current structuring of MS CAP Strategic Plans
- Strengthening of CAP networks, Farm Advisory Systems, AKIS and EIP-AGRI OGs for promoting exchange of knowledge and innovation & the development of digital technologies

### Relevant actions & initiatives for PestNu to build upon

- MS CAP Strategic Plans
- CAP Networks
- Farm Advisory Systems
- The Agricultural Knowledge and Innovation Systems (AKIS)
- EIP-AGRI projects

### More information

[The common agricultural policy at a glance](#)

[The new common agricultural policy: 2023-27](#)

[CAP strategic plans](#)

[Key contributors to the CAP](#)

## 3.2. Organic farming legal rules

### Brief overview

Organic farming is a fast-growing area in EU agriculture, which is a direct result of increased consumer interest in organic products. In response to the challenges posed by this rapid expansion, and in order to provide an effective legal framework for the industry, the EU passed new legislation related to the organic sector which applies from 1 January 2022. Since then, [Regulation \(EU\) 2018/848](#) of the European Parliament and of the Council of 30 May 2018 is the applicable legislative act, also known as the basic act, laying down the rules on organic production and labelling of organic products, repealing and replacing Council Regulation (EC) No 834/2007 of 28 June 2007.

Examples of the changes that were made under the new organic legislation include:

- production rules are simplified through the phasing out of a number of exceptions and opt outs;
- the control system is strengthened thanks to tighter precautionary measures and robust checks along the entire supply chain;
- producers in third countries will have to comply with the same set of rules as those producing in the EU;
- organic rules cover a wider list of products (e.g., salts, cork, beeswax, wool, etc) and have additional production rules (e.g., deer, rabbits and poultry);
- certification will be easier for small farmers thanks to a new system of group certification;
- there will be a more uniform approach to reducing the risk of accidental contamination from pesticides.

The new organic legislation is supported by the action plan for organic production in the EU (see the next subchapter), launched in March 2021.

When implementing or preparing legislation in this field the EC is backed up through [cooperation and expert advice](#), namely the Expert group for technical advice on organic production (EGTOP), the committee on organic production and the civil dialogue group.

EU organic farming rules cover agricultural products and encompass every stage of the production process. There are specific rules for plants, livestock, processed food and wine, yeast, aquaculture and hydroponics and more. These regulations are based on a number of key principles, among which are (relevant for PestNu) the:

- limiting the use of artificial fertilisers, herbicides and pesticides, along with the need for pest monitoring;
- non recognition of hydroponic production as organic due to the absence of soil;

Of relevance is the principle under which *Organic production privileges techniques which do not involve the use of plant protection products, being the use of certain products allowed if such techniques do not provide adequate protection and only if those plant protection products have been authorized in accordance with the Regulation (EC) No 1107/2009, after having been assessed and found to be compatible with the objectives and principles of organic production, including where those products have been authorised subject to restrictive conditions of use, and consequently have been authorised in*

accordance with this Regulation. Recently, this Regulation (EC) No 1107/2009 that frames, among others, the marketing of products intended for plant protection in organic farming has been amended by the EU Regulation 2019/1009 on fertilizing materials and biostimulants (addressed in Section 3.5).

### Relevant or crossing points for PestNu

- Some PestNu innovations suit the new regulation, namely those focusing on pest monitoring.
- Eventually new bioproducts (if authorized) given the legal frame given by Regulation (EC) No 1107/2009 and also Regulation (EU) 2019/1009
- EU rules do not allow for plants grown hydroponically to be marketed as organic except when they grow naturally in water. This is because organic production is only possible when plants are grown naturally in soil. This also applies to plants that are grown in an aquaponics system.

### Relevant actions & initiatives for PestNu to build upon

- Revision of organic farming rules, work of experts?
- Organic Action Plan (?)
- [EIP-AGRI actions on organic farming](#)

### More information

[EU Organics at a glance](#)

[EU Organic production and products](#)

[EU legislation for the organics sector](#)

[Cooperation and expert advice](#)

## 3.3. Organic action plan

### Brief overview

A sustainable food system is at the heart of the European Green Deal. Under the Green Deal's Farm to Fork strategy, the European Commission has set a target of 'at least 25% of the EU's agricultural land under organic farming and a significant increase in organic aquaculture by 2030'. To achieve this target and to help the organics sector reach its full potential, the Commission is putting forward an action plan for organic production in the EU.

The Action Plan [[COM \(2021\) 141](#)] is broken into three interlinked axes that reflect the structure of the food supply chain and the Green Deal's sustainability objectives.

**Axis 1:** stimulate demand and ensure consumer trust.

**Axis 2:** stimulate conversion and reinforce the entire value chain.

**Axis 3:** organics leading by example: improve the contribution of organic farming to environmental sustainability.

The three axes will be supported by 23 actions, continuing some of the successful 2014-20 actions, as well as putting forward an array of new actions and mobilising different sources of funding.

## Relevant or crossing points for PestNu

Axis 1: To support continued growth and maintain a profitable market for organic operators, the Commission will undertake actions to:

- improve traceability, namely (action 7) *in synergy with the work on digital product passports, assess to what extent the traceability of organic products could benefit from blockchain or other digital technologies and envisage, in a second step, a pilot project with stakeholders. These steps will be supplemented by actions under Horizon Europe on the use of blockchain technologies in the agri-food sector as well as other targeted research & innovation actions aimed at developing innovative solutions to trace organic food.*
- facilitate the contribution of the private sector, namely (action 8) *with the objective of reinforcing the role of retailers, wholesalers, catering services, restaurants and their businesses, the Commission will, (action 8.1) aiming at obtaining clear commitments from relevant stakeholders to support and increase the distribution and sale of organic products, in the context of the Farm to Fork strategy's code of conduct for responsible business and marketing practices, and disseminate best practices in relevant platforms like the Circular Economy Stakeholder Platform; and (action 8.2) establish partnerships with businesses willing to promote the use of organic products as part of their corporate sustainability policy. These measures will be further discussed in the platform for Business and Biodiversity.*

Axis 2: to continue progress in production and processing, the action plan will:

- encourage conversion, investments and exchanges of best practice, namely (action 9.1) *starting in 2023, assess the specific circumstances and needs of Member States regarding the growth of the organic sector, and ensure Member States make the best use of the possibilities offered by the new CAP to support their national organic sector. This support will include technical assistance, the exchange of best practices and innovations in organics, and the full use of relevant CAP instruments such as eco-schemes and rural development environmental management commitments, which include organic farming. Farm advisory services on specific topics will be strengthened, notably as part of Agricultural Knowledge and Innovation System (AKIS), to promote relevant knowledge exchange and (9.2) starting in 2022, promote the exchange of best practices (education and training curricula, courses, materials, etc.) at EU and national level allowing education providers (e.g. technical schools, universities) to develop courses on organic farming as part of the general curriculum and present innovative solutions targeting the organic sector (production, processing, retailing and consumption). EU demonstration farm networks will be set up on specific topics to promote a participatory approach (dissemination). Best practices and synergies with the EIP-AGRI projects will be promoted via the future CAP network;*

Axis 3: The Commission will further improve the organic sector's contribution to sustainability and environmental challenges through actions focused on:

- developing alternatives to contentious inputs and other plant protection products namely by (action 19.2) set up EU demonstration farms networks to promote a participatory approach (dissemination). Best practices and synergies with the EIP-AGRI projects will be promoted via the future CAP network; (19.3) strengthen farm advisory services, notably as part of Agricultural Knowledge and Innovation System (AKIS), to promote knowledge exchange of material suitable for the organic farming; and (20.2) starting in 2022, will, building on the forthcoming regulation



on biopesticides, and via the strengthened farm advisory services, notably AKIS, foster where appropriate the use of alternative plant protection products, such as those containing biological active substances.

- making more efficient use of resources namely (action 23) promote the more efficient and sustainable use of water, the increased use of renewable energy and clean transport, and the reduction of nutrient release, in all types of farming, with organic farming leading the way, and with the involvement of the Member States through their CAP Strategic Plans, as well as with the new Strategic Guidelines for aquaculture and European Maritime, Fisheries and Aquaculture Fund (EMFAF)

### Relevant actions & initiatives for PestNu to build upon

- (Use of blockchain technologies) and innovative solutions to trace organic food
- The EU code of conduct for responsible business and marketing practices (subsection 3.6)
- [Circular Economy Stakeholder Platform](#)
- [Platform for Business and Biodiversity](#)
- The Agricultural Knowledge and Innovation Systems (AKIS) (Section 4)
- Exchange of best practices with education providers to present innovative solutions targeting the organic sector
- EU demonstration farm networks
- EIP-AGRI projects (Section 4)
- New regulation on biopesticides (next subsection)

### More information

[EU Organic action plan](#)

## 3.4. Legal rules for the sustainable use of pesticides

### Brief overview

The background is set by [Directive 2009/128/EC](#) which aims to achieve a sustainable use of pesticides in the EU by reducing the risks and impacts of pesticide use on human health and the environment and promoting the use of Integrated Pest Management (IPM) and of alternative approaches or techniques, such as non-chemical alternatives to pesticides.

EU countries have drawn up [National Action Plans](#) to implement the range of actions set out in the Directive. The main actions relate to training of users, advisors and distributors of pesticides, inspection of pesticide application equipment, the prohibition of aerial spraying, limitation of pesticide use in sensitive areas, and information and awareness raising about pesticide risks.

A cornerstone of the Directive was the promotion of IPM. Along with the promotion of organic farming, IPM is one of the tools used for low-pesticide-input pest management, and IPM must be implemented by all professional users.

- IPM involves an integrated approach to the prevention and/or suppression of organisms harmful to plants through the use of all available information, tools and methods

- IPM aims to keep the use of pesticides and other forms of intervention only to levels that are economically and ecologically justified and which reduce or minimise risk to human health and the environment.
- Sustainable biological, physical and other non-chemical methods must be preferred to chemical methods if they provide satisfactory pest control.

In 2019, [Commission Directive \(EU\) 2019/782](#) was adopted, establishing Harmonised Risk Indicators (HRI) to estimate the trends in risk from pesticide use, as referred to in Directive 2009/128/EC (Article 15 (1)). These indicators measure the progress achieved in meeting objectives at Union level, enabling MS to manage and to report on risk at national level. However, the EC is committed to develop a more sophisticated indicator to show the trend in the risks associated with emergency authorisations. In the future and when data becomes available, it is envisaged to develop additional indicators to facilitate monitoring specific aspects of the Directive 2009/128/EC. These future indicators could be based on organic farming, certification of sufficient knowledge acquired by professional users, and inspection of pesticide application equipment.

Since 22 June 2022, the European Commission has adopted [proposals for a new Regulation on the Sustainable Use of Plant Protection Products](#) (2021/2115), in line with the F2f and Biodiversity strategies and their goals, namely the reduction by 50% of the use and the risk of chemical pesticides by 2030. IPM is also reinforced and there is a ban on all pesticides in sensitive areas. Other key measures include requiring MS to set positive targets to increase the use of non-chemical pest control methods and requiring farmers and other professional users of pesticides to obtain independent advice on alternative methods to ensure greater uptake of non-chemical pest control methods.

The proposal transforms the existing Directive into a Regulation which will be directly binding and uniformly applicable to all MS.

With regard to the placement of plant protection products on the market, namely the approval of new (bio)pesticides, this is ruled by (EU) Regulation No 1107/2009, which has been successively amended towards simplification and received a new impulse recently through the Regulation (EU) 2019/1009 Laying down rules on the making available on the market of EU fertilising products. This topic further explored in the next subchapter.

### Relevant or crossing points for PestNu

- National Action Plans
- IPM
- Targets for non-chemical pest control methods
- HRI calculation methodologies fitting to organic agriculture
- Regulation for the marketing of (new) pesticides

### Relevant actions & initiatives for PestNu to build upon

- Current revisions of National Action Plans
- Best practices, tools, and training for IPM
- HRI definition
- Follow up the advances in regulation of the marketing of new products

## More information

[Sustainable use of pesticides](#)

[National Action Plans](#)

[Integrated Pest Management \(IPM\)](#)

[Harmonised risk indicators](#)

[Farm to Fork: New rules to reduce the risk and use of pesticides in the EU](#)

## 3.5. Regulations on plant protection products – pesticides, fertilizing materials and biostimulants

### Brief overview

In the EU, Plant protection products (PPPs) include both conventional synthetic pesticides and biopesticides and the placing of PPPs on the market involves 2 steps according to Regulation (EU) No 1107/2009 (Figure 1 Figure 2). Firstly, the active substance is evaluated and approved at EU level and will be included in a list of approved substances that are subject to renewal. Secondly, the formulated product is evaluated and authorized at Member State (MS) level, which is only possible if the active substance has been previously approved at the EU level. This process can take minimum, 3 years.

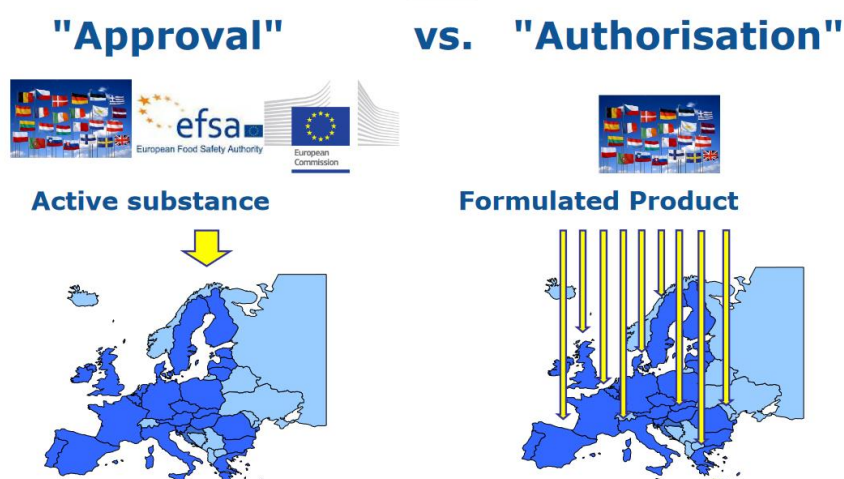


Figure 2 – Main processes involved in the placement of new Plant Protection Products on the market<sup>5</sup>.

Regarding biostimulants and fertilizers since July 2022, [EU Regulation 2019/1009](#) (FPR, Fertilising Products Regulation) is the one enforcing the landscape of the marketing of fertilising materials in the European Union replacing EC Regulation 2003/2003, and in addition to current national MS rules, will define the settings to market fertiliser and plant biostimulant products. Its adoption is part of the [Circular Economy Action Plan](#) and introduces new definitions for fertilizing product and biostimulant. Among novelties, it sets out the requirements for Component Material Categories (CMCs) that can be used for their production. This new regulation also implies MS have to nominate a notifying authority which will be responsible for assessing the conformity of products and coordinate with the different notified bodies within their territory. The [NANDO database](#) lists all the notified bodies for these directives. Besides, an

<sup>5</sup> Klaus Berend, Head of Unit Pesticides and Biocides, DG Health and Food Safety. "[EU Legal framework for pesticides](#)", Global Minor Uses Summit, 1-4 October 2017, Montreal, Canada

amendment of the FPR has been published in October 2021 ([Commission delegated regulation \(EU\) no.2021/1768](#)) to adapt the FPR to technical progress.

Last February 2022, the MS have approved new rules to accelerate the approval and authorisation of biological plant protection products containing microorganisms to reduce reliance on chemical pesticides. The four approved legal acts are expected to come into force by November, are designed to ensure that new biological solutions that can replace chemicals are put on the market “significantly faster”, according to a European Commission statement<sup>6</sup>.

However, and [EU Regulation 2019/1009](#) states exclusion whenever products assume protection functions: *“Products with one or more functions, one of which is covered by the scope of Regulation (EC) No 1107/2009, are plant protection products falling within the scope of that Regulation. Those products should remain under the control developed for such products and provided for by that Regulation. Where such products also have the function of a fertilising product, it would be misleading to provide for their CE marking under this Regulation, since the making available on the market of a plant protection product is contingent on a product authorisation valid in the Member State concerned. Therefore, such products should be excluded from the scope of this Regulation”*

The EU concept of low-risk PPPs focuses on risk, but the nature of the active substance makes a difference for the approval procedure. Currently EU rules include [Commission Regulation \(EU\) No 283/2013](#) setting out the data requirements for active substances and [Commission Regulation \(EU\) No 284/2013](#) setting out the data requirements for plant protection products, and the Commission has set up a working group to assess the data requirements and assessment principles with a view to updating them facilitate the approval of (biological) active substances<sup>7</sup>.

### Relevant or crossing points for PestNu

- The new rules and those being updated.

### Relevant actions & initiatives for PestNu to build upon

- Follow up closely and identify barriers for PestNu products entrance into market.

### More information

[EU Plant Protection Products Regulation](#)

[Current situation and trends of biopesticide regulations in EU](#)

[Status of the Regulation \(EU\) no.2019/1009 on fertilising materials and biostimulants](#)

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<sup>6</sup> EURACTIV news article, 2022, [EU green lights new rules to speed up approval, authorisation of biopesticides](#)

<sup>7</sup> European Court of Auditors, 2020, [Special Report 05/2020: Sustainable use of plant protection products: limited progress in measuring and reducing risks](#)

## 3.6. EU Code of Conduct on Responsible Food Business and marketing

### Brief overview

The EU Code of Conduct on Responsible Food Business and Marketing Practices is one of the first deliverables of the Farm to Fork Strategy and an integral part of its action plan. It sets out the actions that the actors 'between the farm and the fork', such as food processors, food service operators and retailers, can voluntarily commit to undertake to tangibly improve and communicate their sustainability performance. These actions can be directly relevant and implementable within their own operations or may encourage collaboration with industry peers and other food system stakeholders (such as farmers and consumers) to make similar changes. The Code entered into force on July 2021.

It contains a set of 7 aspirational objectives (AO) as voluntary commitments for action together with a monitoring and evaluation framework to measure progress. Each AO has specific targets and a list of indicative, tangible and measurable actions, which actually contribute to a food environment that makes healthy and sustainable food choices easier. Commitments may take the form of a declaration of engagement and actions in major areas, together with an agreement to move towards higher levels of ambition within a defined timeframe.

[Signatories](#) may be European associations, food business operators and other actors in – or related to – food systems which can meaningfully support and/or contribute to the aspirational objectives set out in the Code. The Code is applicable to all activities relating to the production, trade, processing, promotion, distribution and serving of food.

### Relevant or crossing points for PestNu

- AO1 of *Healthy, balanced and sustainable diets for all European consumers, thereby contributing to 2) Reducing the environmental footprint of food consumption by 2030* aims at improve food consumption patterns in the EU by encouraging increased consumption of fruits and vegetables (e.g. by increasing the availability thereof and/or access thereto); or provide/promote more sustainably-produced food products/meals (e.g. sustainably-produced organic food; aquaculture and algae products); or *Provide transparent, voluntary product information to consumers, e.g. through digital means;*
- AO2 of *Prevention and reduction of food loss and waste* aims at *minimising waste and reducing losses in operations and across value chains (e.g., by new product development from co-products or discarded products)*
- AO6 of *Sustainable value creation in the European food supply chain through partnership* aims at *Promoting technology and knowledge transfer (e.g. integrated farming techniques); engaging in joint pre-competitive research and innovation (e.g. co-innovation product/process/technology); boosting the uptake of digital solutions and modern technologies; Promote and support innovation and/or increased use of sustainable agricultural, aquaculture and fisheries practices in partnership with farmers/fishers; Support sustainable use of pesticides and fertilizers whilst contributing to maintaining food security and resilience;*
- AO7 of *Sustainable sourcing in food supply chains* aims at *encouraging the uptake of scientifically-robust sustainability certification schemes for food*

## Relevant actions & initiatives for PestNu to build upon

- Keep up and engage with the Code (PestNu partner SEVT is involved via FoodDrinkEurope).
- Search signatories for potential Advisory Board members.
- Involve partners in The Code.

## More information

[EU Code of Conduct on Responsible Food Business and marketing](#)

## 3.7. Soil Strategy & Soil Health Law

### Brief overview

The [EU soil strategy](#) for 2030 sets out a framework and concrete measures to protect and restore soils, and ensure that they are used sustainably. It sets a vision and objectives to achieve healthy soils by 2050, with concrete actions by 2030.

It also announces a new Soil Health Law by 2023 to ensure a level playing field and a high level of environmental and health protection.

The process for developing a new Soil Health Law has been launched with the publication, in March 2022, of the European Commission's [Call for evidence for an impact assessment](#) for a soil health law. So far it was open for feedback (March 2022) and is now open to [public consultation](#) (October 2022).

### Relevant or crossing points for PestNu

- Key actions of the Soil strategy and how (if) they will frame PestNu innovations focusing on soil:
  - tabling a dedicated legislative proposal on soil health by 2023;
  - making sustainable soil management the new normal, by proposing a scheme for land owners to get their soils tested for free, promoting sustainable soil management through the CAP and sharing best practices;
  - increasing research, data and monitoring on soil;
- (Possibly) Addresses issues found relevant by practitioners that responded to PestNu survey

## Relevant actions & initiatives for PestNu to build upon

- Explore the new Soil Health Law initiative and compare it with points highlighted by the PestNu questionnaire targeting practitioners and set out in D1.1.
- Keep up with the status of new Soil Health Law initiative, engage with public consultation for impact assessment (Deadline 24 October 2022) and access specific needs

## More information

[Soil Strategy](#)

[Soil Health Law](#)

### 3.8. Sustainable EU food system –new initiative

#### Brief overview

The F2f strategy commits the EU to a transition to sustainable food systems and the development of a legislative framework for sustainable food systems (SFS) to enable this to happen.

This initiative aims to make the EU food system sustainable and explores to integrate sustainability into all food-related policies. It will lay down general principles and objectives, together with the requirements and responsibilities of all actors in the EU food system.

More specifically, it will lay down rules on:

- sustainability labelling of food products
- minimum criteria for sustainable public procurement of food
- governance and monitoring

The process for developing a new policy framework has been launched with the publication, in 2021, of the European Commission's [inception impact assessment](#) for a 'Sustainable Food System Framework Initiative'. This sets out four potential governance options comprising the 1) absence of any new EU level policy; 2) one based in voluntary approaches; the 3) reinforcement of existing legislation and 4) the building up of a new comprehensive framework legislation on the sustainability of the EU food system. So far it was open for feedback (October 2021) and public consultation throughout a survey that recently closed (July 2022).

#### Relevant or crossing points for PestNu

- sustainability labelling of food products

#### Relevant actions & initiatives for PestNu to build upon

- Keep up with the status of initiative (so far done by PestNu partner SEVT) and access specific needs
- Explore public consultation results and compare with PestNu questionnaire targeting citizens (many similarities in the questions – what about results?)

#### More information

[Sustainable EU food system –new initiative](#)

Baldock, D. and K. Hart (2021) '[Pathways towards a legislative framework for sustainable food systems in the EU](#)', Institute for European Environmental Policy

### 3.9. Nutrients – action plan for better management

#### Brief overview

Nutrients (nitrogen & phosphorus) are essential for life and important natural resources. Yet nutrient loss leads to air, soil and water pollution, loss of biodiversity and a wide range of climate-change impacts.



Existing EU legislation has helped address this problem in recent decades. However, nutrient pollution and inefficiencies in the nutrient cycle still exist due notably to shortcomings in specific legislation and to significant issues in implementing the legislation. It may also be due to the lack of an integrated approach on nutrient pollution encompassing air, water, soil and climate thus requiring additional action at EU level to improve food security, protect human health and preserve the ecosystem.

The process for developing a new action plan has been launched with the publication, in March 2022, of the European Commission's [Call for evidence for an initiative](#) (without an impact assessment) for an Action Plan for Nutrients management. So far it was open for feedback (April 2022) and public consultation throughout a survey that has recently closed (August 2022).

### Relevant or crossing points for PestNu

- Potential for framework and exploit hydroponics and aquaponics role on sustainable agriculture
- Framework for PestNu innovations focusing on nutrient management
- (Possibly) Addresses issues found relevant by practitioners that responded to PestNu survey

### Relevant actions & initiatives for PestNu to build upon

- Keep up with the status of initiative (so far done by PestNu PCo during [public consultation](#)) and access specific needs.
- Explore public consultation results and compare them with PestNu questionnaire targeting practitioners.

### More information

[Nutrients – action plan for better management](#)

## 3.10. Conversion of farm accountancy data network (FADN) to a Farm Sustainability Data Network (FSDN)

### Brief overview

This initiative will expand the scope of the current network collecting data on EU farms to include data on their environmental and social practices. With this new data collection, it will be possible to benchmark farm performance and give farmers tailored advice and guidance. This will improve the sustainability of farmers, including their incomes, in line with the objectives of the common agricultural policy, the Green Deal and F2f and biodiversity strategies.

The process for developing a regulation has been launched with the publication, in June 2021, of the European Commission's [roadmap](#). The [proposal for regulation](#) was recently opened for feedback until 9 September 2022.

### Relevant or crossing points for PestNu

- Potential for DSS?

### Relevant actions & initiatives for PestNu to build upon



- Keep up with the status of initiative (so far done by PestNu PCo during [feedback](#)) and access specific needs

## More information

[Conversion to a Farm Sustainability Data Network \(FSDN\)](#)

### 3.11. Digital Innovation Hubs

#### Brief overview

European Digital Innovation Hubs (DIH) are part of the Digital Europe Programme and will function as one-stop shops that help companies dynamically respond to the digital challenges and become more competitive. By providing access to technical expertise and experimentation as well as the possibility to 'test before invest', DIH help companies improve business/production processes, products, or services using digital technologies. They also provide innovation services, such as financing advice, training, and skills development that are needed for a successful digital transformation. Environmental issues are also taken into account, in particular with regard to energy consumption and low carbon emissions.

European Digital Innovation Hubs will have both local and European functions. EU funding will be made available for hubs that are already (or will be) supported by their Member States (or regions), in order to increase the impact of public funding. The Digital Europe Programme will increase the capacities of the selected hubs to cover activities with a clear European added value, based on networking among them, and promoting the transfer of expertise. Member States have an essential role in the selection process of the DIH; the initial network of DIH will be established from a list of hubs designated by the Member States. Following the adoption of the Digital Europe Programme work programme, the first restricted call for EDIHs opened on November 17th, 2021, to enable selected DIHs to start their operations towards September 2022.

#### Relevant or crossing points for PestNu

- DIHs focusing on Agriculture and Food (Figure 3)



Figure 3 – Geographical distribution of European DIH focusing on agriculture and food.<sup>8</sup>

## Relevant actions & initiatives for PestNu to build upon

- Accompany evolution in PestNu consortium MS and DIH work focuses and trends for checking concrete crossing and working points
- Events, initiatives and calls

## More information

[European Digital Innovation Hubs](#)

## 3.12. European Partnerships

### Brief overview

European Partnerships bring the European Commission and private and/or public partners together to address some of Europe's most pressing challenges through concerted research and innovation initiatives. They are a key implementation tool of Horizon Europe, and contribute significantly to achieving the EU's political priorities.

Partnerships will

- address complex challenges outlined in Horizon Europe, such as accelerating the transitions towards a society and economy that are climate neutral and circular.
- support the achievement of EU priorities, such as the European Green Deal, a Europe fit for the digital age, an economy that works for people, and a stronger Europe in the world.
- be impact-driven by deploying a broad range of R&I activities, from concept to demonstration and validation, to those supporting market, regulatory and societal uptake.
- contribute to a stronger European Research Area (ERA) by avoiding the duplication of efforts.
- create critical scales of investment and enhance synergies between programmes.

<sup>8</sup> <https://s3platform.jrc.ec.europa.eu/digital-innovation-hubs-tool>

## Relevant or crossing points for PestNu

Regarding the Pillar II - Global challenges & European industrial competitiveness:

Cluster 4 partnerships – the initial list of candidate European Partnerships in Horizon Europe comprise the following in the area of digital, industry and space that are of relevance for PestNu (final proposals were submitted in 2020 and MoU signed in 2021):

- European Partnership for **Key Digital Technologies** for – Flexible Farm-to-Fork Sensing – aims to support the digital transformation of all sectors of the economy and society, make it work for Europe and address the European Green Deal. It focusses on Key Digital Technologies (electronic and photonic (light-based technologies) components, and the software that defines how they work as part of a system)
- European Partnership on **Artificial Intelligence, Data and Robotics** - will drive innovation, acceptance, and uptake of these technologies by boosting new markets, applications and attract investments, to create technical, economic and societal value for business, citizens and the environment. By 2030, European sovereignty is expected in the development and deployment of trustworthy, secure, and robust AI, data and robotics, compatible with EU values and regulations.

Cluster 6 partnerships - the initial list of candidate European Partnerships in Horizon Europe comprise the following in the area of climate, energy and mobility that are of relevance for PestNu (final proposals were submitted March/April 2022 and are expected to be launched in 2023, except for Circular bio-based Europe, already established since 2021):

- European Partnership [Accelerating farming systems transition: agroecology living labs and research infrastructures](#) - aims to structure and support a network of living labs and research infrastructures accelerating the transition towards agroecology throughout Europe. It will provide spaces for long-term, site-specific, multi-stakeholder and real-life experimentation, and deliver ready-to adopt practices that support farmers in understanding and implementing agroecological practices at the scale needed for positive economic, environmental and social impacts. By 2030, the ecosystem around agroecology will be better connected at EU level, knowledge of agroecological processes will boost uptake of agroecology by farmers and the environment and the social performance of farming will be improved.
- European Partnership for **Agriculture of Data** – aims to support sustainable agriculture in the EU as well as policy monitoring and implementation by using digital and data technologies in environmental observation. The partnership will generate EU-wide data sets and information through combining geospatial and Earth observation datasets and employ data technologies to provide solutions to the agricultural sector allowing for more efficient, environmentally friendly, and profitable production and strengthen monitoring capacities across policy fields.
- European Partnership for **Safe and Sustainable Food Systems** – aims to coordinate, align, and leverage European and national R&I efforts to future-proof food systems for co-benefits through an integrated and transdisciplinary systems approach, and provide solutions to the Farm to Fork strategy. The Partnership will provide the scientific evidence, as well as the collaborative experience among practitioners and citizens, to support the transformation of local, national, European and global food systems.

- European Partnership for a [Circular Bio-based Europe](#) - the objective of the initiative is to produce major contributions to the climate targets by 2030, pave the way for climate neutrality by 2050, and increase sustainability and circularity of production and consumption systems in line with the European Green Deal. It aims to develop and expand the sustainable sourcing and conversion of biomass into bio-based products focusing on multiscale biorefinery processing and apply circular economy approaches such as utilisation of biological waste from agriculture, industry and municipal sectors. It also aims to deploy bio-based innovation at regional scale with the view to revival of rural and marginal regions.

Regarding PILLAR III - Innovative Europe – EIT KICs (knowledge & innovation communities)

- [EIT Digital](#)'s mission is to drive digital innovation and develop entrepreneurial talent in order to enhance both economic growth and quality of life across Europe.
- [EIT Food](#) will be delivering solutions to develop a highly skilled food sector and collaborate with consumers for products, services and new technologies delivering a healthier lifestyle for all European citizens.

Cross-pillars II and III (MoU 2021)

- European **Open Science Cloud** (EOSC) Partnership - aims to deploy and consolidate by 2030 an open, trusted virtual environment to enable the estimated 2 million European researchers to store, share and reuse research data across borders and disciplines. The partnership will bring strategic coherence and complementary commitments at EU, national and institutional levels to bring together all advanced data infrastructures in Europe, modernise the ERA with a capability to produce "FAIR-by-design" (Findable, Accessible, Interoperable, Reusable) datasets, and populate EOSC with new FAIR data and related services, (iv) expand the FAIR data culture across Europe.

### Relevant actions & initiatives for PestNu to build upon

- Accompany evolution and work focuses and trends for checking concrete crossing and working points with PestNu
- Events, initiatives and calls

### More information

[European Partnerships in food, bioeconomy, natural resources, agriculture and environment](#)

[European Partnerships across various themes](#)

## 3.13. EU Missions

### Brief overview

EU Missions are a novelty of the Horizon Europe research and innovation programme for the years 2021-2027 and are expected to deliver impact by putting research and innovation into a new role, combined with new forms of governance and collaboration, as well as by engaging citizens. They support Commission priorities, such as the European Green Deal, Europe fit for the Digital Age, and the New European Bauhaus are a coordinated effort by the Commission to pool the necessary resources

in terms of funding programmes, policies and regulations, as well as other activities. They also aim to mobilise and activate public and private actors, such as EU Member States, regional and local authorities, research institutes, farmers and land managers, entrepreneurs and investors to create real and lasting impact. Missions will engage with citizens to boost societal uptake of new solutions and approaches.

### Relevant or crossing points for PestNu

- [EU Mission: A Soil Deal for Europe](#) whose main goals comprise putting in place an effective network of 100 living labs and lighthouses to co-create knowledge, test solutions and demonstrate their value in real-life conditions; or developing a harmonised framework for soil monitoring in Europe;

### Relevant actions & initiatives for PestNu to build upon

- Accompany EU Soil Mission 2022 calls and results and interact

### More information

[EU Missions in Horizon Europe](#)

## 4. Relevant Operational Groups and Actors

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Along with the new policy and regulatory framework all the networking panorama is also changing. Besides DIH and other European Partnerships already mentioned, or signatories of the EU Code of Conduct on Responsible Food Business and Marketing Practices, coordination with operational groups and actors under PestNu activities requires partners to be able to identify main players and stakeholders.

During Y1 of the project's lifespan, and for assessing the national setups to support the promotion of PestNu DST & AOP innovations consortium partners have identified more than 70 relevant institutions. These combine [Entities involved in National CAP Strategic Plans](#), control entities coordinating, regulating and responsible for plans enforcement in fields such as the [sustainable use of pesticides](#), organic production or labelling and nutrition; agriculture and agrifood national clusters; sustainability clusters, DIH and others.

However, and in addition, some information was gathered and is hereby presented on the way networking (of these and other) relevant actors and operational groups occurs. Again, it should be stressed that this is a non-exhaustive list, mainly based upon what was brought to our knowledge by partners, in attended events or in the several synergic actions performed and reported later.

### Networks supporting the New CAP

- [Farm Advisory systems \(FAS\)](#) - All countries in the European Union have a farm advisory system. The FAS helps farmers to better understand and meet the EU rules for the environment, public and animal health, animal welfare and good agricultural and environmental condition ([GAEC](#)) and work in support of the CAP. Through these CAP's farm advisory services, Member States also have to offer advice to farmers on the sustainable use of pesticides, innovation, digital technologies, and sustainable management of nutrients.<sup>9</sup>
- **(New) CAP Networks<sup>10</sup>** – will undertake networking activities related to all interventions that MS put in place within their CAP Strategic Plans. As recognized in the New CAP, networks are a key tool to drive and steer policy and so, new CAP Networks at EU and national level will be promoted<sup>11</sup>. At EU level we will be moving from two networks (ENRD and EIP-AGRI) towards a single European CAP network. The new national CAP networks will essentially replace the current [National Rural Networks \(NRN\)](#) and expand their remit to include the whole CAP.
- [European Network for Rural Development \(ENRD\)](#) - is the hub that connects rural development stakeholders throughout the EU. The ENRD contributes to the effective implementation of Member States' Rural Development Programmes by generating and sharing knowledge, as well as through facilitating information exchange and cooperation across rural Europe. Each MS has established a [National Rural Network \(NRN\)](#) that brings together the organisations and administrations involved in rural development. At EU level, the ENRD supports the networking of these NRNs, national administrations and European organisations
- [EIP-AGRI](#) – is the European innovation partnership for agricultural productivity and sustainability or EIP-AGRI, an European initiative that promotes innovation to make the

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<sup>9</sup> [Farm to Fork: New rules to reduce the risk and use of pesticides in the EU](#)

<sup>10</sup> Antonella Zona & Helen Williams, DG AGRI [CAP networks - Framing elements](#), 16th NRN meeting, Calatayud, Spain – 3 March 2020

<sup>11</sup> DG AGRI 2019. [EU rural review. No 27.](#), Publications Office of the European Union.

agriculture and forestry sectors fit for today's global challenges. This operational group coordinates the funding of projects, networking and knowledge exchange activities through the CAP and the European research and innovation programme. With such funding two types of multi-actor projects are supported through the EIP-AGRI: 1) local, regional or national innovation projects called ['operational groups'](#) and 2) [transnational research and innovation projects](#) bringing together partners from all over Europe. Among these are [thematic networks](#) that collate existing knowledge and translate it in understandable information and tools for practitioners in the field. Networking activities for facilitating the exchange of knowledge and the dissemination of innovation are organised by the EC with the support of the EIP-AGRI 'service point' and at national and regional levels by national EIP-AGRI organising bodies or rural networks. Such activities include the [EIP-AGRI](#) platform; [workshops and seminars](#); European expert groups called [focus groups](#), also multi-actor, who discuss research and innovation needs on very practical subjects; and [publications](#) informing on innovation and funding opportunities. EIP-AGRI runs also the [Subgroup on Innovation](#) connecting to the ENRD.

- [Agricultural Knowledge and Innovation Systems \(AKIS\)](#) are the EIP-AGRI spotlight for knowledge sharing between everyone who uses and produces it. Moreover, they are one of enforcing pillars of the New CAP (see how [here](#)<sup>12</sup>). Efficient AKIS will support generating innovation and exchanging knowledge between advisors, farmers and foresters, researchers, rural networks, national and regional authorities, media, all people involved in education and training, and consumers.

### Networks supporting the Agricultural Policies

- [Agricultural civil dialogue groups \(CDGs\)](#) - comprise representatives of groups such as producer and consumer organisations, as well as environmental charities. Their aim is to help advise and monitor the Commission's agricultural policy and make contributions based on their on-the-ground experience. CDGs exist in areas such as the [common agricultural policy](#), [organic farming](#), [quality and promotion](#), [Environment and climate change](#), [Income support and greening](#), [Rural development](#), [Horticulture, olives and spirits](#) among others.
- [Agricultural committees](#) - comprise representatives of all EU countries and a Commission representative as chairperson thereby representing the views of EU countries on current and upcoming organic legislation. They serve as a key link between the EU and its constituent countries, meeting regularly to discuss any proposed changes to the current set of rules. Existing committees cover areas such as organisation of agricultural markets, Agricultural product quality, organic production, funds, payments, farm accountancy data network, etc.
- **Expert Groups** – which draw on outside experience providing advice to European Institutions to make sure that the EU rules are effective and proportionate. Examples are the [expert group for technical advice on organic production](#) (EGTOP), the [Expert Group on Organic Production](#) or the [Expert Group Fruit and Vegetables Market Observatory](#).

### Others

- [Standing Committee on Agricultural Research \(SCAR\)](#) plays an important role in coupling R&I and in removing barriers to innovation, and aims to make it easier for public-public and public-private sectors to work together in delivering innovation that tackles the challenges faced

<sup>12</sup> Inge Van Oost DG AGRI, [CAP post 2020 - How to better integrate advisors in the AKIS thanks to the new CAP?](#) i2Connect Regional stakeholders' workshop Southern Europe, 8 June 2022



in the bioeconomy area. Among others has strategic working groups in Agroecology (SCAR-AE); AKIS (SCAR AKIS); Bioeconomy (SCAR BIOECONOMY); Fisheries and Aquaculture Research (SCAR FISH); Food Systems (SCAR FS). It is the is the entity responsible for the preparation of the candidate European partnership 'Accelerating farming systems transition: agroecology living labs and research infrastructures'.

- **[Soil partnerships](#)** - The [Global Soil Partnership](#) is a globally recognized mechanism established in 2012 with the mission to position soils in the Global Agenda and to promote sustainable soil management. It hosted by the United Nations Food and Agriculture Organisation and regional partnerships were established among interested and active stakeholders of the same regions such as the [European Soil Partnership \(ESP\)](#). Regional needs and priorities are translated into regional actions through the ESP implementation plan. The list of the ESP focal points in each country (when existing) is available [here](#) and other partners of the ESP can be found [here](#).
- **[Circular Economy Stakeholder Platform](#)** - A joint initiative by the European Commission and the European Economic and Social Committee, the European Circular Economy Stakeholder Platform brings together stakeholders active in the broad field of the circular economy in Europe.
- **[Zero pollution stakeholder platform](#)** - bringing together actors from different communities and areas of expertise to tackle inter-related challenges, such as strengthening a joint environment and health agenda developing and sharing good practices on cross-cutting topics of the [Zero pollution action plan](#) targeting improving soil quality by reducing nutrient losses and chemical pesticides' use by 50%; enforced since last quarter of 2021.
- **[EU Platform on Food Losses and Food Waste \(FLW\)](#)** - was established in 2016, bringing together EU institutions, experts from the EU countries, international organisations and relevant stakeholders selected through an open call for applications. The Platform aims to support all actors in: defining measures needed to prevent food waste; sharing best practice; and evaluating progress made over time.
- **[EU Food Loss and Waste Prevention Hub](#)** - which is a "one-stop-shop" for stakeholders active in the area of food loss and waste prevention and reduction.
- **[EU Business @ Biodiversity Platform](#)** - provides a unique forum for dialogue and policy interface to discuss the links between business and biodiversity at EU level. It has been set up by the European Commission with the aim to work with and help businesses integrate natural capital and biodiversity considerations into business practices.



## 5. Synergies established & main findings

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### 5.1. Advisory board and punctual interactions

#### Brief description

Within its multi-actor and cross-sectoral approach, PestNu was concerned to ensure useful and active bridges and connections to decision makers and operational groups for being able to establish the grounds for synergies at national and local level, within the Member States covered by the consortium.

#### Goals

With these synergies, besides seeking to enforce PestNu's communication and dissemination strategy, the consortium aimed for a more direct and closer link to current legal, regulatory and operational framework helping PestNu consortium to uptake and also share with stakeholders' relevant information about the current state of the art of EU and Member States policies & instruments. The ultimate goal is to identify and orient how the applied research of the PestNu project could be effectively used to establish best practices and new regulations, codes and directives on DST and AOP innovations in the agriculture and agri-food sector.

#### Approach

During this first year PestNu involved many of these relevant stakeholders within its Advisory Board, thus creating a closer pathway for periodic communication and interaction. Punctual direct contacts were also established through meetings or events. In some cases, these relevant stakeholders have been asked to contribute directly to PestNu activities such as the questionnaire intended for institutions, or as speakers or participants in the National workshops foreseen and organized within the Project. Additionally, due to their trustworthiness many were asked to help PestNu by circulating and publicizing PestNu activities in a wider network.

#### Key Findings

In these first 12 months over 20 useful synergies were reported by the PestNu consortium, at different levels, with policy makers; control entities; EIP-agro focus groups; agriculture and agrifood national clusters; digital innovation hubs; sustainability clusters among others. The key results and findings could be summarized as follows:

- It was possible to increase knowledge about the current status of the legal and regulatory framework, which has been and is, at this moment, actively changing in several fronts towards the incorporation of Green Deal, F2f and Digitalization of Europe strategies goals.
- Due to the timeline of this change in the policy and legal framework, very recent or still ongoing, it is vital confronting it with benchmarking results among PestNu partners, IAB members and reached stakeholders regarding barriers to innovations uptake by food production systems and for reducing time to market and with project's activities (PestNu and sister ones), to pinpoint actions that can contribute for joining this momentum, either by contributing to the dissemination of the novelties or by supporting policy makers and other agents to build these new tools upon knowledge, experience and available or foreseen innovations.

- Due to the very recent nature of some of these instruments - many entered into force only in (mid) 2022, will be doing so in 2023 or only will be finished within this period - the consortium should identify those that may require for monitoring within the timeframe of the project and partners' competences for further reporting later on, thereby helping to assess its adequacy or efficiency in the quotidian of the F2f chain and in the achievement of Green Deal and F2f strategies.
- These comprise i) the new CAP and its financial incentives to farmers uptake of new technologies and practices; ii) new regulations and rules such as those on fertilizing materials and biostimulants or regarding the sustainable use of pesticides and its impacts on the bureaucracy and time to market of new products like the ones brought by PestNu under Circular Economy approaches, iii) new initiatives towards sustainability labelling and its impact on the increase of organic food production, uptake by market or reduction of related costs or iv) actions intended at accelerate digitalization like the EU partnership on Agriculture of Data or DIHs enforcement their and technical and financial support.
- Regarding the digitalization of the agricultural sector, data sharing must be promoted for example for alerts, for feeding decision support systems in real time or for benchmarking and public authorities are engaging with such actions under EU partnership on Agriculture of Data.
- Opportunities and mechanisms arising for increasing knowledge transfer and training of farmers seem to be mainly linked to the enforcement of AKIS and CAP advisory systems, EIP-AGRI focus groups work and actions and DIH, and thus synergic actions within these operational groups' dynamics should be explored by PestNu for increased efficacy. New funding opportunities will arise for AKIS and NRN for working groups on innovation.
- With regard to displacement of aquaponics potential within the scope of organic vegetables production, from the meeting with the DG-AGRI it was found out that it may be worth to explore and assess the distinctive environmental conditions that could justify aquaponics application for organic food production, namely those found in the Southern Countries covered by PestNu consortium. This could contribute to exploring the possibility of accessing exception permits to the "no soil" condition set by organic legal rules, in resemblance to what happened in the past with Northern countries realities such as frozen soil, that gave rise to exceptional permits for aquaponics recognition as organic food production systems in Finland, Sweden or Denmark.
- This same approach of being able to assess, characterize and describe how certain technological approaches fit best certain geographical realities and should thus be enforced, or what is hindering such, is needed as there seems to be a difficult discussion between Northern and Southern countries regarding, for instance, plant health and threats, which are much of a problem in the southern regions and little is known or perceived by those in North. This was found to be mainly relevant by Portuguese and Greek policy makers and control entities (like DGADR, DGAV or BPI).
- Indeed, as Plant Health has not necessarily common ground or is a central point for all EU Member States and their realities the transitioning to organic farming, reduction in the use of pesticides and fertilisers, or shifting of the nature of the products in use for more sustainable ones requires technical evaluation, for instance by EU funded projects like PestNu, of what are the risks and farmer's losses (even when using top and cutting-edge innovations and practices). This will support the building up of compensatory mechanisms and tools for farmers, arising from the need to use phytoprotection or incapacity of totally fitting the targeted goals.

- In order to compensate farmers a common definition of what is “biological fight” is one of the things that is needed as there is no zero risk. For pesticides under use active molecules risk is already known and how to mitigate it and authorities find it difficult to prohibit them without having well studied and evaluated alternatives, just because of policies (sometimes induced by opinion-decision-makers). As it takes years to approve new molecules, the lack of solutions simultaneously with ban of use is also perceived by companies (producers and downstream agents) as negatively impacting industry and the market.
- The lack of measures to mitigate the economic impact of the strategy regarding pesticides reduction and the need to more quick access to benefits needs that all actors, industry, farmers and regulators have learning time and analyse data and thus, efforts and tools towards such goal are welcome not only by decision makers but by other operational groups such as fertilizers’ producers’ associations. It is commonly perceived that consumers also need information. For this purpose, DSS may be the most disruptive tool in Agriculture 4.0.
- Consulted stakeholders like decision makers and operational groups agree and highlight that innovation needs demonstration and dissemination - within production regions and from one region to another and thus Projects’ efforts should take this into account as much as possible in order to succeed. Interaction with agricultural experimental stations to allow testing technologies in different countries and regions to assess could be a pathway for this adapted transfer of knowledge. In what concerns precision farming this may have some momentum also under sectorial AI [Testing and Experimentation Facilities](#) foreseen under the Digital Europe Programme.
- Tools that valorise ecosystem services and territorial cohesion are also lacking.
- These agents’ experience with farmers also revealed that these later ones’ practice needs to be structured and thus intermediate actors’ knowledge should be enforced - it could help to target initiatives to agroadvisors and agricultural cooperatives and producers’ associations which need reskilling. On the other hand, their feedback should be valued as they are constantly visiting the field and able to observe and adjust responses. Besides being able to deliver solutions they can bring back existing problems and needs.
- Especially when there is a high number of farmers vs production area sustainable food systems require technical advising, exigent and market oriented increasing harmony towards food sovereignty, export and for reducing gaps in competition between farmers from smaller and bigger countries.
- As far as perceived, the EU training offer is not adequate to farmers, lifelong learning programs are lacking, for example allowing for training at the end of the day, weekends, with adjustable curricula to already existing skills.

## 5.2. Questionnaires to target groups

### Brief description

Within its WP1, devoted to the Framework Design, Requirements and Specifications, PestNu contemplated an in-depth systemic analysis focusing on the assessment of overall user requirements and needs of practitioners, institutions and citizens throughout three questionnaires that gathered over

1100 responses. Moreover, the project promoted also a questionnaire for benchmarking the barriers to implementation of new technologies among the project's developing partners and IAB members, which had 24 responses.

## Goals

The main goal of the work done was to gain a wide insight into the main perceptions, needs, drivers and barriers of the Agrifood chain practitioners, institutions and citizens concerning the AOPs and DSTs and to translate it into specific recommendations which could contribute to the design of systemic innovation and to support the future activities of the project. The benchmarking activities among technical partners and IAB members aimed the identification of main reasons behind the current lack of adoption of similar innovations as developed in PestNu. Besides, as it was possible to collect valuable insights to be considered when addressing synergies with policy makers and operational groups and are hereby presented. Further information and outcomes are available in WP1 deliverables.

## Approach

Stakeholders were assessed via Voice-of-the-Customer methods to understand and manage their expectations. Questionnaires allowed for distinguishing each country's needs and benchmark on EU level. Three surveys were launched at the 9 consortium countries in a concise and profile-neutral manner, covering three different stakeholder groups a) practitioners, b) public and private institutions by M12, c) and citizens of the farm. In parallel, a questionnaire was carried out among the project's developing partners and IAB members covering topics such as the development of new technology, new products and circular farming to identify key barriers to implementation of these technologies. Extended analysis of the results is available on WP1 deliverables.

## Key Findings

In general, the questionnaires had good acceptance and high participation level with diversified contributors' profile.

The first questionnaire - Q1 – which targeted Farm to Fork practitioners' needs and requirements, gathered around 380 responses and had groups of questions addressing AOPs and DSTs but also others, addressing general perceptions, impact of existing policies, training and networking activities or the standards the participant knew or followed. The key relevant findings for present deliverable could be summarized as follows.

- The reduction of the dependence on hazardous pesticides use, of the loss of nutrients from fertilizers and of the environmental footprint is considered as very important but more perceived as such by agronomists (most of them could be further seen as agroadvisors) than by Farmers, similarly among countries.
- With regard to the achievement of the F2f targets, they were considered moderately feasible but a quite high percentage of Farmers declared either unawareness of the targets or of its feasibility, indicating both a gap in information about the EU Strategy and how to comply with it.
- Taking from those that justified their choice, the effort is seen as “very difficult and arduous” with “little time for obtaining such ambitious outcomes”. On one hand “current agronomic techniques create dependencies that are difficult to wean and overcome” and “changing from safe to unsafe will surely take time and the transition will be difficult”; “the sector will not have time in a serious and sustainable way to provide fundamental alternatives for the levels of food production in

quantity and quality for current and future (short term) needs”; “ With the current regulation of organic production in the EU, achieving this goal in the context of a more unstable climate implies a significant reduction in average agricultural productivity and greater variability in the production and quality, which puts food security (sovereignty) at risk on the European continent”.

- The objectives are seen as “numerical targets (which) lack a consequence analysis and are “paper products”, (with) no alternatives today if we are to simultaneously produce more food and increase profitability in agriculture”.
- Commonly, answers revealed this worry with other aspects that need simultaneous care and compliance namely food sovereignty and external markets competition. “Because it strongly reduces productivity with a consequent increase in prices and dependence on foreign countries, it becomes increasingly impractical to compete economically with other continents.”.
- Since “pests and diseases can be devastating” many pointed out the “lack of immediate viable alternatives, both effective and reasonably priced, stressing the “effective””; “really efficient agronomic products and practices would be necessary, not only in theory”. “It economically makes many explorations not feasible as they do not deliver the needed yields”. “The economy of the Mediterranean areas depends in a very important manner on intensive agriculture, which needs those products to be feasible”.
- “The emergence of new pests and diseases (which is) not common in certain countries, climate change, the arrival of food from countries that do not comply with phytosanitary standards and dependence on these countries, increase in the world population, increase in prices” were the most cited reasons.
- In addition, “the system is sluggish”. Producers stressed, for instance, that “the homologation processes of new products are hugely expensive” and “take 8 to 10 years just to have a permit”.
- Further research and new approaches are needed and “the nutrient utilization path is, indeed, the main path to take. A well-nourished crop is the best bet to be able to reduce agrochemicals because it becomes much more resistant because it is healthier. I can demonstrate this in my fields, the more nourished/stronger the crop, the less pesticides/herbicides will be needed”.
- Despite a good level of awareness of the various AOPs was found among practitioners’ groups, their demonstration in real case scenarios and their penetration in the participating countries was considered as moderate. Practitioners perceive there is a moderate level of appropriate solutions for reducing nutrient loss and reducing hazardous pesticides and fertilizers, and more abundant regarding the first type than the later one. Again, testing in real case scenarios was considered to be moderate. There is “lack of experimentation and knowledge transfer”
- Still regarding AOPs, a quite low level of knowledge and familiarity with existing guidelines and regulations were observed. Lack of appropriate information, lack of specific standards and guidelines and lack of well-structured and organized national, mainly, legislation are indicated as the main reasons for this gap. There is the “need for Rural Extension services, (which are) non-existent”.
- A quite low level of awareness of the DSTs has been observed, again with Agronomists presenting higher awareness than Farmers. Their demonstration in real case scenarios is estimated as moderate and participants stated that if the use of DSTs was taking place in a more organized and collective way, they would adopt them easier.

- Cost seems to be the most important factor for the low adaptation of both DSTs and AOPs, followed by lack of information/training for the available technologies/practices and low familiarity with new technologies. The need for user friendly interfaces was pointed out.
- Also “there is a lack of incentives to operate more sustainably “or “of a reward system that promotes sustainable business practices”.
- When asked for other factors that negatively affect the adoption of AOPs and DSTs participants mentioned aspects like the age and the low educational level of farmers; the lack of confidence to the effectiveness and the credibility of these technologies; the consequent high risk and the fear of changing and of failing; the established culture among farmers and cooperatives; the structure of the Agricultural sector with the existence of high number of small holders; the lack of research support and trained professionals; the unclear regulation requirements; the estimated low economic performance or the lack of benefits demonstration.
- Funding has been estimated as the most important incentive for the adaptation of both AOPs and DSTs followed by tax reliefs, training and pricing & bargaining models that guarantee a good ROI. A strong preference for training activities with physical presence and a low level of awareness of standards were also observed.

The following comments and suggestions were also received from the survey:

- The existing guidelines and the regulations are not properly communicated by relevant Public Bodies and Co-operations.
- The existing guidelines must provide practical and not general advice. “Clear and easily readable guidelines should be developed”.
- The legislation is extremely scattered, confusing, frequently changing and it doesn't provide necessary technical support for implementation. The whole system is very bureaucratic.
- There are insufficient instructions and guidelines for the proper use of fertilizers to reduce NO<sub>3</sub> leaching in the soil derived from discarded greenhouses drainage solutions.
- Moreover, there is a lack of information concerning the whole process of nutrient recycling namely of
  - standards for calculating nutrient losses;
  - standards for measuring the impact of nutrients in agro-ecological ecosystems;
  - methods for measuring CO<sub>2</sub> capture in the soil;
  - guidelines for soil fertility and plant nutrition;
  - guidelines for the optimal application period for each of the suggested substances/active compounds;
  - simplified online consulting platforms;

Questionnaires Q2 and Q3, intended for public and private institutions and citizens of the farm, respectively, were built in a more closed way, not allowing for the collection of opinions/contributions. However, overall **perceptions depict that among** public and private institutions opinions divide mainly in issues regarding AOP, with 1/2 of the participants stating that current regulations can be an obstacle in the development of new biopesticides. Participants also divided with around 1/2 stating that fertilisers' impact on the environment is due to the use of non-sustainable practices by farmers' whereas others

think 'Fertilisers may have an impact on the environment due to the nature of fertilisers'. They also struggle to find possible that AOP bring economic benefits to the agro-food sustainability (not having doubts about positive impacts for society and the environment. This target group revealed to be more consensual when regarding DST with participants agreeing on its potential to help reduce the use of pesticides and fertilisers, nutrient losses and pesticide residues in food and in the environment' although not so sure about if they are able to provide 'sufficient accuracy in diagnosing diseases & insects, detecting and predicting their spread to crops, thereby increasing crop yield and improving quality characteristics of agricultural products'. Similarly, the potential of these technologies to bring economic and environmental benefits to the agri-food was a more agreed option than that of social benefits. Finally, on routes to accelerate action towards fulfilment of 2030 targets the most preferred were 'Supporting farmers in appropriate and rational use of hazardous pesticides' and 'Financial support to farmers for the use of organic practices and precision agriculture technologies', respectively. These and other main conclusions have led to some recommendations (see D1.3 for more detail):

- Communicate AOPs on agricultural products to all stakeholders of supply chain;
- Communicate the enhancement of the current financial support of organisations developing AOPs and DSTs to increase their maturity level

The questionnaire addressed to citizens showed that awareness of F2f Strategy is still not a reality (only 47% stated knowing it). Despite, almost 2/3 affirm to be aware of DST & AOP and there is willingness to pay (by 80%) for food produced using organic practices even if the cost is higher. On the other hand moderate preference was expressed for food produced with the support of modern technologies, even though a high percentage of the participants replied positively regarding the impact in society of these modern technologies. This could be due to lack of information, as almost half of the participants responded there is a necessity of an informative indication/labelling used in products produced under the support of modern technologies. These and other main conclusions have led to some recommendations (see D1.3 for more detail):

- Communicate more effectively the F2F EU Strategy and its targets
- Demonstrate the benefits of AOPs and DSTs on agricultural products
- Communicate the addition of an informative indication/labelling in products produced via the support of modern technologies
- Communicate AOPs and DSTs on agricultural products

The benchmarking survey among PestNu's technical partners and IAB members (promoted under T 1.3) highlighted aspects such as "The customer's lack of knowledge about the economic advantage and benefits" and "Lack of knowledge on handling and operating new devices/instruments/technologies" depicting that solution's developers feel the need for knowledge transfer for achieving success in implementation. Also, the need for demonstration ("Validate and demonstrate in practice on more commercial farms" or "Testing and experimenting on more crops") were mentioned as important to apply in integrating new development in the field. Current strategies to increase the awareness of the product or technology on farmers

Moreover, the survey had three questions that related directly to the scope of this report. A specific question on what opportunities these players see coming from changes (in technology,) government policy or regulations where some relevant answers were:

- "Tighter legislation on emissions from wastewater treatment plants agricultural sites are needed (...)"

- “The new regulations to minimise water consumption could create an opportunity for us to establish a smart farming solution”.
- “to be able to market new products in an easier way”; “Shorter processes for certification and regulation of products, substances, molecules and microorganisms to be used in organic farming”: “EU Future regulatory restrictions will force a change in market of PPP”
- “help in the boost of AI and robotics solutions utilization in agriculture”
- “increase of organic farm”; increased demand for organic products; Concern about soil degradation”
- “A change in government policy would improve almost everything, but this is hardly to be expected under the current constellations”
- “Government policy can play a role in stimulating specific areas of technology development, or more generally such as promoting "digitalization".”
- “Environmentally friendly technologies are going to be supported, to feed the cities with growing food in the cities to avoid transport of CO2 emissions in the future”

Another specific question was made on if "Do current EU and regional legislation and regulations help market release of your product or technology?" that had one-third (of 24 answers) answering “No” while the remaining two-thirds either answered yes or left some relevant comments such as:

- “In concrete terms, neither the EU nor national authorities should constantly interfere in economic processes. The EU's homework is to protect stocks in the seas, lakes and rivers, should abuse be put under strict control. Impossible husbandry conditions in the Southeast Asian countries should be put under control, here the impossible pricing is generated, which has a ruinous effect on the local fishing industry. So, there would be a wide field of activity for the EU to bring about improvements!”
- “Simplify the application and admission procedure of the product as category 4.0, granting a tax incentive in the form of a tax credit for buyers”
- “The actual framework (Green Deal and Farm to Fork) will be a game changer in near future.”
- “The rules and regulations with regard to organic certification should be updated or a new label should be created to reflect aquaponic, circular food production”
- “(...) Real-time, continuous monitoring of nutrient pollutants from and in water systems and facilities should be a legislative requirement to effectively battle eutrophication and environmental destruction and economic impact.”
- “Autonomous systems need to be OK to use anywhere if run below 5 km/h”
- “Less bureaucracy”
- “use drones to spray crops; streamline the law to place biological products on the market”

There was one last question, about if there are any specific legislation or regulations acting as an obstacle to the free movement or launching of the products and technologies in the market. Here only a few concrete answers were given:

- “GDPR is a problem because we are not allowed to use data from previous clients in new models”,
- “Regulation (EU) 2020/(74; D.lgs.n. 185 del 2003 (ITA)”,
- “There are a myriad of regulations and laws that are difficult for the producer to understand and certainly not comprehensible! Lengthy approval procedures that lead to massive delays due to lack of knowledge among officials. I don't know of any official who is directly involved in an



approval process and knows about aquaculture!!!! Therefore, everything is put on the back burner so as not to have to make a decision,

- "New European regulation will difficult negotiations with customers"
- "Yes because it's so complicated the new rules for fertilizer products - new law July 16<sup>th</sup>"

### 5.3. Participation in events promoted by EC Services

#### Brief description

Within the framework of EU funded projects PestNu and sister projects have been asked to join and discuss clustering and joint activities able to further support and enforce policies targets and goals in some relevant events promoted by EC services.

#### Goals

The main goals of these initiatives were to facilitate projects to know each other, disseminate main policy goals and expected contributions from EU funded projects and put projects to work together, discussing common ground and joint initiatives.

#### Approach

In this context PestNu team has joined three events:

- The Cluster Session on Plant Health for SC2 projects promoted by the European Research Executive Agency (REA) that took place online, last 23 September 2021;
- The Farm to Fork conference - Building sustainable food systems together that took place online, last 14-15 October 2021;
- The Food Working Group meeting, promoted by the Green Deal Supporting Office (GD-SO), that took place online 31 May 2022;

During the events, Projects presented and discussed their research focus and discussed potential cooperation.

#### Key Findings

- These initiatives contributed mainly for PestNu to feel accompanied by central services on how to achieve objectives and promote a more active exploitation of results. Moreover, awareness was gained on the expectations and needs of harvesting interesting results for communication and policy monitoring and development purposes, in partnership with EC services, under the new framework for effective feedback to policy.
- In a reverse way and for supporting Farm 2 Fork strategy PestNu had the opportunity to engage in the Farm to Fork conference (2021) namely on the thematic session focusing on the innovations to drive sustainability transitions in food systems from farm to fork. This session brought together different actors across the food system representing the voice of researchers, farmers, food businesses, consumers and policymakers and PestNu focused on showcasing its systemic innovations and how do they support the implementation of the Farm to Fork Strategy. For this purpose, a short video pitching the project was produced ([Youtube link](#)).

- Throughout these events promoted by EC Services projects expressed the need to include knowledge and expertise in categories such as expanding regional spread; contacts with relevant stakeholders; access to experimentation and demonstration facilities. It was possible to assess a substantial match between the knowledge and expertise needs of some projects and the availability of this knowledge in other projects, and indicative pathways emerged for synergies and cooperation between projects/consortia.
- Discussions highlighted common ground in areas like the demonstration of good practices, and knowledge co-creation experiments such as living labs and open-days were considered particularly promising, calling for strengthened cooperation among all key actors in the field;
- It was found transversely that the involvement of farmers and other stakeholders is essential in the understanding of optimized solutions in agroecological processes. There is the need to be close to farmers and train them, to facilitate their acceptance and implementation of sustainable agriculture practices. A crucial open issue is, still, how to convince farmers to adopt more costly technologies and consumers to buy more expensive sustainable food products.
- There is a lack of innovative communication methods to engage different stakeholders and to accelerate the uptake of research results in business and policy. Cooperation with industry for technological development and commercialization is of utmost importance to improve marketability of solutions.
- Projects are expected to contribute and shed light on the economic quantification of innovations to assure sustainability of solutions;
- Also, there is the need to enhance data sharing on open platforms, as a significant gap in data sharing, essentially due to policy barriers, still exists.
- Capacity building and training of policy makers is needed to overcome policy barriers and enable cross-fertilization, integration and better use of synergies across projects.
- Specifically in the clustering workshop of the Food WG promoted by the GD-SO, it emerged that since one activity common to all projects is to provide policy recommendations, projects could try to develop a joint policy recommendation paper.
- Several steps should be undertaken in order to achieve this objective and some of the steps are already carried out under some projects' tasks. The GD-SO could help in supporting the implementation of such action. Further steps should enclose the identification in each project, of the person in charge for policy recommendation and build a contact list on this specific action; mapping the different EU policy initiatives to which the different projects are expected to contribute too; the definition of a clear timeline and milestones in order to be able to draft a joint policy recommendation paper.

## 5.4. Recommendations for Policy and Research under PestNu workshops

### 5.4.1. National workshops

Towards the promotion of relevant synergies within the scope of this activity, the national PestNu's workshops held in Y1 angled for taking the most out of the gathering of relevant stakeholders for promoting collaboration, building of bridges and breaking of silos between actors of the food chain and primary sectors. Additionally, they tried to promote a collective action over Farm to Fork direct and indirect actors for assessing relevant opportunities and barriers found by these informal networks active/interested in the fields of pesticides & fertilizers, precision agriculture, organic farming, etc.

On one hand some partners (PT and SE) organized the workshops in close cooperation with relevant national events for the agri-sector thus inscribing PestNu themes in their agendas as a contribution for the promotion of knowledge transfer, clustering and debating of relevant aspects for fulfilling Green Deal and F2f Strategy goals. In the case of the Spanish workshop, open-doors to the aquaponics facility of this partner was the chosen approach. Also UK partners hosted the workshop in their facilities.

On the other hand, all workshops' agendas sought to actively promote debate, including roundtables focused on the discussion and identification of barriers of existing guidelines, opportunities to build upon and also what incentives would encourage adoption of innovations and solutions by EU farmers towards IPM and INM.

#### 5.4.1.1. Portugal

##### Brief description

On 22nd April 2022, PestNu consortium partners APEMETA and AgroInsider hosted the First Portuguese PestNu Workshop for project dissemination and promotion of synergies. The event, was entitled (in Portuguese) "Digitalization and Agro-ecological Practices for promoting plants and soil health - the contribution of PestNu technologies for agriculture transition towards sustainability", an took place in Beja, Alentejo, in synergy with a well-known agriculture fair, [Ovibeja](#), on its 38th edition, whose central theme this year was "How to feed the Planet?". The event had an audience of about 70 people in the room, including students, academia, farmers, agricultural products and services companies and also citizens.

##### Goals

Besides communication and dissemination of PestNu scope, goals, approach and innovations, the workshop constituted an important platform for the debate and sharing, by various farm-to-fork agents, of key aspects for the sustainable transition of food systems.

##### Approach

The agenda combined national authorities, clusters, companies and farmers and focused on the identification of current relevant opportunities and challenges deriving from regulatory and funding tools, along with technology trends. There was also a RT entitled "Everybody Counts" focusing on discussing what are the roles of the different actors and how engagement can be promoted following the holistic

approach brought by the F2f strategy. Participants were also asked to contribute to a PESTLE analysis by sharing positive or negative) factors influencing DST & AOP adoption for reduction of the dependence on fertilizers and pesticides and that of nutrient losses on soil.

## Key Findings

- European directives and regulations (namely the one Sustainable Use of Plant Protection Products) are actively transitioning to better promote integrated management, fostering and opening to innovations, namely the one on the Sustainable Use of Pesticides. Current main challenges (identified by DGAV) are the biological control agents such as biopesticides; organic fertilizers produced under circular economy; plant improvement techniques; the training/advising and also the agricultural warning systems; precision agriculture and digitalization and research;
- According to Food4Sustainability CoLab the Member States' DIH (will) have a key role in the Digitalization of agriculture in the next years functioning as one stop shops for the different types of producers to access knowledge, training, experiment and also financing (50% to 75% public funding support) for effective transitioning to sustainability and targets compliance; By gathering and managing all parties involved, the DIH can contribute to help farmers and other F2f chain actors to easily access agricultural advisory services, innovations, etc fighting the dispersion of providing agents;
- There are 22 DIH in 15 EU countries, namely in Greece, Italy, Sweden and Portugal. Current focus and hot topic areas are IA, IoT, Data Science and Big Data, Blockchain, Photonics, Robotics, Virtual and Augmented Reality and Cybersecurity;
- Technology transfer and training is of utmost importance for complying with the European goals and European funded projects should work on that (stated DGAV) directly with farmers or using synergies with those close to them like DIH and other relevant actors in the field of tech transfer;
- For organic farmers, precision tools are very important to support, demonstrate and optimize Ecology practices and, on the other hand, to take the agro-ecological practices to other farmers in a more user-friendly way. (Alfredo Sendim);
- Although organic food higher cost may be an issue, there are consumers who are willing to pay the additional cost if there is transparency and additional information about the production processes - this allows not only for building trust but also for the consumer to perceive additional gains arising from the sustainability of the options thus giving economic value to externalities (Alfredo Sendim);
- Involvement of industry and downstream actors may be achieved by enjoying the Sustainability momentum - however it is important to support visions aligning between sectors under this purpose, complementarity of skills and provide tools that contribute to the adjustment and redefinition of business models by the various stakeholders - by continuous interaction and cooperation between the various actors in the farm-to-fork value chain (António Vasconcelos);
- Close work with the community can be enforced by actors other than retail - Lipor (intermunicipal waste management company) is an example - and their (20 years) experience with projects engaging citizens and the restaurant sector shows that integrated management of goals such as Food Waste reduction, with that of increasing the consumption of healthier and more

sustainable food, namely of organic food is an area to work in (new jobs, new projects, new initiatives);

- From the debate it became clear that citizens and other actors miss more work and initiatives in this area, and from these “other” F2f actors, closer to the communities, and are interested and welcome the knowledge and experience of such actors and the replication of these good practices.
- There is recognition, by farmers, of the added value brought by the new technologies and the opening to their use and incorporation in the productive daily life. However, aspects like lack of scale block hiring skilled staff to deal with new info and data arising from the use of these technologies. Farmers welcome user-friendly decision support systems that can either be managed by public entities when regarding more generic information available for certain areas or regions, or in the form of advising systems, available for the different types and sizes of farms.
- Moreover, bureaucracies like activities licensing could benefit from simplification and support by public bodies. New business models set by some stakeholders under the scope of sustainability, combining food production with other capabilities for achieving economic viability often fall under different decision-makers (ex. agrotourism combined with aquaponics and new products from microalgae use) that either difficult or inviable innovations' uptake.
- The innovations brought in the afternoon panel ranged from microscopic level, addressed for instance by the bioproducts or nutritional programs focused by Fertinagro, to the macroscopic level with the use of EO data use as shown by Agroiinsider (and reinforced by the Portuguese Space Agency) and their best use requires technical staff, and skilled in different areas of knowledge, not common among farmers. To reach the market many companies have thus opted to offer consultancy services based on the technologies rather than the technologies by themselves.
- Regarding EO data, there is much data but both common access points and integration lack - to ease its use by farmers, companies and citizens. Interoperable platforms managed by public entities are thus a priority for the EU partnership for Agriculture of Data (Portuguese Space Agency)
- New bioproducts and nutritional programs may be expensive when compared to chemical products but in the overall balance the production is not necessarily more expensive as less products are used in the fields (Fertinagro).

### PESTLE Analysis by participants

Positive and negative factors influencing DST & AOP adoption for reduction of the dependence on fertilizers and pesticides and that of nutrient losses on soil:

<b>P</b> olitical	<i>Global Consensus (on the long run); Active; Financial Support; Incentive biogas production in PT</i>
<b>E</b> conomic	<i>Integral Sustainability (of Life on Earth); Incentives; Lower losses; Technology costs; Reduce taxes</i>
<b>S</b> ocial	<i>Food Security (global); Tendencies; Job creation in the interior (rural)</i>
<b>T</b> echnical	<i>Extension (to all geographies); (be) Present in the field; Support to Research</i>

Legal	<i>Easy (law-making should be); Faster; Ease Licensing</i>
Environmental	<i>Sustainability; Reduce CO2 production</i>

### 5.4.1.2. Spain

#### Brief description

On June 23, 2022, the Tilamur aquaponics facilities hosted the first Spanish Workshop entitled (in Spanish) “Sustainable Agriculture based on Precision Technologies and Agroecological Practices - Innovations of the PestNu Project. The event was organized by the Spanish group of the PestNu consortium, namely Tilamur, CDTA El Mirador, Neoalgae and Fertinagro. The event was held at the Tilamur facilities and at the THC hotel conference room in Lorquí, Murcia and had around 30 attendees interested in biofertilizers, precision agriculture and organic agriculture, comprising small farmers but also associations and cooperatives, small companies interested in distributing biostimulants, among others.

#### Goals

Along with the goal of showing first-hand the operation of an aquaponic production and microalgae cultivation plant, and presenting PestNu main objectives, the event aimed at creating synergies and detect real needs in the field in order to transmit and solve these barriers, since it depends on it that this precision, technological, sustainable and ecological agriculture transforms agroecology in the near future, solving a good part of the pollution problems that industrial agriculture poses.

#### Approach

Throughout its agenda the event brought together representatives of biofertilizer and biostimulant marketing companies, consumer groups, the federation of agricultural cooperatives, farmers, municipal and regional authorities and a RT was promoted in the afternoon period for discussing how far are conditions established for shifting food systems towards sustainability. Participants were also asked to contribute to a PESTLE analysis by sharing positive or negative factors influencing DST & AOP adoption for reduction of the dependence on fertilizers and pesticides and that of nutrient losses on soil.

#### Key Findings

- DST are very relevant for agriculture in the Region of Murcia due to the need to optimize water consumption and efficiency in phytosanitary treatments. Along with others already in use or in testing, PestNu's innovations are welcome and there is interest in accompanying the demonstration of these innovations.
- This region now has new regulations stricter than most European EU countries and producers are forced to comply with more demanding limits and reduce the use of inorganic nitrogenous fertilizers and phytosanitary treatments for assuring soil quality and the protection of the Mar Menor.
- Thus, local stakeholders are very active on what concerns uptake and transfer of innovations to agriculture. Public institutes like IMIDA are engaged in transferring satellite technology to farmers, CDTA carries out continuous crop tests of new biopesticides and biostimulants and producers reaching CDTA and FECOAM are interested in DST & AOP.

- Biofertilizers market is driven by the growth of organic farming and the need to improve soil organic matter. The interest of governments to reduce the carbon footprint of the agricultural sector and improve sustainability also contributes to the development of this market.
- However, time for approval of new bioproducts has been a barrier and companies like Fertinagro and Neoalgae are hoping that new regulations such as EU No. 2019/1009 [8] do indeed potentiate the inclusion of recycled and organic materials for fertilizer purposes and reduce the time to market.
- Besides these new products, the combination of new technologies in nutrition and biocontrol with the digitization of agriculture indeed allows for better results in terms of sustainability and food security (Fertinagro and Neoalgae).
- The cultivation of microalgae can have/ is having a relevant role in the production of biostimulants used in agriculture. Using wastewater as a microalgae culture medium is the perfect way to increase circularity and help reduce technology costs.
- A key factor for the success of biofertilizer development and acceptance is a well-functioning industry supply chain, which includes raw material producers and suppliers, biofertilizer producers, distribution channels and end users. Fertinagro and Neoalgae are integrated in different stages of the value chain and many efforts are currently being made to develop innovative biofertilizer products.
- The new legislation for the Sustainable Use of Pesticides represents a new strategy in the use of phytosanitary products, for instance differentiating chemical from non-chemical products and potentiating bioproducts for disease treatment, along with the enforcement of IPM. The use of chemical products is discouraged and if occurring as last resort, will need (upon reporting) monitoring and validation by independent advisors (not products producers or suppliers).
- The uptake of organic food from small farmers by big retailers is many times hindered by these later ones' strict rules, that penalize the supplier due to the "lower" organoleptic properties and, by its turn, this is caused by consumption patterns since people are used to buy once a week or every two-week. Promotion of organic food and consequent reduction of its cost should thus be supported by consumer's education on the properties of these products (covering both benefits and limitations) so that this pathway is altered. The phytosanitary cost of "perfect" and "pretty" food is not taken into account thereby impacting negatively on organic food uptake
- Consumer groups, like El Verdecillo, are increasing their members and among people's motivations are food sovereignty, or its impact on health or in the environment. Concerning the last, food miles are one of the more commonly perceived and used metrics, many times also inhibiting the choice for organic food along with its higher costs.
- Citizens search to obtain new alternatives to the ecological label reflecting these worries. In that sense it's important that citizens belonging to this consumer group have the opportunity to grow their own vegetables and make effective use of AOP agroecological practices. For this type of initiative, El Verdecillo has some farmland located very close to the city of Murcia, where the final consumer produces their own vegetables and holds markets among small local producers of cheese, honey, salt, eggs, guaranteeing quality and transparency of these products through alternative labels such as GGN (certified, responsible farming and transparency). Their perception is that "The citizen is always ahead of the regulations and tries to find alternatives to those regulations that administrations take so long to update".
- According to Emilio María Dolores (Head of Aquaculture Service of the Region of Murcia) aquaponics have huge potential to promote and stimulate development in rural areas due to depopulation. Likewise, he raises the possibility that agricultural cooperatives can adopt this technology to produce other final products apart from vegetables such as fish, algae, etc... The

possibility is very wide” raised Emilio, since it is a totally sustainable technology, it generates a circular economy and it can eradicate famine since it provides a source of animal protein for humans in disadvantaged areas. As disadvantages he added the high cost of fish feed and the need to have knowledge of fish farming and water recirculation systems.

- Much of what could be done by local and regional policymakers for supporting aquaponics development has been hindered in the past by the separation of policy and supervisory powers and funds between agriculture and fisheries areas. This is being currently overcome through multifunds new approach that may facilitate aquaponics access to funding.
- Farmers search for their suppliers, namely final sellers of plant protection products, to be their advisors on the best approach to achieve plant health and thus companies have it incorporated in their business models, offering technical advice and guarantees on the final product offered to the farmer. This leads to interest in knowledge on new products and practices, able to support upgrading their portfolio.

### PESTLE Analysis by participants

Positive and negative factors influencing DST & AOP adoption for reduction of the dependence on fertilizers and pesticides and that of nutrient losses on soil:

<b>P</b> olitical	<i>More involvement, upgrade range, do not influence positively, potential local consumption</i>
<b>E</b> conomic	Rural population maintenance, main point, high-cost systems, disaster, limitations, fewer obstacles
<b>S</b> ocial	<i>Advance, need to reach society, Agricultural sector work awareness, resilience, Agricultural sector work awareness, demand</i>
<b>T</b> echnical	<i>More support, cost reduction, training and information, vital.</i>
<b>L</b> egal	<i>Delay, real legislation is missing, harmonization of requirements and adaptation, green deal achievement, less bureaucracy</i>
<b>E</b> nvironmental	<i>Very positive, minimize environmental impact, the adoption of these practices favours compliance with environmental requirements, Vital, Lack of compromise</i>

#### 5.4.1.3. UK

##### Brief description

The UK cluster workshop was held as a hybrid meeting on the 23<sup>rd</sup> September 2022 in London. The theme of the workshop was “Ethics and innovation in precision agriculture” and the event was organised and hosted by the PestNu project’s UK partner Trilateral Research. The event counted with 17 attendees. Participants were reached out to and invited based on their expertise and involvement in the field. These participants included members of the PestNu advisory board, industry stakeholders, research peers, policy experts and other interested parties. Speakers were invited using a similar method – experts who had experience with policy and governance or disseminating new technologies in the field were approached, to include more alternative ideas from outside of the project as well as include a non-EU perspective



## Goals

The aim of the workshop was to bring together industry stakeholders in the UK and discuss some wider issues around new technologies in agriculture and propose solutions in the form of policy recommendations. This was done by first introducing the PestNu project; some of the technologies being developed; governance related issues that have come up in other PestNu national workshops; and including perspectives and experiences from external speakers who practice and research within the same field of agricultural innovation. Participants would discuss their viewpoints and ideas and fill in a PESTLE analysis table at the end of the day with keywords related to different aspects that affect PestNu technologies.

## Approach

The workshop started with presentations from the speakers on topics of PestNu technologies, standardisation within new agriculture developments, standards of practice, ethical concerns around digitalisation in farming and research questions around agricultural innovation. Each presentation was immediately followed by a short question and answer session; however, the aim of the presentations was to inform the roundtable discussion at the end of the day. This roundtable discussion was structured around themes of trust and adoption, standards, policy and legal framework, and the future of agricultural innovation. The themes that were present throughout all the discussions were on the subject of establishing infrastructure that supports the new technologies in their different aspects as well as trust and transparency through at all levels of the innovation.

## Key Findings

### TRUST AND ADOPTION

- To encourage adoption, farmers want to see the technology or system in practice 'down the road' - familiarity breeds confidence. On the ground dissemination and local demonstration are what get most interaction from farmers.
- Farmers may be conservative towards a brand-new technology because of unsuccessful trial experiences in the past. A lot of innovation does not work in farming and has to be amended, or further innovated on the ground. Community discussions, testing and proving in several conditions and over longer periods of time are necessary to mitigate distrust.
- Immediate access to help, training and support for new technology is important if farmers are to adopt technology they don't understand.
- Length of tenancies on farms is important - farmers won't invest in innovation in a rentier system. This may be region specific (UK in particular), as perhaps tenancies have longer terms or greater security in various EU Member States. The idea of the traditional farmer is disappearing due to value of land.
- Incentive schemes and cost considerations in the UK are not developed enough so far, therefore new technologies are only really viable for large scale farms at the moment and more difficult for smaller farmers. This has led to renting or hiring contractors for many of the more expensive tools.
- Financial incentives for trying new things were not considered good in all scenarios – in some cases it may lead to initiatives being taken away, reduced competition or favouring of bad solutions.

- Technological solutions that use large amounts of data lead farmers to ask “who benefits here”? Is someone going to charge me more for a product designed on data from my field?” Farmers fear losing autonomy over their farms.

#### POLICY AND REGULATION

- Workshop participants recognised the importance of regulation in this area, but warned that regulations can also help advance bad technology, meaning that solutions that are cheap but not necessarily useful can sometimes be subsidised.
- Key policies to improve basic infrastructure are needed, e.g., policies to improve internet access, which is a basic but vital need if reliant on data.
- Goals not policy: farmers are innovative and like to do things their own way, especially when considering a wider scale. The theme of regulation stifling innovation was present throughout the discussion on policy.
- Similarly to the European Common Agriculture Policy (CAP), the UK Environmental Land Management (ELM) policy was criticised by the participants for considering the farmers, food production and food security less than the environmental impact of farming, by focusing on soil management and promoting biodiversity for example. Including farmers in the policy making process whether it be through citizen assemblies, focus or test groups, and not just as the executioners of the policy, enhances the quality of the regulation.
- Any new standards or best practice guidelines should first consider why they are needed to gather data or information in this type of way, why these guidelines are necessary so as not to burden the farmers with additional protocols simply “for the sake” of establishing a best practice.

#### FUTURE OF FARMING INNOVATION

- The tools needed for the future will be around climate technologies, replacement of labour (could again be specific to the UK), and energy and crisis savings. Innovative solutions will be around livestock health and welfare and gene editing.
- For the future of pesticide use in agriculture the workshop participants foresee more specific technologies for specific problems e.g., applied genetics and the cultivation of cooperating species in terms of insect protection will definitely be the next development; image analysis with specific weeding/spraying etc has great potential and will develop the coming years.
- Systemic change is generally resisted and solutions are rarely “one size fits all” which means investment in new business structures centred on selling detailed agro-ecological advice and training are needed.

#### PESTLE Analysis by participants

Political	Citizen assemblies and focus groups to inform policy; farmers incentivised by goals not policy; support locally produced agri-products
Economic	Land ownership vs renting; length of tenancies; incentives in the UK have not been in place for long enough
Social	Peer-to-peer demonstration of technologies/practices; training and support from agronomists;
Technical	Past trial and error experience makes farmers hesitant to continue innovating sometimes;
Legal	Trust and transparency around data use; policy to support basic infrastructure; harmonisation of requirements and legal framework
Environmental	Minimising environmental impact; food security as important as environmental impact

#### 5.4.1.4. Sweden

##### Brief description

On 26<sup>th</sup> September 2022, PestNu consortium partners Aggrovast and RISE hosted the first Swedish PestNu Workshop for project dissemination and presentation of technical partners and their products. The event, "Precision tools for horticulture", took place in Skara, during the Swedish University of Agricultural Sciences popular science week "Smedjeveckan", on its 24<sup>th</sup> edition. The theme this year was "An earth where people and animals are healthy". The event had an audience of 29 people in the room and online in a Teams meeting, including researchers, advisors, tech developers, producer organisation, farmers, teachers, authorities, startup incubator.

##### Goals

The first part focused on communication and dissemination of PestNu scope, goals and approach. The DS in the project were presented and demonstrated in order to give the participants a good understanding of the benefits of the technologies and a good base for the coming round table discussions. In the second part, the roundtable discussions, the innovations were discussed to detect real needs in the field, various barriers for adoption of new technology and how to increase the use of IPM and INM.

##### Approach

The event brought together representatives of various tech developers, researchers, farmers and advisors in order to gain understanding of each other's needs and barriers of new technologies. The focus was on DST, but also other technologies and methods were included. Participants were also asked to contribute to a PESTLE analysis by sharing (positive or negative) factors influencing DST & AOP adoption for reduction of the dependence on fertilizers and pesticides and that of nutrient losses on soil.

##### Key Findings

- The average age of horticultural producers in Sweden is 56 years and the number of producers aged 65 or older has increased to 26% the last decade. This is a challenge for the sector, especially when taking into consideration that this group of aging farmers are supposed to adopt new technologies.
- The last few years the interest of organic products has decreased, instead products that are locally produced are of interest. There are probably a number of reasons for this; the carbon footprint, Covid-19 crisis and the fact that Sweden has a relatively low national self-sufficiency in food products. The war in Ukraine has added even more interest to the self-sufficiency.
- The horticultural sector in Sweden is comparably small so therefore companies producing pesticides are reluctant to seek approval for their products in Sweden. Subsequently the AOP and DST are important tools for the horticultural sector. In addition, Sweden has generally a stricter environmental legal framework than most EU countries and this will most likely also contribute to the willingness of adopting new technologies.
- The uncertainty caused by troubled times (Ukraine-war, increased interest, energy prices, prices for fertilisers etc) will probably increase the interest in new technologies enabling an optimised use of inputs.

- Labour is a bottleneck for the horticultural / agricultural sector and there's a lack both on non-qualified staff doing weeding for instance, but also a lack of more qualified staff who manage the production with regards to planning, technical tools and so on. Automation can be a solution to replace the non-qualified staff.
- There is probably a strong demand for DST in the sector, both from authorities, advisors and farmers and the advantages are often obvious. For example, the SpyFly saves time, energy and staff costs. The Swedish Board of Agriculture carries out field observations for early warning systems and this task engage 20-25 persons each season all over Sweden.
- The DST could also be a complement to traditional advisors, for example in the island of Gotland there's quite a lot of horticultural producers but there's a lack of advisors. By using advanced technologies that sends data remotely the advisors in main land can have a local presence without being there themselves. This could increase the interest of producers and in the long run increase the horticultural sector in Sweden.
- Two participants works in the forestry sector and they see a lot of opportunities for the SpyFly in forestry.
- It is important with cooperation between different actors to spread information about new technologies; authorities, tech developers, advisors and farmers have to meet and understand each other's needs and practical issues.
- Since many producers in Sweden has a problem to find staff, they are in general very busy and do not have possibilities to try out new technologies on their own. Therefore, it is very important that authorities, advisors and tech developers come together and implement field trials and demos in order to prove that the new technologies work and let the farmers see by themselves. As long as the producers / farmers know that the technology works and "does its job" they are not so price sensitive and are willing to invest in new technologies.
- Introduction of new regulations may not affect farmers / growers very much in practice but just the feeling of additional burden may lead to an increased stress and less interest of working with primary production.

### PESTLE Analysis by participants

<b>P</b> olitical	Lack of understanding, delays and protraction
<b>E</b> conomic	New technologies can save labour, energy and costs. Subsidies and economic stability
<b>S</b> ocial	Food security / national self-sufficiency, resilience, lack of labour
<b>T</b> echnical	5G, joint support from advisors and tech developers, fast development so it's difficult to navigate and understand what is best and compare.
<b>L</b> egal	Harmonization of requirements and adaptation, less bureaucracy. Responsibilities for autonomy robots, responsibilities for problems with techniques which may cause extra costs.
<b>E</b> nvironmental	Less environmental impact, monoculture and efficiency vs biodiversity

## 5.4.2. Clustering actions with other projects for policy recommendations

### 5.4.2.1. Online meeting with sister projects May 2022

#### Brief description

On May 16, 2022, PestNu fostered, online, the first meeting of GD projects under call 6.1 (LC-GD-6-1-2020), whose main focus is Testing and demonstrating systemic innovations in support of the Farm-to-Fork Strategy, for promoting clustering and fostering synergies.

#### Goals

The main goal of the event was to have projects presented and discuss their research focus and potential cooperation. Further information and outcomes are available in the other WP7 deliverables.

#### Approach

Besides focusing on clustering for technological aspects, efforts were made for searching for common ground towards the identification of points regarding policy monitoring and worthy of feedback to policy agents.

#### Key Findings

- Interest in joint policy recommendations was expressed by [ClieNFarms](#) (Climate Neutral Farm) which has also highlighted focuses such as how are projects supporting the integration of different environmental aspects; or supporting social valorisation in agriculture
- Also [SchoolFood4Change](#) (Shifting school meals and schools into a new paradigm by addressing public health and territorial, social and environmental resilience) identified space for joint policy briefs
- With [SISTERS](#) (Systemic innovations for a Sustainable reduction of the European food waste) there is a potential collaboration pathway regarding the need for a broader policy context regarding aquaponics and organic farming.
- PestNu emphasized in the potential of its digital platform for agro advisory and business service as a tool able to be used by other projects to upload best practices and training materials, to foster synergies and investment.

### 5.4.2.2. Clustering Workshop Thessaloniki July 2022

#### Brief description

On July 7, 2022, PestNu coordinating institution, CERTH, hosted in Thessaloniki the first 1<sup>st</sup> Workshop on Clustering Activities of PestNu's sister projects. In this workshop more than 20 European project coordinators and the Green Deal project coordinators of LC-GD-6-1-2020 participated and shared their focus and innovations, discussing strategies concerning the Green Deal objectives, as well as for broadening policy context.

#### Goals

The objectives of this workshop were twofold. On one hand, to foster exchanges between the participants and identify and promote potential synergies between European projects to help meet the objective of the European Green Deal: reducing the dependence on hazardous pesticides; reducing the losses of nutrients from fertilisers, towards zero pollution of water, soil, and air and ultimately fertilizer use, and; on the other hand, create a broader policy framework in IPM and INM in organic farming and in novel circular economy food production systems.

## Approach

The event initial presentations, by PestNu partners and IAB members, aimed to highlight the main framework and also opportunities and challenges in areas such as pesticides, fertilizers, from plants to food and throughout F2f stakeholders like industry or retail. Besides the pitch presentation of projects, coordinators were asked to engage in three roundtables focused on the main thematics covered by PestNu:

- RT1: Agriculture 4.0 (regarding the reduction of pesticides/fertilisers)
- RT2: Pesticides free agriculture & Organic Farming
- RT3: Food Wastes

The roundtables focused on the identification of i) background & drivers (barriers, opportunities, etc) ii) commonalities and iii) possible joint initiatives to address the points discussed.

## Key Findings

### RT1: Agriculture 4.0 (regarding the reduction of pesticides/fertilisers)

- Regarding knowledge sharing on precision agriculture participants identified the most used/effective ways currently used to deliver results and knowledge as being mainly conferences, papers, publications, laboratories communities, MSc and PhD, articles on media, open calls and open days.
- Interaction with DIH, AKIS or CAP advisory actions were also reported as being under use.
- Main pathways to collaborate under a common framework reported/identified were synergies, common projects, research, interaction with citizen groups, volunteer groups, active community and demonstrations.
- However, participants agreed on the need to develop collaboration culture and increase available tools and knowledge on how to do it as although it may seem ideal to collaborate, in real life main barriers are to find common ground to work under a common framework - it is necessary to increase design thinking.
- Focus & activities on standardization didn't seem transversal to participating projects (indeed only reported by PestNu) and little was discussed on how could barriers to the application of precision agriculture be overcome using this pathway.
- When asked if the projects' tools satisfied the farmers' expectations and about their engagement in the process different experiences were gathered. Some RT participants reported that although participating in the projects farmers don't necessarily care, they just enjoy possible results. Initial expectations are not necessarily high and thus not all engage but when so they were happy about the results.

- For stimulating adhesion of small and medium-sized farms main tools reported were involvement of associations, open calls, money for research, events, financial networks attract, initiatives that allow for ICT democratization, mass production to lower cost. However, many projects still rely on big farmers due to their openness and skilled staff.
- RT participants found it hard pricing their precision farming tools as different types are covered. Many are free and open, others have free datasets, others can be > 5000 €/year under consulting business models (EO ones, for example). All agreed that mass production can help lower the cost.
- About practices and models followed so that tools can be introduced to market and made available, participants reported i) multi actor approaches, periodic re-evaluation, stakeholders' consultation, use feedback, dissemination within partners, research until target market reach ii) free pilots, constant bug updating with fixed solutions, trainings, showing of results and iii) empathizing with end user, real problem addressing, problem solving efficiency. Tools have to be easy to use, sustainable and efficient for SMEs.
- Regarding training, the projects reported they train relevant stakeholders like technicians in the farm, policy advisors, municipalities, associations, partners near farm, DIH or support services through free and open tools for training.
- The possibility of joint actions like a common training workshop for several projects was evaluated. Although it seemed a nice idea, it was found difficult to be implemented due to barriers such as difficulty for cooperation under a common framework and finding common ground among projects.

#### **RT2: Pesticides free agriculture & Organic Farming**

- Regarding barriers, PestNu Coordinator brought to discussion the “no soil” condition stated in the EU organics legislation, which is an important barrier for the labelling of aquaponics' vegetables as organic food, thus hindering the lowering of production costs. As farmers don't use chemical pesticides in aquaponics the question was raised on what could be proposed and justified in order for regulations to be more flexible.
- Participants highlighted this is a relevant barrier, felt in several countries, and that is not just an aquaponics problem, as hydroponics are also not considered as organic in the EU, whereas in the USA they are, thus interfering with market. The need to propose changes in regulations as policy recommendations was identified.
- The bases behind EU organics legislation and this condition were discussed. The principle that healthy soils lead to healthy plants, able to resist diseases, namely the argument that if plants are grown organically on soil, they become resistant to several pathogens, was identified as the major one.
- The problem of potential pesticides residues uptake by plants in agricultural commodities was pointed out as an example of risk when organic crops are cultivated on soils being used for years for conventional farming. It was discussed whether monitoring programmes for pesticides residues are implemented by different MSs and Greece. It was pointed out that despite the several findings of soil contamination (literature, data bases) the monitoring of pesticide residues in soil is not required at the EU level, in contrast to water monitoring regulated by the EU. It was also mentioned that organic food is being monitored for pesticides residues by Member States (MS) and if residues are found the source of origin is being examined by



authorities. The production of food on soils containing pesticide residues is a concern with respect to possible uptake of residues by the (following) crop(s), even though authorised pesticides should not be persistent in soils. Although this is an aspect covered in pesticide registration requirements there are cases where residues are found, especially when organic crops are cultivated on intensively used soils for arable and perennial crops or during the transition period from conventional to organic farming. Pesticide residues were detected according to the EFSA report (EFSA, 2018) where 6.5% of the organic food samples analyzed during 2013–2015 from EU MS, Iceland and Norway contained pesticide residues; including long since banned pesticides\*<sup>13</sup>. The MRL exceedance rate for organic food amounted to 0.2% of the samples tested. It was considered that such findings could be used to support the claim that hydroponics should be allowed in organic farming with strict rules. In the end, there is high need to produce organic food with no pesticide's residues hence advantages of Hydroponic Culture for Organic Cultivation should be highlighted and disseminated to Legislators.

- For addressing this barrier a possible pathway worthy to be explored was identified - those working on hydroponics and aquaponics and also the industries producing fertilisers and pesticides could work together, writing down some justifications and recommendations on why we don't necessarily need soil and why/how/what procedures can be used in such modern food systems so that they could be considered as organic farming and why should Europe change these strictly directives, as they may have a lot to lose economically from USA or Asia or from other countries. So, all this should be written down with justifications from both a technical and also economical perspective, stressing also what will the industries that produce organic products gain. Also, agronomists can help regarding the health of the plants. "So, we can work together on that and present something at the end of the project that is reasonable (PestNu PCo)". For this, the need to make bridges and promote synergies with organics organizations like IFOAM or Copa Cogeca and access conditions under which they will be willing to collaborate on this, was identified as being vital.
- Another point discussed was labelling as a form of food expressing its sustainability and how projects, products and technologies relate to labelling initiatives. The benefits arising from this sort of tools were highlighted as well as the need to force it into practice by an European Directive. The existence of some labels was identified but no clear relation with the Sustainable EU Food System - new initiative.
- Despite its enforcement as a policy, the need to safeguard regional specificities and work at Member State level was highlighted. "We must be careful on how we include the directives because Europe implements strict conditions that are not possible to apply" differences between Northern and Southern Countries should be taken into account.
- Regarding further actions to be promoted by EU projects, the need to combine information was stressed as the key for it - "We have to connect the dots from farm to store and be near to the farmers to train them, translating all these technologies to practices". "Sustainability is not only one solution, it is holistic. You need to monitor all the process to get sustainability. I don't think one project can achieve this; this could be done in collaboration with other projects."
- Regarding knowledge transfer and training RT, participants were asked if they are directly connected to AKIS and CAP systems. Multi-actor approach and stakeholders' involvement from the very beginning of the project was stressed as being crucial to success. "The best way to

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<sup>13</sup> Monitoring data on pesticide residues in food: results on organic versus conventionally produced food. European Food Safety Authority (EFSA). First published: 11 April 2018 <https://doi.org/10.2903/sp.efsa.2018.EN-1397>.



transfer the knowledge to the users, is a qualified transfer service like extension service". Funding opportunities in the new CAP for collaboration of unions or any kind of consortium of growers for transfer of knowledge and solving specific problems was also pointed out, as the proportion has changed with more money coming if farmers prove that they do something more. "It will be a motive for growers".

- Regarding useful tools for decreasing organic food prices using Projects' technologies, and increasing dissemination of environmental good practices used for food production participants said that although useful, subsidies shouldn't be the only policy tool to be used by the EU. Tools encouraging knowledge transfer and demonstration are also needed. "Farmers need to be trained and all this information needs to be disseminated to them". "The growers said that they need an intermediate stage which is called demonstration".
- Best approaches/tools identified were demonstration sites, living lab workshops, open days, and training on how to use the new products, technologies and practices. "Even the consultants. Train the trainers.", "Advisers from companies".
- "Another point is that we don't have a database to share on what we are doing or take advantage of what is done between the related projects. Create an initiative for creation of a database for projects". The possibility of using PestNu's digital platform for such a purpose was identified.
- Another identified barrier was that the procedures to put new products in the market differ according to the product nature and are long. While bioproducts and fertilizers seem to occur at MS level, and need approval in every country, anything entitling itself as a plant protection product enters a longer and expensive pathway, taking place at European level.

### **RT3: Food Wastes**

- Many of the participants had already been together in the meeting promoted by the GD-SO on the 31st of May 2022 so this RT allowed for continuity of discussion.
- Disparity of projects goals and scopes led to the for identifying a few common barriers such as the lack of standardization on news ingredients/extracts; the food waste sourcing logistics, the diversity of business models for waste usage, the need to assess economic viability, the length and morosity in the registration of new products deriving from waste and also, for instance, the regulation on animal by-products not intended for human consumption which rules the use of this type of "waste".
- However projects found to be covering a lot of complementary areas, which could contribute for further cooperation like Demonstration & Scaling Up farms, Living Labs, New products (biopesticides, biofertilizers, food, nutraceuticals, packaging), Guidelines for sustainable retailing, Modelling, Data Space?, Policy recommendations, Mobile valorisation technologies, Impacts (reduction CO2, Measurement for FLW, Governance, Value Chain Approach, Reduction, Valorisation, Policy and many waste sources including that from fruits and vegetables, Olive, Forestry, along with several other sources.
- Common ground was found for synergies and joint actions enabling collecting solutions for sharing with farmers, training activities and technology and knowledge transfer.
- Projects should try to connect to AKIS, EIP-AGRI, EU Code of Conduct subscribers, for identifying needs for information, and for later sharing activities, results etc.

- It was stressed that joint policy recommendations should be explored, namely by periodic sharing of experiences.
- Continuity of clustering and sharing for deepening relations and joints actions was found essential.

## 6. Conclusions and Recommendations

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One of the main conclusions drawn out is that **the policy and regulatory framework is actively changing** and new tools have either recently been published or are under development. Moreover, the previously known frames are being adjusted. This is happening **in several fronts such as digitalization, agroecology and sustainable farming or circular economy**. Apart from the main policies (ex: Green Deal, Farm 2 Strategy, Organic or Circular Economy Action Plan), novelties in regulations and instruments and the way everything is connected and goes together towards the achievement of 2030 goals **doesn't seem to be, yet, perceived by all F2f actors**, at least in a homogenous way throughout their nature and position. Mostly those that are not horizontal institutions (ex: farmers, companies, technologies and service providers, industry and citizens) may be stuck to the experiences with previous versions, or feel outside of the momentum and not aware of the holistic approach behind the new European policies and how that asks and recognizes them as (an important) part of the process. **For succeeding in the enforcement of these tools all the involved stakeholders have to be better (and quickly) informed and aware of changes and new opportunities deriving from it**, for being able to join efforts and also have a critical overview, needed for policies and regulations evaluation. In these context, deliverables such as this public report will may be useful as they provide quick insights on this dynamic and feel the pulse on how actors perceive it, but they are scattered and incomplete asking for further support.

Thus, it is recommended that

- PestNu (and other EU funded projects) communication and dissemination activities such as conferences, workshops and eventually training (continue to) actively involve policy makers (as speakers and participants) and promote the dissemination of this new set of policies and regulatory tools next to interest parts;
- PestNu (and other EU funded projects), based upon deliverables and knowledge gathered during activities, engages with EC initiatives on laws and policies currently in development, namely in those open for feedback or public consultation (ex: Soil Strategy) thereby contributing for them;
- Clustering efforts with other projects should attempt the production of joint policy recommendations, namely by gathering working groups for such purpose where periodic sharing of experiences, deliverables and definition of timelines and milestones take place. The GD-SO is available for help in supporting the implementation of such action;
- At least for EU funded project consortia it would be helpful if EC services could promote specific and targeted training initiatives for the different types of stakeholders (ex: small workshops; asynchronous training) targeted at passing the main messages and novelties brought by the new tools and accelerating their enforcement (ex: rules on the making available on the market of new pesticides, fertilizers and biostimulants).

However, **there are barriers already identified such as the “no soil” condition stated in the EU organics legislation, which hinder hydroponics and aquaponics success** as sustainable and accessible systems for the production of healthy food, particularly fresh vegetables and fruit maximising output and minimising the use of resources (space, soil and water), despite further recognition. As plants not naturally growing in water produced through hydroponics & aquaponics systems cannot be certified

as organic, their marketability decreases, influencing profit and willingness for replication of these novel approaches. Moreover, competition is biased as this reality is not shared by countries like USA and Canada. **It could be worth to explore and assess the distinctive environmental conditions that could justify aquaponics (& hydroponics) application for organic food production**, namely those found in the Southern Countries covered by PestNu consortium, **and the possibility of accessing exception permits** to the “no soil” condition set by organic legal rules, in resemblance to what happened in the past with Northern countries.

Therefore, it is recommended that

- PestNu promotes synergies with those working on hydroponics and aquaponics, agronomists and also the industries producing fertilisers and pesticides for a joint effort towards the assessment why/how/what procedures can be used in such modern food systems so that they could be considered as organic farming and don't necessarily need soil. Arguments should cover both technical and economical perspectives, stressing also what will the industries that produce organic products gain. First steps should comprise the contact with organics organizations like IFOAM or Copa Cogeca and access conditions under which they will be willing to collaborate

Along with the new policy and regulatory framework, **the networking panorama seems to be changing** and **there are many relevant operational groups and actors** involved in the adjustment of regulations and policies. **Also, the way they (will) interact** – partnerships, missions, AKIS, voluntary commitments, platforms - **is relevant** to understand and better design and adjust innovations uptake and success. As **networking seems to be the key for the success in reaching many of the upcoming goals, effort should be put in its promotion** getting people to know initiatives and networks by names, involving them in the events, promoting connections and clustering. It's also important that all F2f actors are familiarized with these dynamics and for such purpose we hope to have given some contribution in this deliverable.

It is, nevertheless, recommended that

- PestNu (and other EU funded projects) communication and dissemination activities such as conferences, workshops and training (continue to) actively involve these relevant actors, institutions and operational groups promoting debate and discussion as they are also involved in the making of policies and regulatory tools and need to be aware on how to make them open to innovation. Moreover, by doing such, Project's communication and dissemination events inscribe themselves as relevant networking tools under the new policies design;
- Synergies are fostered directly with these actors based upon deliverables and knowledge gathered during activities, for identifying gaps of knowledge, needs and requirements, common and complementary ground, etc. Additionally, this is important for succeeding on the drafting of joint policy recommendations stated above, which requires stepping out of each project knowledge and action silo and increase the awareness about other parties' perspectives.

**Innovations like those that are brought up by PestNu and sister projects are of interest and nourished by national and local policy makers, or regulatory and control entities as they constitute useful means to enforce current plans and strategies** towards the transition of producing systems towards sustainability. **The better these agents understand how far technology is going and what are its trends the better they can accommodate them and meet their needs**, thus

welcoming initiatives that allow for such notions. Among these are **events** such as those promoted by PestNu (workshops, demonstrations, training), and others more specific and allowing for a wide overview of best available techniques, its range of applicability and reporting of its use in different agriculture and countries' realities such as **joint databases** combining technologies, case studies and guidelines for application **may be some examples of useful outcomes. This effort also fits knowledge transfer to farmers and innovations users, of course.**

It is, therefore, recommended that

- PestNu (and other EU funded projects) to engage with the building of existing or planned databases combining technologies, case studies and guidelines for application of innovations, for example working closely with EIP-AGRI for identifying relevant initiatives to build upon such as those focusing on Demonstration - for which [Farm Demo](#) is very good example, Digitalisation (ex: [Smart4MS](#) and other examples<sup>14</sup>), Organic Farming, Sustainability, among others.
- PestNu (and other EU funded projects) to engage with EU knowledge reservoir(s) for practice that will serve as advisors' back-offices for innovation support and advice, as well as the innovation strand of the CAP network such as the [EU Farm Book](#).
- PestNu explores the potential of its own digital platform to meet/fit existing gaps in this field and act as gathering and clustering platform connected to these EU initiatives.

**Precision farming tools, improved agro-ecological practices and bioproducts for plant and soil health are very welcome and in line with Agroecology and Organic Farming operators' needs** as they allow for useful data and tools to support their practices and decision making and to corroborate and strengthen many of the current practices. Also, **traditional farmers and those implementing IPM feel and/or expect the benefits** that DSTs and AOPs bring to the transition of food systems towards sustainability. **However, they need to trust new technologies for adopting and using them** and they feel reluctant whenever testing and proving in several conditions and over representative periods of time don't occur. Also, many indeed buy emergent technologies because they're subsidized but do not adopt them as further support to adaption to each farm's reality has no eligible support.

It is, therefore, recommended that

- PestNu (and other EU funded projects) engage in and promote demonstration initiatives, fostering that authorities, advisors and tech developers come together and implement field trials and demos, and make community discussions thereby engaging in the process of proving that the new technologies work and letting the farmers see by themselves.

**Also, many farmers struggle with lack of scale allowing for hiring technical staff. Others feel difficult to, on top of that, have them skilled in different areas of knowledge to tackle tools from microscopic to macroscopic level. And thus, trained advisors are needed as well as eligibility of costs, regarding their hiring, under incentive schemes.**

**Knowledge sharing and transfer to farmers and their advisers emerged as one central point for coordination with policy makers and operational groups and interaction with AKIS, the (new) CAP Networks and DIH appear as the main pathways.**

<sup>14</sup> [2018, EIP-AGRI Workshop: Enabling farmers for the digital age: the role of AKIS](#)

It is recommended that

- PestNu should work and follow up closely with these players (CAP networks, AKIS, DIH) and, for instance, access needs and requirements to later on feed them on the most meaningful topics (which are targeted in PestNu research) thus better targeting the practice abstracts that will be build. For instance, feeding and clustering with [i2connect](#) project could be beneficial;
- Not only farmers but also their advisors and even their trainers are covered by PestNu training;
- Further incentives to knowledge share and transfer to the field take into consideration the nature (micro to macro) and diversity of skills needed for innovations uptake enabling funding possibilities allowing that not only farmers but also their cooperatives and associations are able to absorb innovations. It could be also beneficial, for example, to promote that precision farming tools uptake by these organisations and then made available to farmers on a pay-per-use or as-a-service models;
- Synergies with regional experimental stations and living labs for adjustment and adaptation of technologies to different countries' agricultural realities are encouraged as well as with standardization agents as these are very active areas (both digitalization and new fertilizing materials and biostimulants) requiring for action towards effective innovations uptake. In what concerns precision farming this may have some momentum also under sectorial AI [Testing and Experimentation Facilities](#) foreseen under the Digital Europe Programme.

Yet, and for now, it seems that **nor AKIS realities nor its strength are homogenous among the MS that constitute PestNu consortium**. With regard to **DIH, they are still on the process of starting operations (in the form of DIH), expectably from September 2022 onwards**.

Thus, it is recommended that

- Synergies with AKIS are further explored, for instance, by getting to know countries realities<sup>15</sup> and exploring synergies with national actors, and coordinating with EIP-AGRI and clustering with [i2connect](#) project could be beneficial;
- Coordination and interaction with Agrofood DIHs is enforced, accompanying in Sweden (as PestNu partners RISE and Agrovast lead a [candidate Agrofood DIH](#)), Spain (with the [candidate Agrofood DIH in the region of Murcia](#)) in Greece (with the [candidate Agrofood DIH](#)) and eventually in Portugal (with the [candidate Agrofood DIH](#), which is already an initiated synergy)

**The PestNu project is taking place in a quite dynamic framework of policies and regulations and thus some challenges emerge**. On one hand, the goals and ambitions PestNu aims to fit with its innovations and systemic approach are well known and there are, by this time, some opportunities and tools for its enforcement, requiring for targeted synergies. On the other hand, a lot of them are still being put in place and **barriers may arise from the possible lag between agendas/plans of action**, and care should be taken so that it doesn't undermine PestNu expected impacts. For example, data sharing mechanisms and easy(ier) pathways for assessing farmers needs and requirements seem to be still on a start-up phase, which may impact DSTs deployment and the incorporation of specific solutions and

<sup>15</sup> Further insight on AKIS countries realities may be explored in [i2connect country reports](#)

user-friendly interfaces on the DSS. Also, the regulations for putting new bioproducts in the market are still not totally defined as well as the context for assuring minimisation of nutrient losses.

Then, it is recommended that

- PestNu partners are alerted and aware of these dynamics, mainly those relating to their scope of action, and take them into account during project implementation continuing to identify barriers and participating in the process of coordination with policy makers and operational groups;
- Proper synergies are established (eg. EU Partnership on Agriculture of Data and others) towards creating the ground for assuring that results and outcomes are, as far as possible, suitable to adaptation to the imminent reality so that maximum sustainability on the exploitation of results is attained;



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