D1.2 Public and private institutions and citizens from farm needs and requirements

SEVT

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PP	Restricted to other programme participants (including the EC services)	
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List of Abbreviations & Definitions

Abbreviation	Definition
AOPs	Agro-ecological and Organic Practices
DSTs	Digital and Space-based Technologies
EU	European Union
EC	European Commission
AI	Artificial Intelligence
LCA	Life Cycle Analysis
DSS	Decision Support System
GDRP	General data protection regulation
F2F	Farm to Fork
Q	Question
IoT	Internet of Things

Executive Summary

Exploring perceptions, needs, drivers and barriers concerning Agro-ecological and Organic Practices (AOPs) and Digital and Space based Technologies (DSTs) of (i) citizens and (ii) public and private institutes is essential for identifying the special characteristics of each group and country, providing valuable information for the current level of awareness, knowledge and exploitation of these practices and technologies. Lack of awareness and low level of AOPs and DSTs adoption can greatly affect the achievement of the European Union (EU) Farm to Fork (F2F) Strategy targets.

Thus, the aim of this report is to **gain a wide insight into the main perceptions, needs, drivers and barriers of (i) the citizens and (ii) the public and private institutes, concerning the AOPs and DSTs and to translate it into specific recommendations which will contribute to the design of systemic innovation and to support the future activities of the project**. This report presents the outcomes of two on-line surveys, for the citizens as well as the public and private institutes that took place in the context of Task 1.1.

Building on the data collected, descriptive and inferential analysis were applied to explore relations, patterns, and potential groupings, producing meaningful intelligence that can feed the subsequent tasks of the project. **The key findings of these 2 surveys analysis, include: (i) the understanding of the citizens as well as the public and private institutes perceptions and needs and (ii) reveal the main drivers and barriers as well as their support needs upon which PestNu can better target and plan the project's foreseen actions**. The report is structured as follows:

Section 1 provides a short introduction of the scope of the project and the main targets of the two surveys.

Section 2 presents an up-to-date literature review regarding the AOPs and the DSTs.

Section 3 includes all information related to the two on-line surveys design and implementation.

Section 4 is the most extensive section of the report, and it has been designed to present the main outcomes of the two surveys analysis. We first present descriptive findings closely related to **(i) the citizens and (ii) the public and private institutes** and the participating countries followed by the perceptions and estimations of the participants for the levels of awareness, understanding and penetration of the F2F Strategy and its targets, the reduction of pesticides and fertilizer use and the loss of nutrients, the familiarity, use and future exploitation of the AOPs & DSTs, the incentives which are more appropriate for their adaptation, and for the most suitable training and networking activities.

Section 5 presents a summary of the key findings analysis, conclusions, and recommendations.

Table of contents

List of Figures

List of Tables

Introduction

The coronavirus crisis has shown how vulnerable we all are, and how important it is to restore the balance between human activity and nature. The current food and farming systems require a fundamental transformation considering the increasingly worrying environmental, health and socio-economic challenges that have emerged regarding the overuse of hazardous pesticides and fertilisers, and loss of nutrients. Industrial agriculture is largely responsible for the depletion of natural resources based on the increased population and increased demand for food production. In terms of environmental impacts, more than 11% of the EU landscape is affected by moderate to high soil erosion [1]. Agriculture can impact in different ways the adequate chemical and good quantitative status of groundwater and surface waters. Water quality may be negatively affected by the presence of pesticide residues, nutrients from fertilisers, or sediments from soil erosion. On average 44% of total water abstraction in Europe is used for agriculture. The rise in intensive agriculture, and associated land-use change, is also a major driver of biodiversity loss. Recent data on EU Biodiversity indicates that 60% of species and 77% of habitats assessed are in an unfavourable condition of conservation, that intensive farming is an important factor leading to biodiversity loss while the decline of pollinators is reducing yields. Additionally, pesticide residues on vegetable and fruits pose human health to chronic diseases and deaths from over exposure [2, 3].

In the last decade, the European Commission (EC) has funded several projects for Integrated Pest Management (IPM), Integrated Nutrient Management (INM) and Precision Farming tools. Despite the major steps, progress has not been satisfactory either because many national action plans failed to be established within the five-year legal deadline, many haven't harmonized at the EU level, standards for the innovative technologies and methods have not yet been designed by international organisations or regulations were not adopted by EU farmers. Also, many precision farming tools/technologies and organic products have not yet been demonstrated and tested in real case scenarios from primary production to consumption and multi-actor synergies with all F2F stakeholders were insufficient. Finally, overall technical solutions to support farmers in their decision-making and investment needs are still required especially to small and medium-sized farms, for a business-driven innovation and market uptake.

PestNu targets the field-testing and demonstration of DSTs and AOPs under a systemic approach to reduce the pesticides and fertilisers use, and loss of nutrients.

The novel DST which are under examination, are:

- AI robotic traps for real time pest monitoring
- Autonomous mobile robots for pesticide monitoring and 3D spot spraying
- Earth Observation missions with robust Agroradar AI algorithms to map soil/plant nutrients and pest plant inputs using Copernicus data/services
- In-situ and real-time nutrient analysers
- Real-time Algae and bacteria sensor analyser: Flow Cytometer

All the DST will be interconnected to a user-centric cloud-based farm management system, which features a robust Decision Support System (DSS) integrated with a blockchain based system for DST data evidence, integrity, and AI models verification and with a cybersecurity platform to prevent cyber-attacks and Internet of Things (IoT) vulnerabilities.

The examined AOPs are:

- On-site production of biofertilisers from agricultural wastewaters through a robust automated drainage recycling system via an innovative enzymatic hydrolysis procedure;
- Novel foliar biopesticide formulated by circular bioeconomy operations, targeting fungal diseases with biostimulant effect; and
- Advanced nutritional programs for organic farming.

The showcase systemic DST & AOP solutions will be demonstrated and tested in aquaponic and hydroponic greenhouse and open field vegetable cultivation in Greece and Spain. A pesticide reduction program will evaluate the maximum residue and the acceptable daily intake levels to ensure vegetable's food safety and Life Cycle Analysis (LCA) activities will be performed.

Among the first steps of the project is to draw an overall view of the users' needs and requirements to identify country and citizens and institutions specific needs and to benchmark on EU level through surveys involving relevant stakeholders.

The consortium will also explore relations, patterns, and potential groupings, producing meaningful intelligence that can feed the project activities applying system thinking to the specificities of creative approaches to regional, national and harmonization with EU level.

The purpose of D1.2 is to collect information from citizens as well as public and private institutes for their perceptions, needs, drivers and barriers concerning AOPs and DSTs and to produce a comprehensive report for the sector which will translate the user requirements for real case situations into system ones (functional and non-functional), covering the whole systemic innovations design and efficient support (easy to use, cost affordable, safety) for users along the F2F chain.

The outputs of this Task will be directly used in WP2, WP3, WP4, WP5 and WP6.

Theoretical Background

1.1. Agro-ecological and Organic Practices (AOPs)

According to Wezel, agroecological practices can be characterized as agricultural practices aiming to produce significant amounts of food, while valorising ecological processes and ecosystem services by integrating them as fundamental elements in the development of the said practices, as opposed to simply relying on external inputs such as chemical fertiliser and synthetic pesticide applications, or on technological solutions such genetically modified organisms. This assumes that biological processes can replace chemical or physical inputs while limiting external costs, particularly environmental costs. Based on processes that decrease external inputs and negative environmental consequences, such as nutrient cycling, biological nitrogen fixation, natural regulation of pest and diseases, soil and water conservation, biodiversity conservation and carbon sequestration, agroecological practices contribute to improving sustainability of agro-systems. Agroecological practices include cover crops, green manures, intercropping, agroforestry, biological control, resources, and biodiversity conservation practises [4].

FAO/WHO Codex Alimentarius Commission, (1999) defines "Organic farming as holistic food production management system, which promotes and enhances agro-ecosystem health, including biodiversity, biological cycles, and soil biological activity. It emphasizes the use of management practices in preference to the use of off-farm inputs, considering that regional conditions require locally adapted systems. This is accomplished by using, where possible, agronomic, biological, and mechanical methods, as opposed to using synthetic materials, to fulfil any specific function within the system" [5].

Organic farming is characterised by the prohibition of most synthetic chemicals in both crop and livestock production [6]. However, it incorporates a range of other management practices, many of which are uncommonly/exceptionally utilised in conventional systems. Some of these practices are intrinsic (e.g., avoidance of soluble inorganic fertilisers and synthetic pesticides), whilst others are only encouraged by the standards (e.g., field margin management to promote natural predator populations) [7].

In the organic farming practices the use of chemical synthetical pesticides and fertilizers is prohibited. The practices advocate healthy products free from components that may harm humans and nature and include but are not limited to industrial pesticides, fertilizers, clones, GMOs, chemical medications, hormones, growth-boosters, etc.

The AOP technologies and methods, show low level of adoption from the farmers. Soil and nutrient problems, based on deficiency, can often be identified by means of various soil, site, and crop-related indicators. For problems related to the overuse of nutrients, the on-farm indicators are less clear from visual assessment [8]. More sophisticated experiments by farmers are avoided due to high costs and the difficulty in changing away from long-established farming methods. Moreover, farmers are sceptical of adopting organic practices (e.g., biofertilizers, biopesticides) or continue their organic production activity only where financial support is provided [9]. This attitude arises from the low reported yields and production volumes and many farmers see organic farming as risky. This impacts consumers as the organic food products in market are expensive. The farmers believe that market aspects and institutional and regulatory factors are the key barriers to the development of organic farming. Crucial to be mentioned is, that many of the bio-products that appear in the market e.g., biopesticides formulated by

agro/food wastes which are not under the organic rules, thus the product cannot be used in organic farming [10].

Therefore, treatment protocols and protocols for field-scale assessments of biofertilizers and biostimulants (used in biopesticides) should be established and followed by manufacturing industries. Many barriers and challenges appear to circularity of protected cultivation under circular economy systems (aquaponics, greenhouses) [11]. Soilless cultivation systems and especially closed or re-circulating hydroponic systems can significantly reduce fertilizer run-off but not eliminate it, and the spent nutrient solution must be ultimately collected and treated at the end of the crop cycle. If the water used contains solutes that are not absorbed by the plants, then continuous reuse of the drainage solution in closed hydroponic systems will result in salt accumulation. Therefore, many greenhouse growers operate open fertigation systems, i.e., are not recycling nutrient solutions. This practice of discharging used nutrient solutions as wastewater entails severe environmental problems and is a waste of water and fertilizers. Moreover, advanced climate and fertigation control systems and DSS are important tools to control the inputs and outputs of closed/semi-closed greenhouse system and significantly affect the degree of circularity obtained. In addition, the advanced use of data to enhance the optimal use of inputs and the growing environment increases the potential to grow more organically. All these result in high investment costs making labour intensive to maintain a certain level of circularity. Until currently, optimal solutions for circularity have not been developed for all regions around Europe.

1.2. Digital and Space-based Technologies (DSTs)

Digital and space-based technologies are tools, systems, and methods for precision and smart agriculture e.g., geographical information systems, remote sensors for water and nutrient stress and insect detection, proximate sensors for soil (N concentration and pH) and crop conditions, robots both ground and aerial for monitoring yields, Decision Support Systems for integrated pest and nutrient management, etc.

Digital and space technologies in precision farming in Integrated Pest Management (IPM) and Integrated Nutrient Management (INM) have not yet been demonstrated, due to deficits in user-oriented research at basic, applied and particularly cost/benefit analysis level. An additional reason may be the lack of technology transfer programmes and support resources which are necessary for business-driven innovation and market uptake. Most EU projects that are funded via public resources are performed by research centres and universities. Most of them are robust but are far from the real situation of the primary production to consumption since close collaboration with all F2F stakeholders was insufficient. Also, they are currently under development in research laboratories and companies isolated not only from other research groups but also from standards designed by international organisations [12]. Additionally, the benefit of current precision farming systems for IPM and INM to the citizen of farms is not always clear as investments are required, and the actual reduction of inputs may not always be readily known. Some cost-benefit tools do exist, but they are designed for specific scenarios, climatic conditions, and cropping systems. Also, the information needed to calculate the economic benefits may be lacking. Other gains, such as social, and some environmental benefits, are difficult to quantify and most likely to be underestimated. Also, the existing practices should specifically be designed for small and medium-sized farms need to be affordable and easy to use and contribute to high crop production and yield since an initial investment is required and due to their limited revenues cannot be adapted. So new business models are needed to avoid this lack of adoption.

Another problem is that the current DSS are based mainly on collected data and translating these data into useful information for daily farm management are still insufficient. There is a serious disconnection

between farmers' needs and the DSS that are on offer are facing lack of user-friendly visualization interfaces and follow-up of informed decisions for auto-making decision processes and data evidence and integrity [13 & 14]. Also, they are not sufficiently scalable and adaptive to efficiently manage, complex and dynamic data environments. Finally, digitization in farming ecosystems and the rapid evolution and usage of smart communication technologies and tools, bring new threats and risks which generate an enormous exposure to cyber security threats and vulnerabilities [15].

Survey Description

1.3. Overview

Two surveys were created by SEVT in collaboration with the project's consortium. The main mean for the execution of the surveys were the 2 on-line questionnaires. The 1st survey was addressed to the citizens and the 2nd survey to the public and private institutions.

1.3.1. Citizens Survey

The aim of the survey for the citizens was to gather the opinions and impressions from the citizens of the project partners' countries on the project key issues, meaning:

- the Agroecological practices,
- the differences among the conventional and the organic farming, and
- the use of DSTs technologies on the agrifood production.

The questionnaire was addressed to citizens in general, with a special focus to those interested in agricultural production and have tried to produce their own agricultural products.

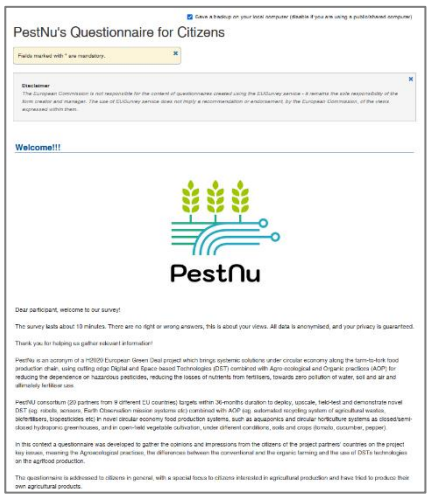


Figure 1: The introductory landing page for the citizens survey

The survey, as indicated in Figure 1, was developed, and designed in English, using the online *EUsurvey* tool, and it was translated into 6 different languages, as follows:

- German
- Greek
- Italian
- Portuguese
- Spanish
- Swedish

After Month 6 of the project, a draft of the questionnaire was circulated among the partners for discussion. Following the first draft, the questionnaire was refined, and it comprises of 6 main sectors. The 6 sectors include 25 questions and is estimated to take no more than 10 minutes to be completed. The survey gives an overall introduction to the participants, contact details of the project, the personal management data policy and it is asked to consent for their participation.

1.3.2. Questionnaire structure

As it is referred above, the questionnaire comprises of 6 main sectors which are described below:

1. Welcoming note
2. Informed Consent form for survey
3. Introductory Data
4. Experience and opinions for Agro-ecological and Organic Practices (AOPs) and Digital and space-based technologies (DSTs)
5. Personal Data Management

6. End of Survey

All information were collected in compliance with the general data protection regulation (GDPR) of the European Union and was used solely for research and statistical reasons. No natural person can be identified from the provided data. Finally, if someone wanted to participate had to agree to the terms and conditions set out to a dedicated consent form that was included at the beginning of the online survey questionnaire.

The questionnaire is presented in Annex I.A.

1. Welcoming note

In this section, the participants receive the main elements for the scope of the project, the aims of the survey and the contact details of the Project Coordinator and Survey Studies Leader.

2. Informed Consent form for survey

In the second section, it is provided the Informed Consent form for the survey where it is described in detail what kind of information is needed. This section includes 2 questions where the participants are asked to agree or not whether their participation is voluntary and if their responses can be used by the PestNu Consortium for the work in the project and can be used for scientific research papers. If a participant chooses "No" as an answer in one or both questions, the survey ends.

3. Introductory Data

In the "Introductory Data" section, 3 mandatory questions and 1 voluntary are included. The first one is referred to the type of citizen where 3 options are given:

- who have tried to produce by their own some agricultural products in rural areas
- who have tried to produce by their own some agricultural products in urban areas (cities and towns)
- with non-experience in any kind of own agricultural production

The second one is referred to the age group where 7 options are given:

- 18-24
- 25-34
- 35-44
- 45-54
- 55-64
- 65-74
- >74

The third one is referred to the country where 10 options are provided:

- Austria
- Cyprus
- Greece
- Ireland
- Italy
- Portugal
- Spain

- Sweden
- United Kingdom
- Other

If someone selects "Other" a new field opens and it is asked to indicate the country.

The last one is referred to the awareness on the F2F Strategy where the participants are asked to indicate if they have heard for it or not.

4. Experience and opinions for Agro-ecological and Organic Practices (AOPs) and Digital and space-based technologies (DSTs)

In this section, 21 questions are included aiming to provide insights into the experience on Agro-ecological and organic practices (AOP), on cultivation of agri-food products, on smart farming or precision agricultural technologies and on the satisfaction of the information received for the agri-food products. The 4 out of 21 questions follows the Likert Scale, 11 are multiple choice, 5 are dichotomous (yes, no) and 1 is open type.

5. Personal Data Management

In this section, it is provided the personal data management policy followed in this survey where it is described in detail the data controller and the relevant contact information.

6. End of Survey

In the final section, the participants are thanked for their participation and info contact for the project are provided.

1.3.3. Public & Private Institutions Survey

The aim of the survey for the public and private institutions was to gather their opinions and views on the key issues of the project and to deepen the understanding about how relevant stakeholders consider the function and the use of pesticides and fertilizers and the exploitation of DSTs.

The survey, as indicated in Figure 2, was also developed, and designed in English, using the online *EUsurvey* tool, and it was translated into 6 different languages, as follows:

- German
- Greek
- Italian
- Portuguese
- Spanish
- Swedish


PestNu's Questionnaire for Public & Private Institutions

Fields marked with * are mandatory.

Disclaimer

The European Commission is not responsible for the content of questionnaires created using the EUSurvey service - it remains the sole responsibility of the form creator and manager. The use of EUSurvey service does not imply a recommendation or endorsement, by the European Commission, of the views expressed within them.

PestNu

Welcome note

Dear participant, welcome to our survey!

The survey lasts about 10 minutes. There are no right or wrong answers, this is about your views. All data is anonymised, and your privacy is guaranteed.

Thank you for helping us gather relevant information!

PestNu is an acronym for a H2020 European Green Deal project (with a duration of 3 years) which brings systemic solutions under circular economy along the Farm to Fork food production chain, using cutting edge Digital and Space-based Technologies (DST) combined with Agro-ecological and Organic practices (AOP) for reducing the intensive use of conventional pesticides, reducing the losses of nutrients from fertilisers, towards zero pollution of water, soil and air and ultimately fertiliser use.

PestNu consortium (20 partners from 9 different EU countries) aims to deploy, upscale, field-test and demonstrate novel DST (eg. robots, sensors, Earth Observation mission systems etc) combined with AOP (eg. automated recycling system of agricultural wastes, biofertilisers, biopesticides etc.) in novel circular economy food production systems, such as aquaponics and circular horticulture systems as closed/semi-closed systems (hydroponic greenhouses), and in open-field vegetable cultivation, under different conditions, soils, and crops (tomato, cucumber, pepper, lettuce).

We are using this questionnaire to gather the opinions and views from the public and private institution representatives of the project partners' countries on the key issues of the project and to deepen our understanding about how relevant stakeholders consider the function and the use of pesticides and fertilisers and the exploitation of DSTs. The responses from the survey will guide us to plan future project activities.

We are very interested to hear your insights concerning the reduction of pesticides and fertiliser use and the loss of nutrients. This will support our understanding of your needs, and will contribute to the successful project implementation.

Do you have any questions or comments? You can contact us: Project Coordinator, Dr Ria Pechlivani/CERTH (rapechl@iti.gr) or Survey Studies Leader, Dr Fotini Salta/SEVT (fotsal@sevt.gr).

Figure 2: The introductory landing page for the private and public institutes survey

After Month 6 of the project, a draft of the questionnaire was circulated among the partners for discussion. Following a few rounds of consultation among the project partnership, the questionnaire was refined, and its final version comprises of 7 main sectors. The 6 sectors include in total 32 questions and is estimated to take approximately 10 minutes to be completed. The survey gives an overall introduction

to the participants, contact details for the project, the personal management data policy and it is asked to consent for their participation. Additionally, the survey allows for participants to give their email in case they want to receive further project information.

1.3.4. Questionnaire structure

As it is referred above, the questionnaire comprises of 7 main sectors which are described below:

1. Welcoming note
2. Informed Consent form for survey
3. Introductory Data
4. Agro-ecological and Organic Practices (AOPs)
5. Digital and space-based technologies (DSTs)
6. Personal Data Management
7. End of Survey

All information were collected in compliance with the general data protection regulation (GDPR) of the European Union and was used solely for research and statistical reasons. No natural person can be identified from the provided data. Furthermore, if someone wanted to participate had to agree to the terms and conditions set out to a dedicated consent form that was included at the beginning of the online survey questionnaire. Finally, the management policy of datasets is described in detail in a specific sector of the online survey.

The questionnaire is presented in Annex I.B.

1. Welcoming note

In this section, the participants receive the main elements for the scope of the project, the aims of the survey and the contact details of the Project Coordinator and Survey Studies Leader.

2. Informed Consent form for survey

In the second section, it is provided the Informed Consent form for the survey where it is described in detail what kind of information is needed. This section includes 2 questions where the participants are asked to agree or not whether their participation is voluntary and if their responses can be used by the PestNu Consortium for the work in the project and can be used for scientific research papers. If a participant chooses “No” as an answer in one or both questions, the survey ends.

3. Introductory Data

In the “Introductory Data” section, 3 mandatory questions are included. The first one is referred to the country where 10 options are provided:

- Austria
- Cyprus
- Greece
- Ireland
- Italy
- Portugal
- Spain
- Sweden

- United Kingdom
- Other

If someone selects "Other" a new field opens and it is asked to indicate the country.

The second one is referred to the type of institution where 7 options are given:

- Companies, Clusters, Associations of companies in the sectors of AOP or DST
- Farmers' unions and cooperatives
- Business support organisations
- Organisations supporting agro-ecology, organic farming, hydroponics, etc.
- Relevant ministries and public institutions involved in planning, regulation, inspection, etc
- Research institutes/Universities
- Other (please specify)

If someone selects "Other" a new field opens and it is asked to specify.

The last one is referred to the representation of the institute where the participants are asked to indicate if they are replying as institutions representatives or not.

4. Agro-ecological and Organic Practices (AOPs)

In this section, 17 questions are included aiming to provide insights into the experience on Agro-ecological and organic practices (AOP). 15 out of 17 questions follows the Likert Scale and 2 are multiple choice.

1.3.4.1. Digital and space-based technologies (DSTs)

In this section, 12 questions are included aiming to provide insights into the views of institutions on Digital and Space Technologies (DST). 9 out of 12 questions follows the Likert Scale and 3 are multiple choice.

5. Personal Data Management

In this section, it is provided the personal data management policy followed in this survey where it is described in detail what data will be collected, who is the data controller, the rights of the participants as data subject and the relevant contact information.

6. End of Survey

In the final section, the participants were thanked for their participation, asked if they want to provide their e-mail for further information and the contact information for the project is provided.

1.4. Surveys' dissemination

A wide dissemination campaign was launched in May 2022 and both surveys were shared among all 20 partner organisations, across 9 participating countries (Greece, Italy, Spain, Portugal, Austria, Sweden, Ireland, Cyprus & United Kingdom). The core means for dissemination were via direct email contacts, social media platforms (Facebook and LinkedIn) and personal contacts through phone calls or meetings.

The main target groups for the survey for citizens, were citizens:

- who have tried to produce by their own some agricultural products in rural areas

- who have tried to produce by their own some agricultural products in urban areas (cities and towns)
- with non-experience in any kind of own agricultural production

The main target groups for the survey for institutions, were:

- Companies, Clusters, Associations of companies in the sectors of AOP or DST
- Farmers' unions and cooperatives
- Business support organisations
- Organisations supporting agro-ecology, organic farming, hydroponics, etc.
- Relevant ministries and public institutions involved in planning, regulation, inspection, etc
- Research institutes/Universities

1.5. Sample

In the survey for citizens were analysed 703 responses in total, coming from 14 countries (the participating countries in the project plus Australia, Poland, France, Netherlands & Mozambique), while in the survey for public and private institutions were analysed 139 responses in total, coming from the 9 participating countries. Data collection took place from May to July 2022 through several dissemination practices.

EU-level Survey Analysis

1.6. Citizens' survey

1.6.1. Descriptive Analysis

1.6.1.1. Demographics and main variables

This section presents the main findings of the descriptive characteristics of the sample and the responses that were collected from all involved countries. Starting from the sample's distribution among the citizens, the total number of responses per citizen type (Q1) are presented in Table 1. The 41% of the citizens have no experience in any kind of own agricultural production, while 59% have tried to produce by their own some agricultural products. The answers were almost equally distributed to rural (30%) and urban areas (29%). In Table 1, an analytical breakdown of the number of responses collected per citizen type is presented. Figure 3 shows the graphic representation of the responses and each percentage.

Table 1: Sample distribution *per* citizen type

Citizens	Responses	Percentage
who have tried to produce by their own some agricultural products in rural areas	209	30%
who have tried to produce by their own some agricultural products in urban areas (cities and towns)	204	29%
with non-experience in any kind of own agricultural production	290	41%
Total	**703**	**100%**

Source: Authors' calculations.

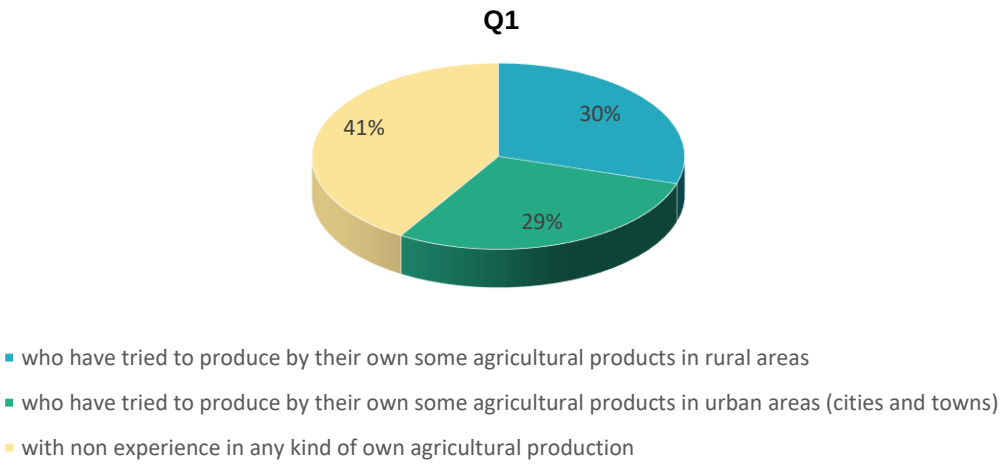


Figure 3: Sample distribution per citizen type

The next question (Q2) concerned the age distribution of the sample (Table 2 and 3). The breakdown per age category is presented in Table 2 and the distribution of the sample per citizen type and per age

category is displayed in Table 3 and Figure 4. The age categories with the higher participation are the 25-34, the 35-44 and the 45-54 (Table 2). The latter pattern was reported at almost all participated countries (Figure 7). The sample distribution per age category and per citizen type for the citizens who have some experience on the production of the agricultural products is almost the same, with the highest contribution to come from the age group of 35-44, while in the citizens with non-experience in any kind of agricultural production, the age group of 25-34 had the highest participation (Table 3 and Figure 4).

Table 2: Sample distribution per age category

Age Category	Responses	Percentage
18-24	37	5%
25-34	181	26%
35-44	192	27%
45-54	156	22%
55-64	83	12%
65-74	47	7%
>74	7	1%
Total	**703**	**100%**

Table 3: Sample distribution per age category and per citizen type

Age Category	Citizens who have tried to produce by their own some agricultural products in rural areas		Citizens who have tried to produce by their own some agricultural products in urban areas		Citizens with non-experience in any kind of own agricultural production	
	Number	%	Number	%	Number	%
18-24	9	4%	9	4%	19	7%
25-34	45	22%	40	20%	96	33%
35-44	57	27%	55	27%	80	28%
45-54	46	22%	48	24%	62	21%
55-64	33	16%	29	14%	21	7%
65-74	15	7%	22	11%	10	3%
>74	4	2%	1	0%	2	1%
Total	**209**	**100%**	**204**	**100%**	**290**	**100%**

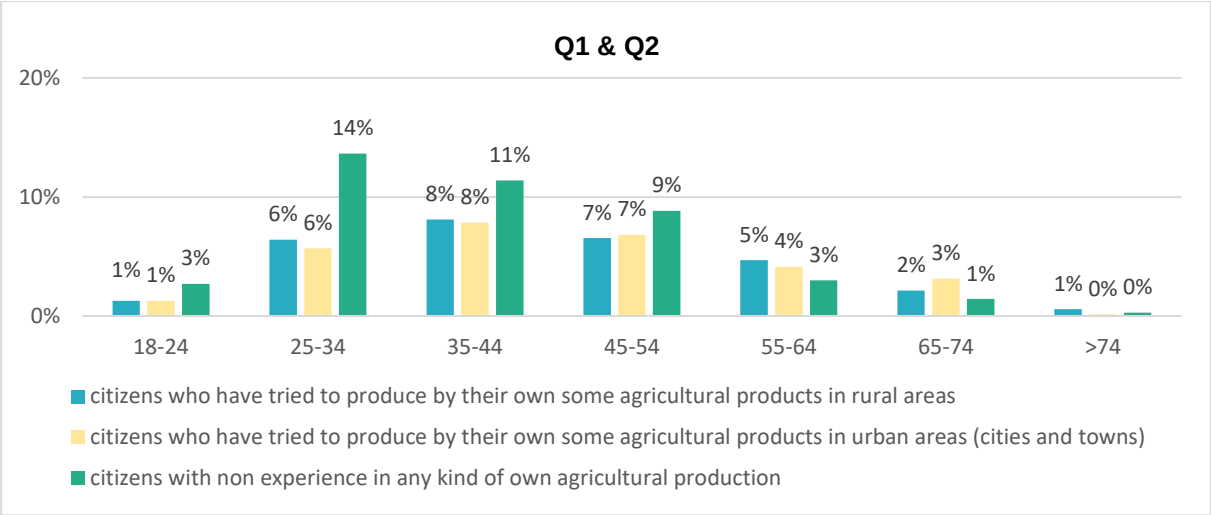


Figure 4: Sample distribution per citizen type and age category

The next question (Q3) concerned the spatial distribution of the sample. The breakdown of the responses per country is presented in Table 4, while the distribution of the sample per country and citizen type is displayed in Table 5. The most responses are coming from Portugal (151), Sweden (145), Greece (104), and Spain (102) followed by Italy (67), Austria (55), Cyprus (38), Ireland (18) and United Kingdom (17). Moreover, 6 responses are coming from Australia, Poland, France, Netherlands & Mozambique. The differences in the participation may be due to the different number of project partners in each country (Greece is represented by 5 partners in the consortium and Italy, Cyprus, and Austria by 1) as well as the different type of organizations (Universities, Research Centres, Business Support Organizations, etc.) which affects the size of questionnaires distribution. In Table 4, an analytical breakdown of the numbers of responses collected per country is presented.

Table 4: Sample distribution per country

Country	Responses	Percentage
Austria	55	8%
Cyprus	38	5%
Greece	104	15%
Ireland	18	3%
Italy	67	10%
Spain	102	15%
Sweden	145	21%
Portugal	151	21%
UK	17	2%
Other	6	1%
Total	**703**	**100%**

In almost all participating countries except for Sweden, UK, Cyprus, most of the replies are coming from citizens with non-experience in any kind of own agricultural production as it is displayed in Table 5 and Figure 5.

Table 5: Sample distribution per country and per practitioner type

Country	Citizens who have tried to produce by their own some agricultural products in rural areas		Citizens who have tried to produce by their own some agricultural products in urban areas		Citizens with non experience in any kind of own agricultural production	
	Number	%	Number	%	Number	%
Greece	27	13%	22	11%	55	19%
Italy	9	4%	17	8%	41	14%
Spain	26	12%	7	3%	69	24%
Sweden	89	43%	53	26%	3	1%
Portugal	28	13%	59	29%	64	22%
Ireland	1	0%	4	2%	13	4%
Cyprus	15	7%	7	3%	16	6%
Austria	9	4%	21	10%	25	9%
UK	5	2%	11	5%	1	0%
Total	209	100%	204	100%	290	100%

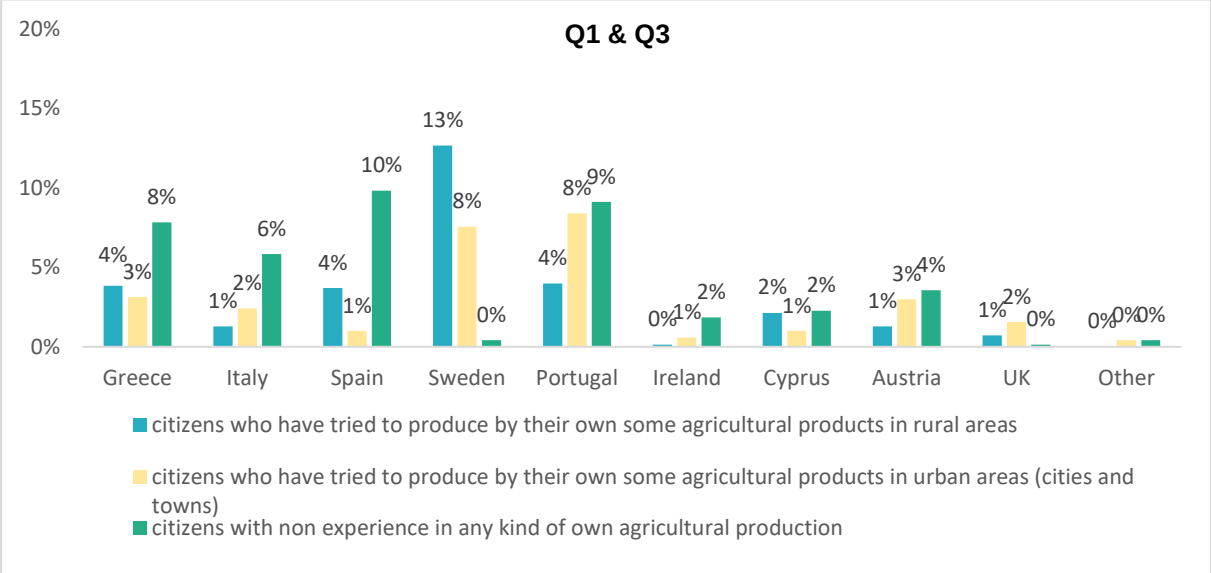


Figure 5: Sample distribution per citizen type and per country

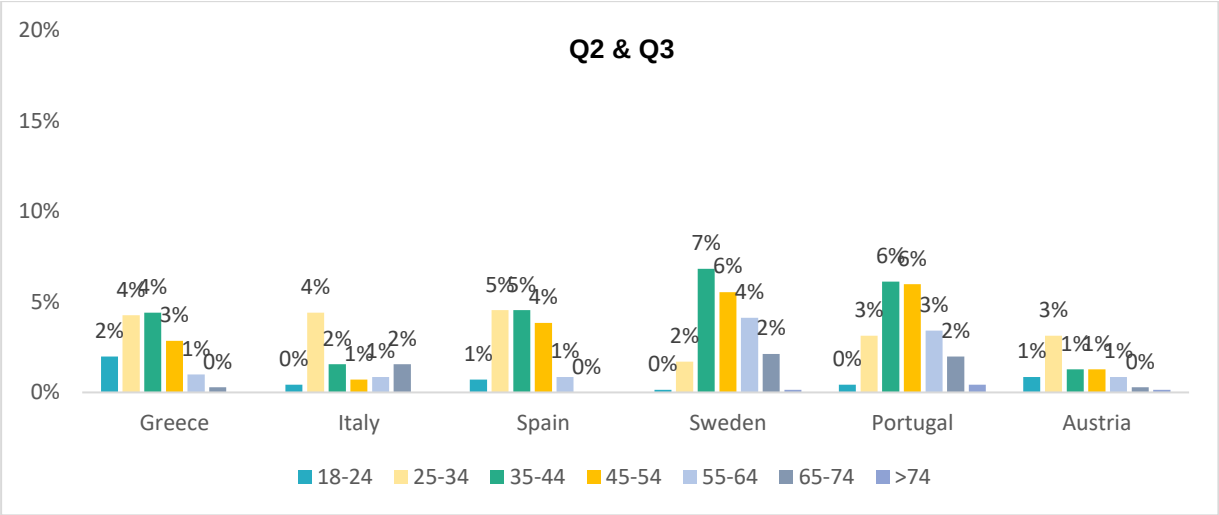


Figure 6: Sample distribution per age category and country

The last question of the Introductory Section was concerned the launched EU Strategy F2F for sustainable, safe, nutritious, and healthy food production, where the participants were asked to declare how familiar are to this EU Strategy. As indicated in Figure 7, the 53% has replied 'No' and the 47% 'Yes'. This indicates a moderate degree of awareness for a such an important EU Strategy. Examining the awareness per citizens' type, seems that the citizens with non-experience in their own agri-food production are also less aware for the EU Strategy F2F (Figure 8). Concerning the distribution per country, in Portugal, the percentage of participants who have heard for the EU Strategy F2F is higher than those who haven't heard it, in Italy and Spain it applies the opposite, while in Greece, Austria, and Sweden almost equal percentages were recorded (Figure 9).

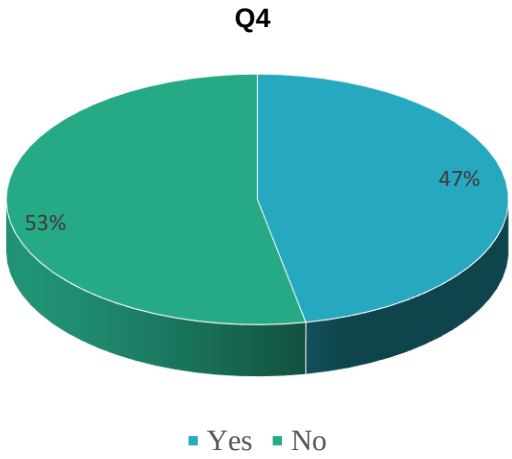


Figure 7: Awareness for the EU Strategy F2F

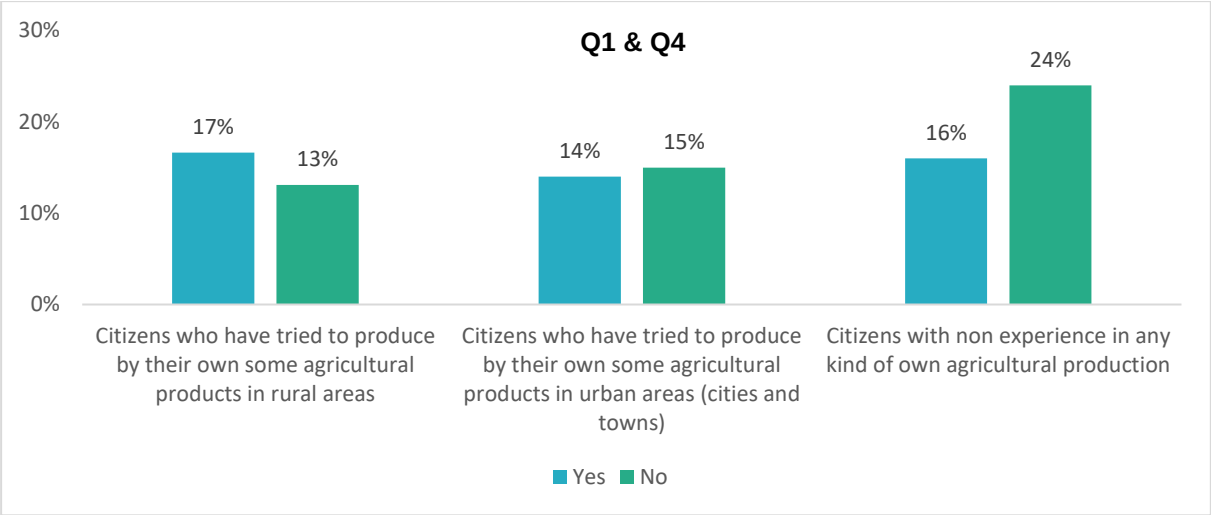


Figure 8: Awareness for the EU Strategy F2F per citizens' type

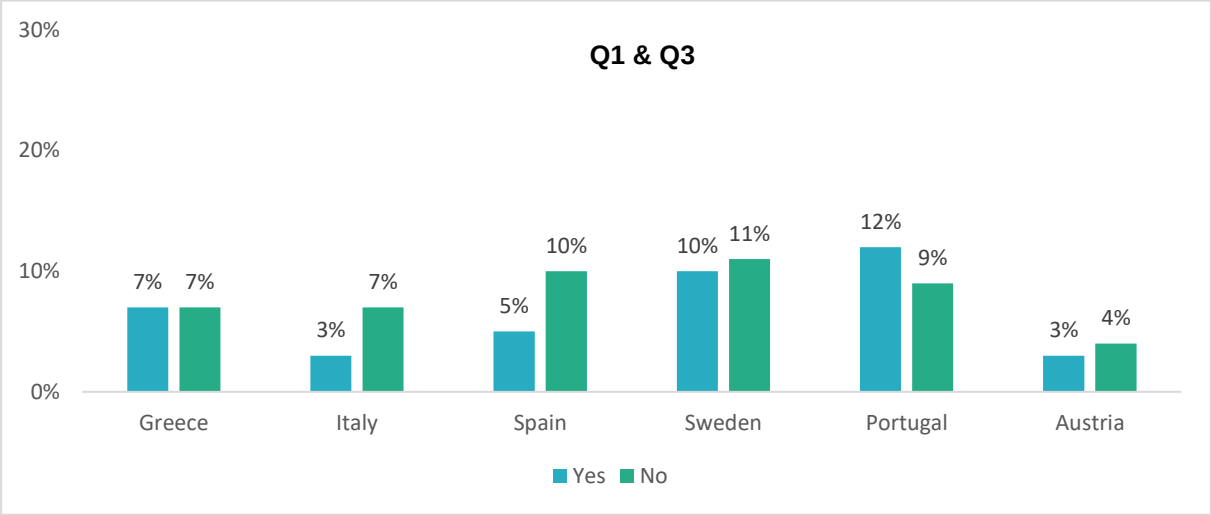


Figure 9: Awareness for the EU Strategy F2F per country

1.6.1.2. Experience and opinions for Agro-ecological and Organic Practices (AOPs) and Digital and space-based technologies (DSTs)

Regarding the awareness on the Agro-ecological and organic practices (AOP) which are used for agricultural production as an alternative to conventional farming, a list was provided to the participants asking to indicate to which they are familiar (Q5). As Figure 10 illustrates, the most known were 'organic farming', 'manure', 'crop choice', 'crop variety and rotations', 'natural pesticides' and 'biofertilizers/biostimulants', gathering each AOP practice percentages ranging from 12 to 14%, followed by 'irrigation & drainage', 'intercropping and relay intercropping' and 'ash'. The less known were 'allellolopathic plants' and 'agroforestry with timber, fruit, or nut trees' (received a total 8%). The distribution of the responses followed similar pattern, regardless of the participated country (Figure 11).

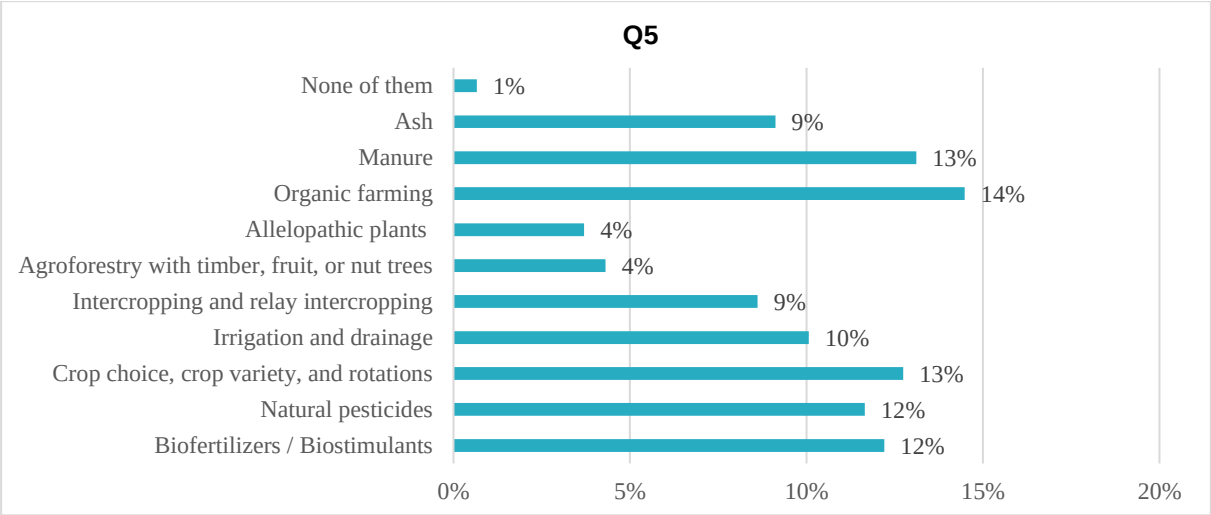


Figure 10: Awareness of the different types of AOPs by citizens.

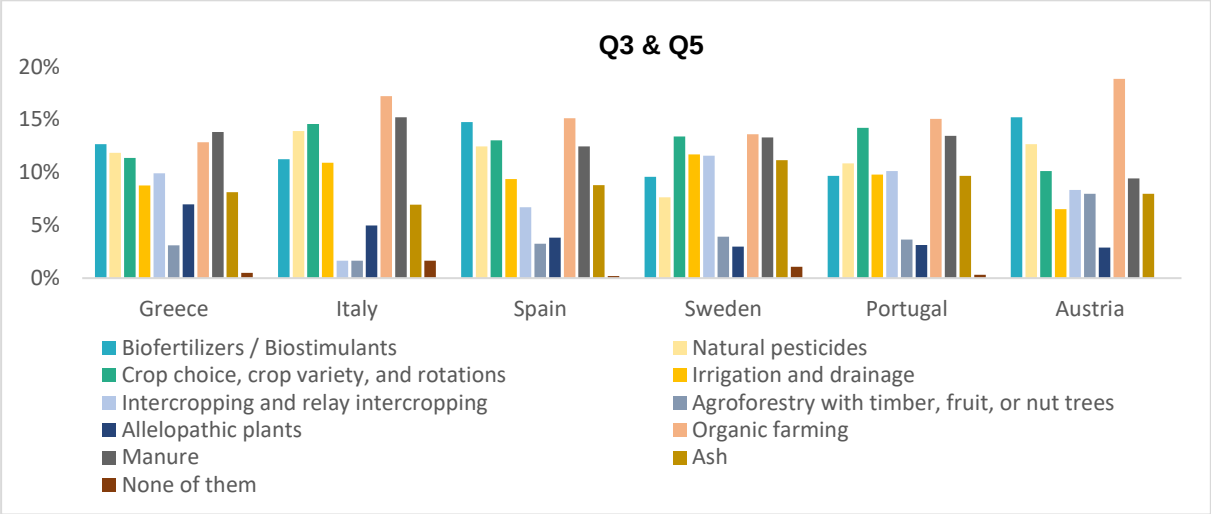


Figure 11: Awareness of the different types of AOPs by citizens per country

Following, the participants were asked to indicate how much they agree with the statement 'The agricultural production with the use of Agro-ecological and organic practices leads to products with improved quality characteristics (taste, colour, shape)' (Q6). The results indicate that the 72% of participants 'Strongly agree' and 'Somewhat agree' with the statement, the 13% 'Neither agree nor disagree' and only the 4% 'Strongly disagree' and 'Somewhat disagree' (Figure 12).

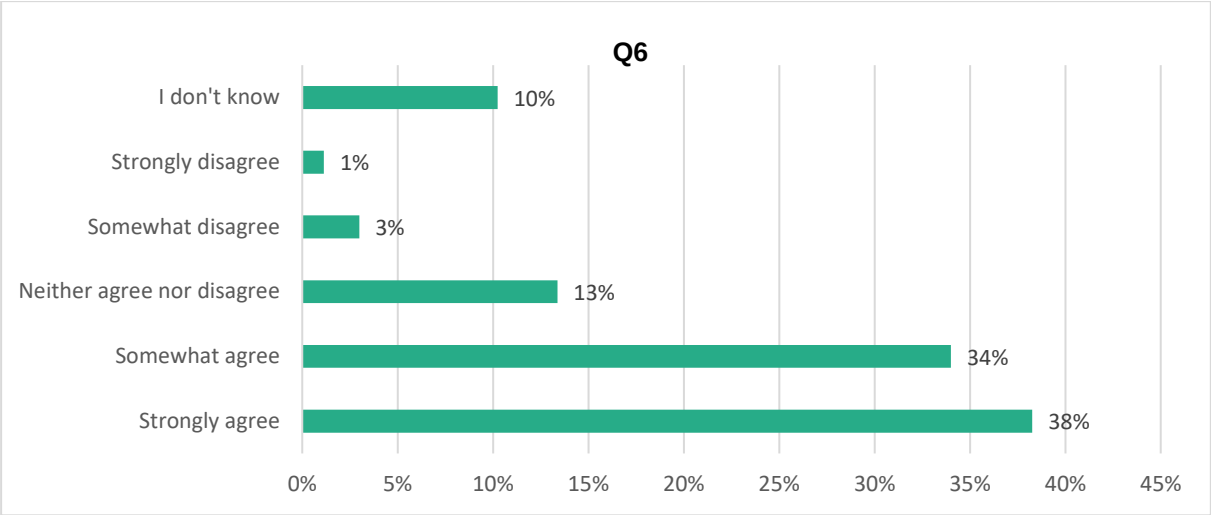


Figure 12: Responses by citizens to what extent they agree with the statement 'The agricultural production with the use of Agro-ecological and organic practices leads to products with improved quality characteristics (taste, colour, shape)'

Then the participants who had replied 'Strongly disagree' and 'Somewhat disagree' were asked to indicate the reasons (Q7). The 34% has replied that 'there aren't major differences in taste', the 31% that 'the appearance of AOP products is inferior to the convectional ones' and the 19% that 'they don't trust farmers for the proper use of the AOPs' (Figure 13). Those who responded 'Other' indicated the following: these practices should be implemented as a more sustainable form of agriculture, resulting in the production of a high-quality product and that the yield and the shelf life is reduced.

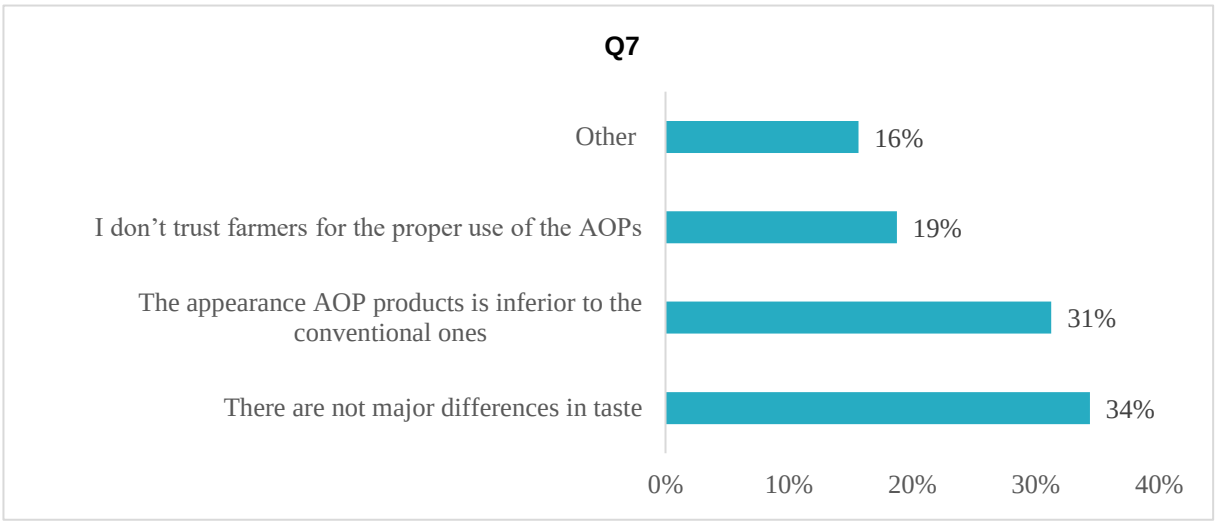


Figure 13: Reasons for replying 'Strongly disagree' and 'Somewhat disagree' on Q6

In the next question (Q8), the participants were asked to indicate if they would buy food produced using organic practices even if the cost is higher. The 82% has replied 'Yes' and the 18% 'No', as displayed in Figure 14. This recorded willingness from the citizens to pay this extra cost may constitute a strong argument for applying organic practices.

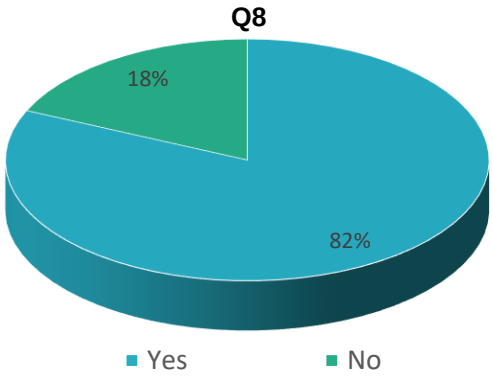


Figure 14: Willingness to buy foods produced using organic practices even if the cost is higher

In Q9, the citizens were asked if they have heard of alternative cultivation methods, through which the plants are growing without soil. Figure 15 illustrates that the 53% are familiar to 'hydroponic', the 27% with 'aquaponic' method, while the 19% responded that they have not heard either of them. A further spatial distribution of the sample took place, showing that hydroponic cultivation method was the dominant among the responses at all participating countries except for Austria (Figure 16).

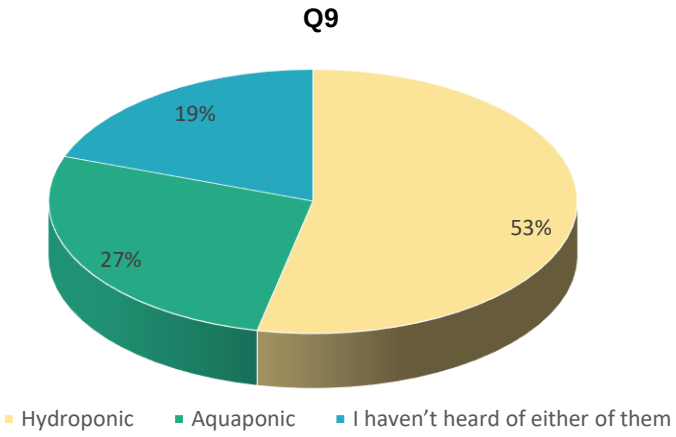


Figure 16: Awareness for the new cultivation methods that have been developed for plant growing without soil

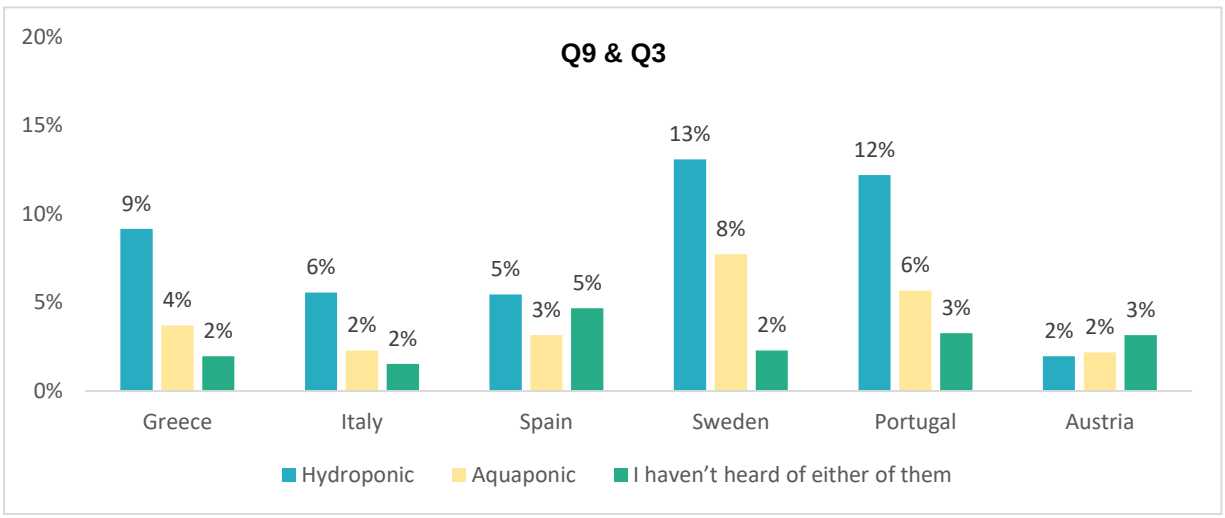


Figure 15: Awareness for the new cultivation methods per country

In the next question (Q10), the participants were asked to indicate if they have ever tried to grow their own agricultural products. The 69% has replied 'Yes' and the 31% 'No' as displayed in Figure 17. In all countries, most of the participants have an experience in growing their own agricultural products, with the highest contribution coming from Sweden (20%) followed by Portugal (15%) (Figure 18). Figure 19 illustrates that the age groups with the highest involvement in growing their own agricultural products are the 25-34 (15%), 35-44 (19%) and 45-54 (16%).

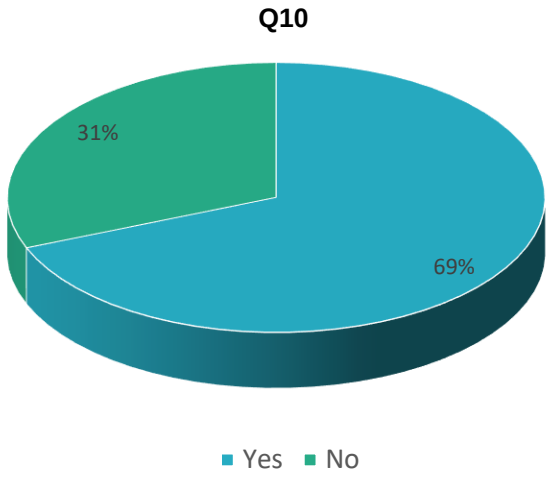


Figure 17: Responses received if the participants have ever tried to grow their own agricultural products

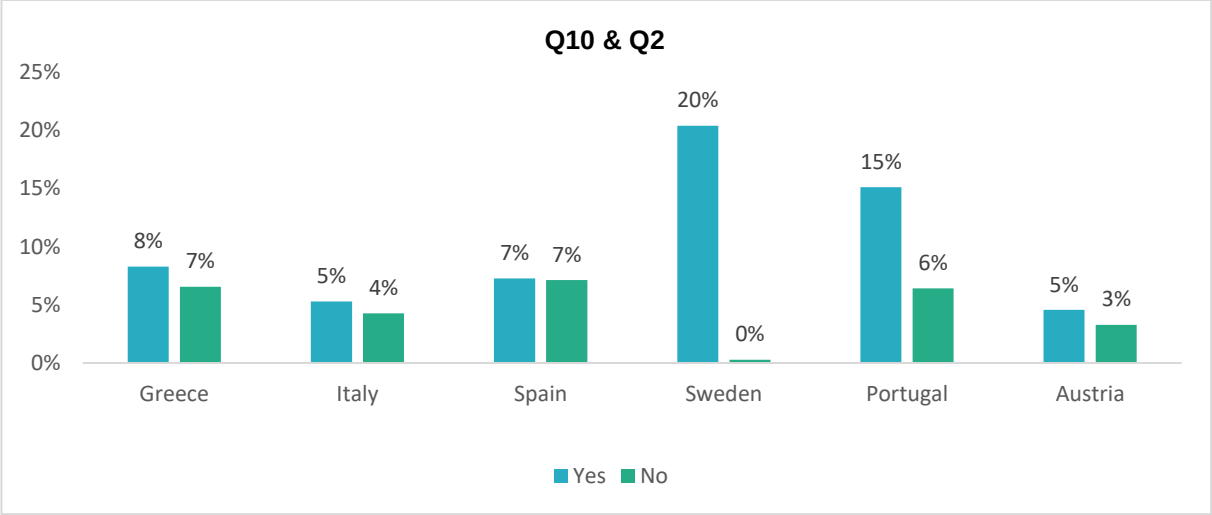


Figure 18: Responses received if the participants have ever tried to grow their own agricultural products per country

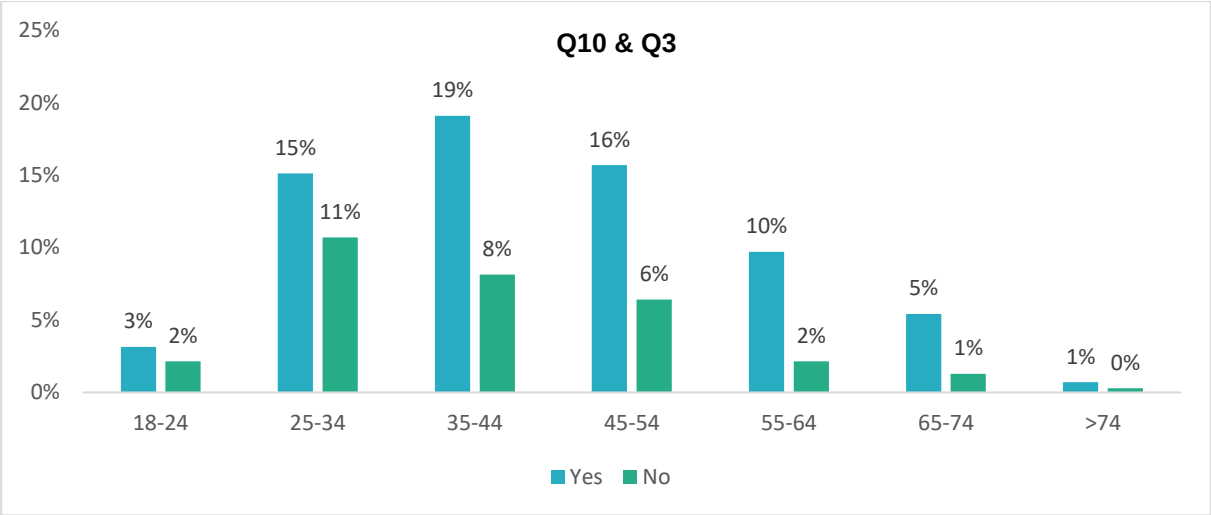


Figure 19: Responses received if have the participants ever tried to grow their own agricultural products per age category

The participants who replied that they have tried to cultivate their own agricultural products were further asked to indicate the preferred cultivation place (Q11), the reasons for doing it (Q12), what they have cultivated and if they have used any Organic Practices (Q13). With regards to the place, they mainly cultivate in gardens (44%) followed by fields (20%), balconies (17%) and less in terraces (8%) and community gardens (7%) (Figure 20). In the countries' distribution, garden is the main option for cultivating agri-food products followed either from balconies, or fields (Figure 20). The community gardens are an option mainly in Portugal, Sweden, and Austria, while other options for growing agricultural products are the greenhouses, the aquaponics in the kitchen, the large pots, the indoor hydroponic and the allotments (Figure 21).

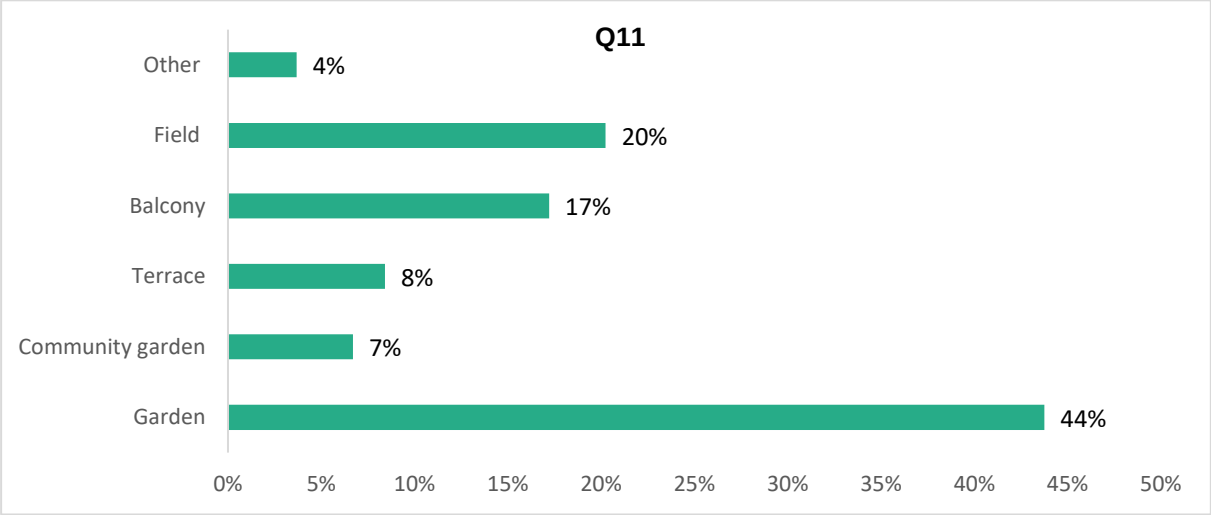


Figure 20: Preferable places for cultivating agricultural products by citizens

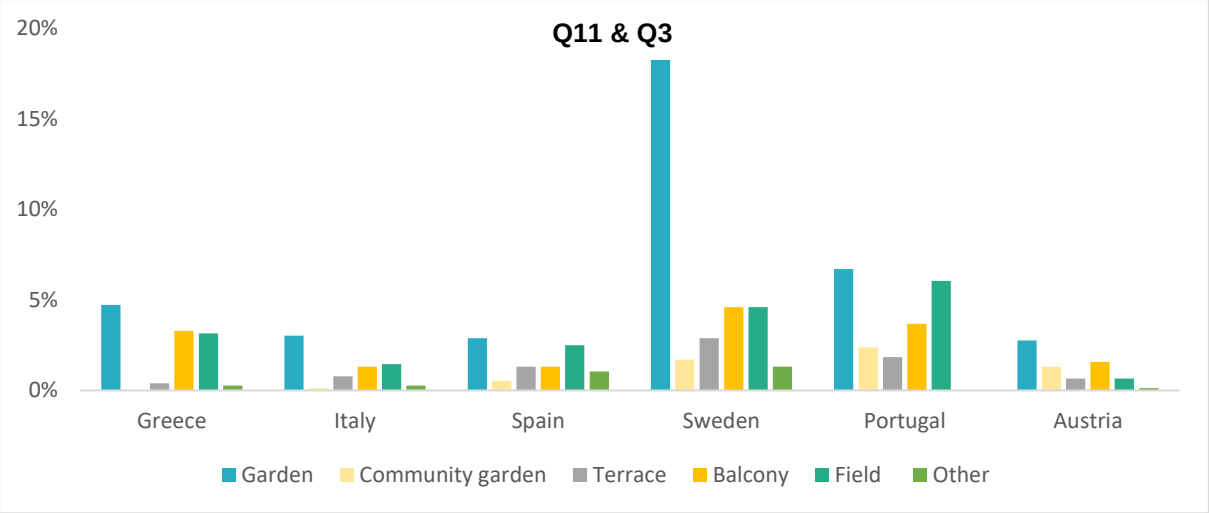


Figure 21: Preferable places for cultivating agricultural products by citizens per country

Concerning the reasons for cultivating agricultural products, as it is displayed in Figure 22, the one receiving the most replies regardless of country was 'as a hobby' (23%) followed by 'to produce products with higher quality characteristics' (18%) and third in a raw came 'to get outside' (13%). The participants reported several other reasons such as (i) to teach children where the vegetables come from and how are they been harvested and about sustainability, (ii) to achieve a local natural embellishment, (iii) to have a cultivable space attached to the house, (iv) to have access in tasteful, easily available fresh vegetables, (v) to grow product or varieties that cannot be easily found, (vi) to develop links with the local community, (vii) to reduce the landfill load of organic matter, the plastic and food waste, (viii) to have access in organic food at less expense, (ix) to trade products with local stores and (x) to increase their independence.

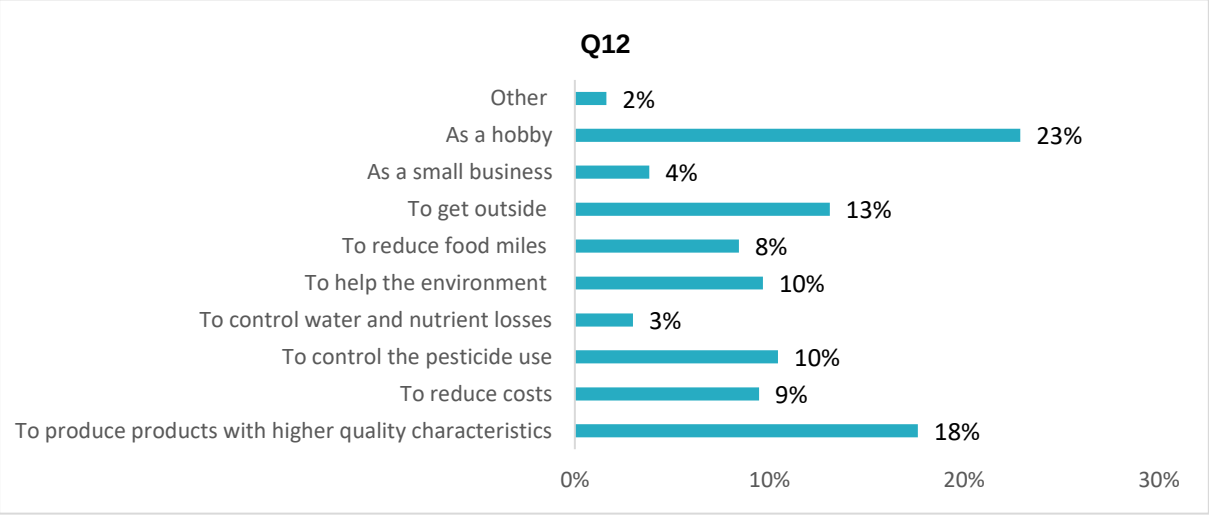


Figure 22: Reasons for cultivating agricultural products

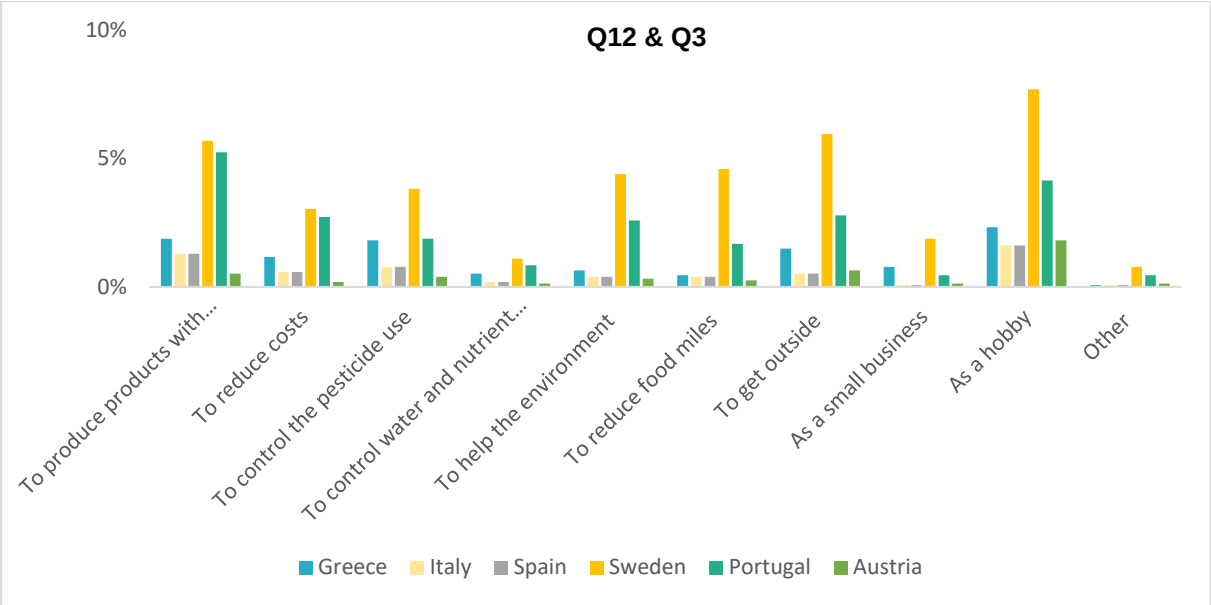


Figure 23: Reasons for cultivating agricultural products per country

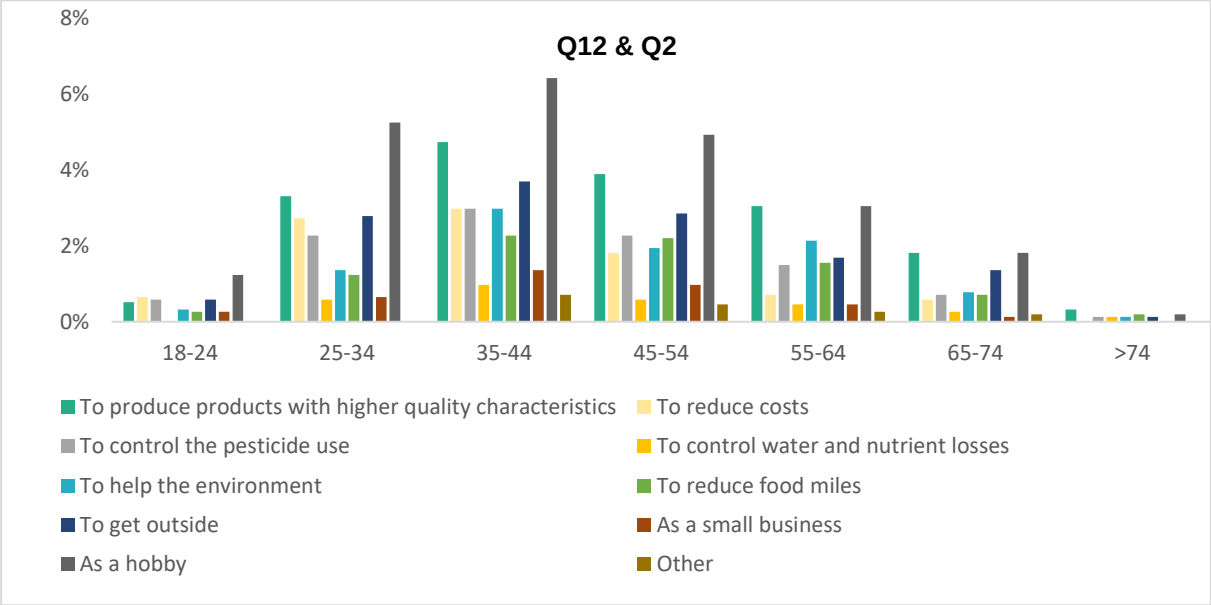


Figure 24: Reasons for cultivating agricultural products per age group

Replies in Q13 indicate that the citizens of this survey mainly cultivate salad vegetables (25%), herbs (22%) and all sort of vegetables (20%) and less fruit trees and fruit plants (14 - 17%) (Figure 25). Other cultivated products included cereals, mushrooms, sprouts/shoots, nuts, legumes, oilseeds, tubers, berries, flowers, and grapes as the participants indicated. Regarding the distribution of cultivation products per country, in Sweden, the most cultivated species are all sort of vegetables, in Greece, Spain and Portugal the salad vegetables, while in Italy and Austria the herbs (Figure 27). Moreover, clustering the results per age group, citizens within the age of 18-54, mainly cultivate salad vegetables, while in the age > 55 the herbs are dominated, as it is displayed in the Figure 26.

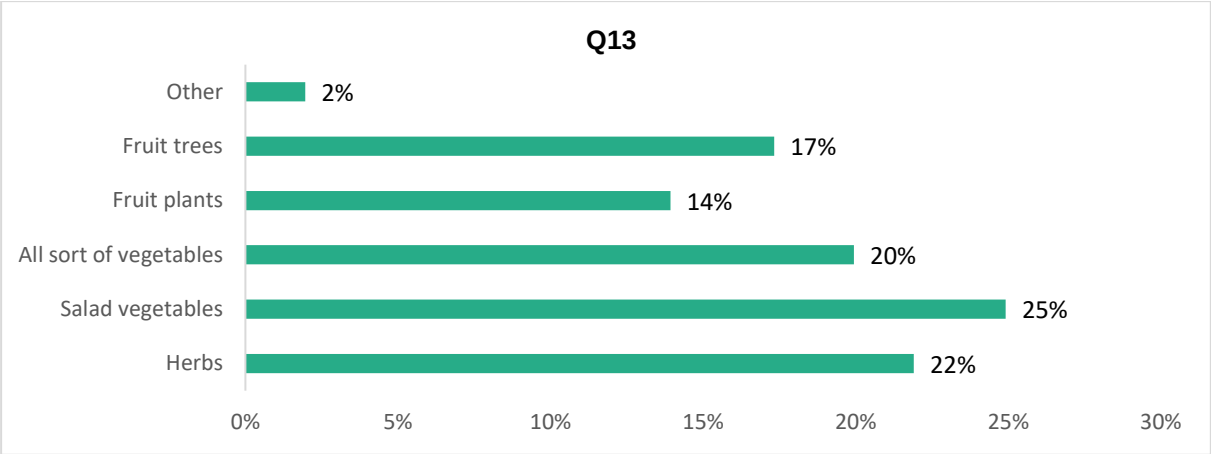


Figure 25: Responses of what kind of agricultural products the participants prefer to cultivate

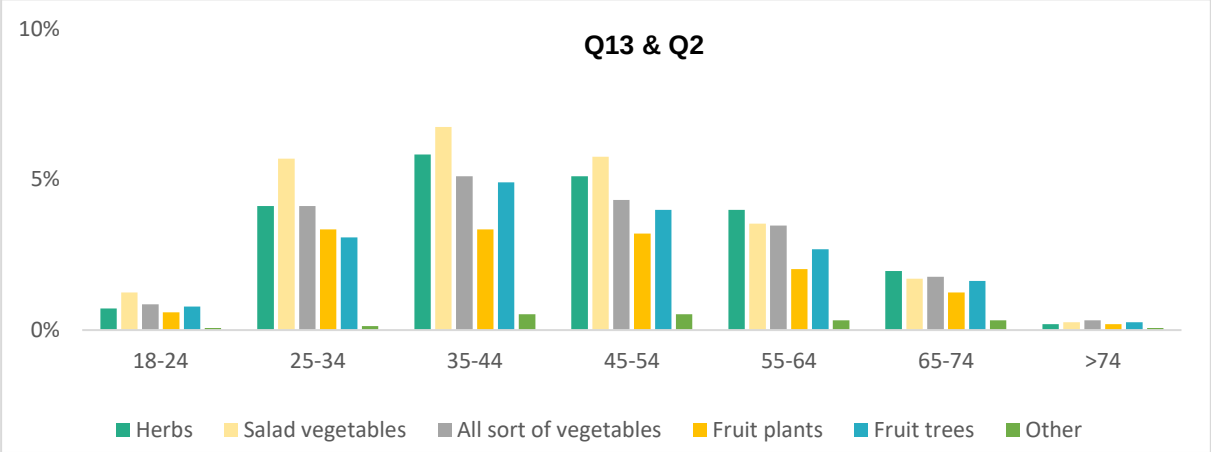


Figure 26: Responses of the kind of agricultural products the participants prefer to cultivate per country

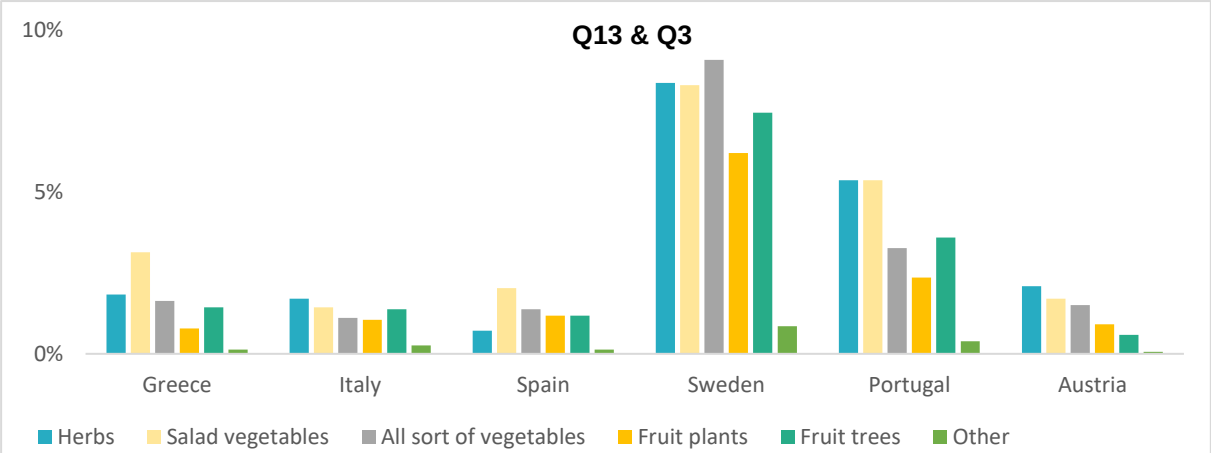


Figure 27: Responses of the kind of agricultural products the participants prefer to cultivate per age group

Q14 was followed, asking the participants to indicate if they previously used some Organic Practices. Most of the citizens who cultivate agrifood products use biofertilizers (53%) followed by natural pesticides (28%), while only 19% use other organic practices such as compost (Figure 28). For Q14 - Q25, the data were not additionally presented per country since no significant differences were recorded.

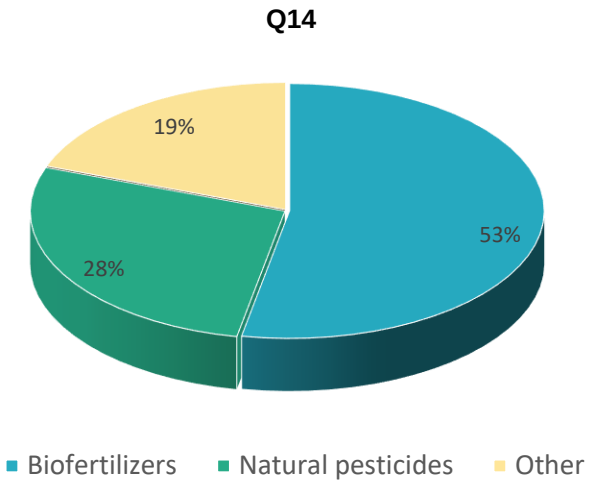


Figure 28: Use of organic practices

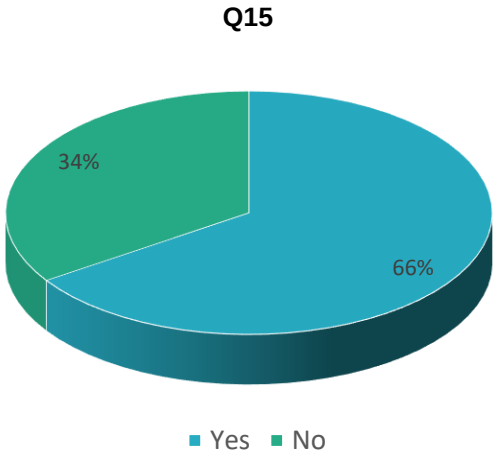


Figure 29: Previous knowledge of modern technologies application such as Smart farming or Precision agricultural technologies on agricultural food production

The next question (Q15) was to declare if they were familiar to modern technologies application such as Smart farming or Precision agricultural technologies on agricultural food production. As Figure 29 indicates, the results showed that *ca*. 2/3 of the participants are already familiar to such technologies, namely the 66% replied 'Yes' and the 34% replied 'No'.

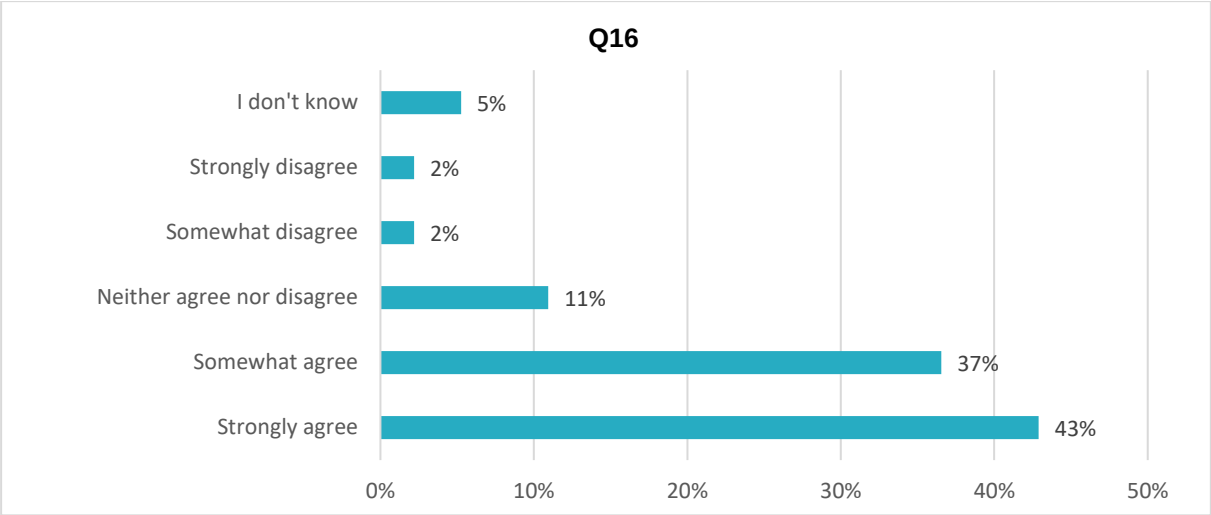


Figure 30: Responses if these technologies may improve the quality characteristics of agricultural products in case there was a previous knowledge of them (Q15)

In Q16, the participants were asked to indicate how much these technologies may improve the quality characteristics of agricultural products in case there was a previous knowledge of them. According to the results, the 43% 'Strongly agree', the 37% 'Somewhat agree', 11% 'Neither agree nor disagree', while 4% replied 'Strongly disagree' and 'Somewhat disagree' (equally distributed) (Figure 30). The latter may indicate a positive tendency by the citizens to adopt such agricultural technologies since 80% agreed ('strongly' and 'somewhat') for their beneficial effect on quality characteristics of agricultural products.

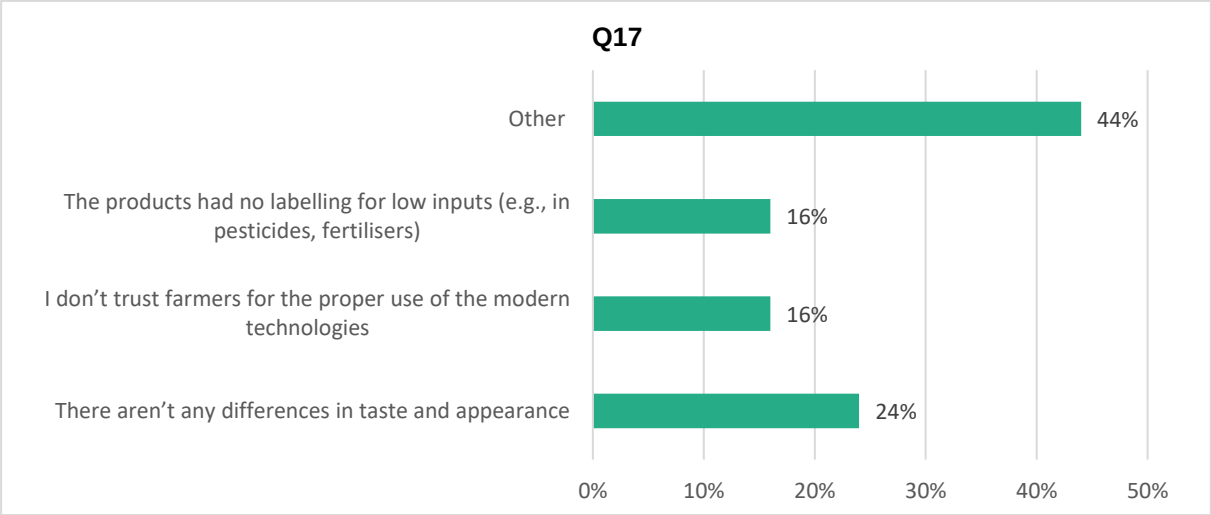


Figure 31: Reasons for disagreeing that these modern technologies may improve the quality characteristics of agricultural products (Q16)

In case the participants 'somewhat' or 'strongly' disagreed with the potential improvement of the quality characteristics of agricultural products, they had also to reply Q17 in order the disagreement reasons to be elucidated (Figure 31). Specifically, the 24% replied 'There aren't any differences in taste and appearance', while statements 'I don't trust farmers for the proper use of the modern technologies' (16%) and 'The products had no labelling for low inputs e.g., in pesticides, fertilisers' (16%) were chosen by 32%. Finally, the 44% of the test sample chose to reply 'Other'.

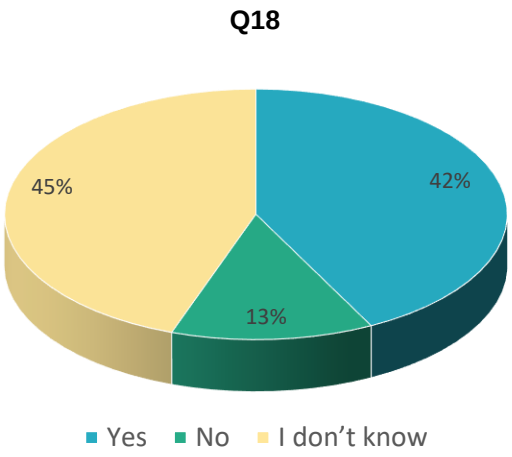


Figure 32: Preference for agricultural products to grow via the support of modern technologies

In Q18, the citizens were asked to declare their preference on growing their agricultural products with the support of modern technologies. The 42% replied 'Yes' and the 45% 'No', while a 13% of the test sample preferred to reply, 'I don't know' (Figure 32). The latter indicates a moderate degree of awareness of such type of modern agricultural technologies by the citizens participating in the present survey.

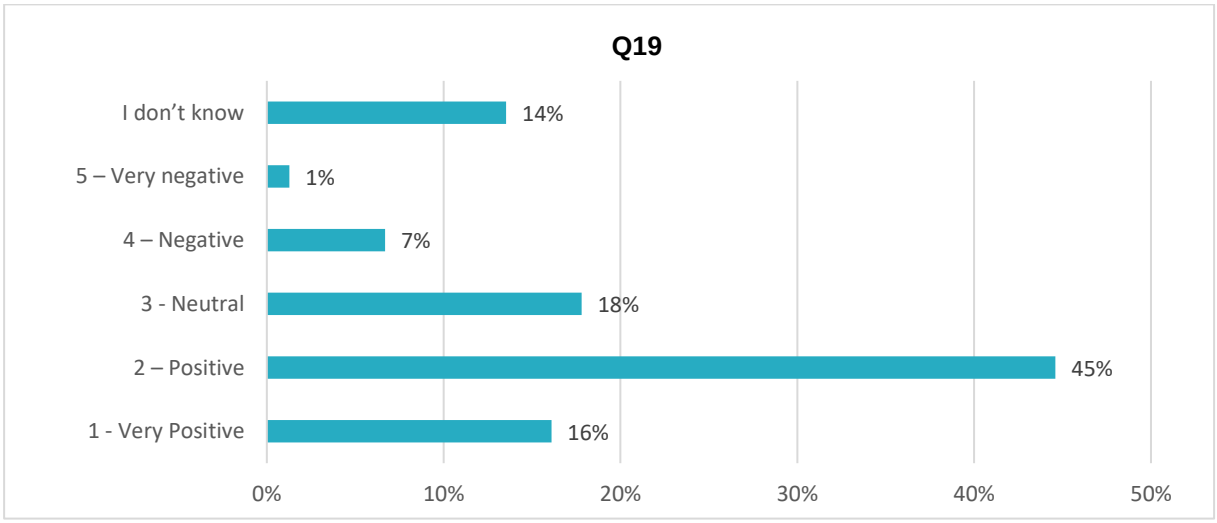


Figure 33: Responses on the potential society impact of the application of these modern technologies on agricultural food production

In Q19, the participants were further asked if they believe that these modern technologies on agricultural food production will have a positive or a negative impact in society (impact on health and safety standards, human health, unemployment rate, ecosystem quality etc.). The 61% of participants replied positively ('Positive': 45% and 'Very Positive': 16%), while the 18% of the participants responded 'Neutral', the 14% 'I don't know' and only 1% 'Very negative' (Figure 33).

In the next question (Q20), the citizens were asked to declare if an informative indication/labelling would be useful for products produced under the support of modern technologies. The 54% from the participants replied, 'Yes' and the 30% 'No', as indicated in Figure 35. Only 16% from the participants replied, 'I don't know' (Figure 34).

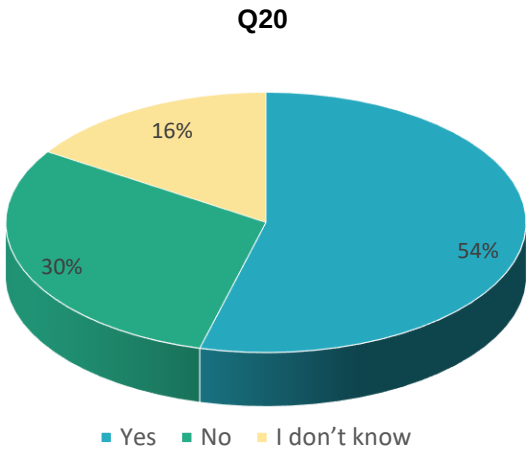


Figure 34: Responses if an informative indication/labelling would be useful for products produced under the support of modern technologies

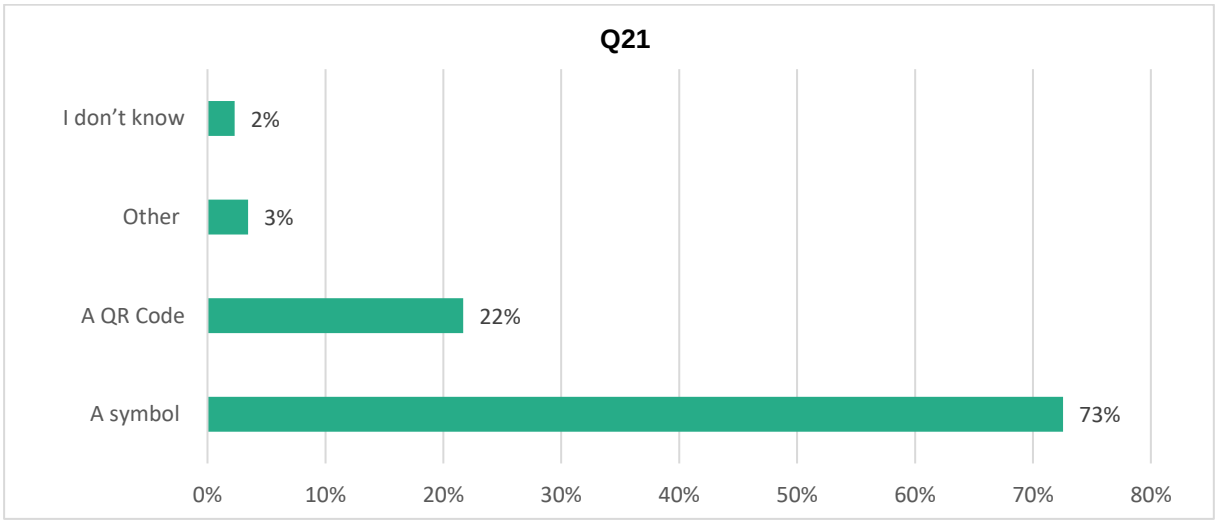


Figure 35: Preference on the type of informative indication/labelling used in products produced under the support of modern technologies

Participants who responded 'Yes' were further asked to choose which indication/labelling type prefer in Q21. Thus, according to Figure 35, the 73% replied 'A symbol', 22% 'A QR Code', while the rest 5% replied 'I don't know' and 'Other'. Considering the high preference on 'A symbol', it seems that the participants prefer to receive the information fast and easy.

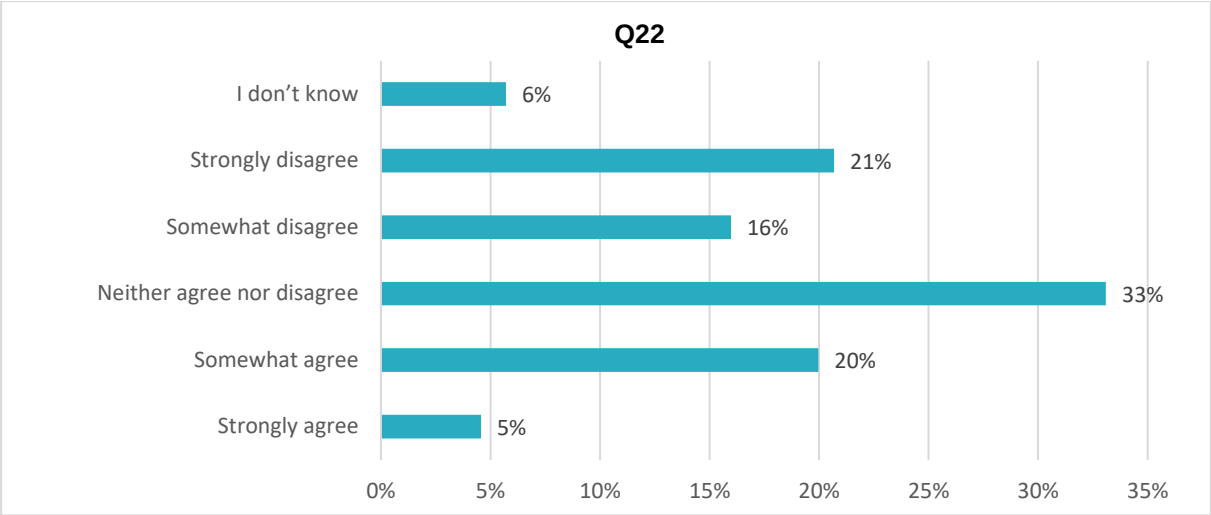


Figure 36: Responses if the information related to how the agricultural products are produced is sufficient

In Q22, the participants were asked if provided information related to how the agricultural products are produced is sufficient. The majority of the participants responded neutrally (33%), while those who replied, 'Strongly disagree', 'Somewhat agree' and 'Somewhat disagree' were the 21%, 20%, and 16%, respectively (Figure 36). Only the 5% from the participants replied that 'Strongly agree'. In Q23, the participants who disagreed were asked to indicate the reasons. The main reason for replying negatively in Q22 was that the participants don't find information related to cultivation conditions on the labelling of the product.

Figure 37: Preferences on who the participants would trust to provide the information about how agricultural products are being produced

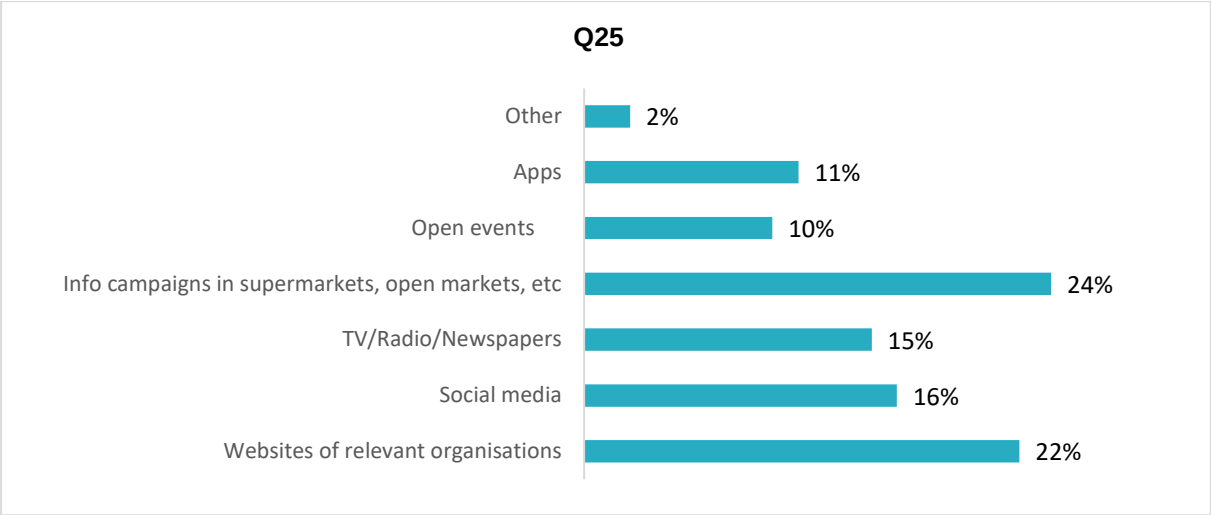


Figure 38: Preferences on the type of receiving the information about the production of agricultural products

Moreover, in Q24, the preference of the participants related to who would trust to provide information about how agricultural products are being produced, their replies followed the order: Relevant public organizations (27%) > Agricultural Universities & Research Centers (25%) > Farmers Unions & Agricultural Co-operations = Consumers organizations (18%) > In the shops (9%) > Other (3%) (Figure 37). Regarding the results of Q25, where the citizens were asked to indicate the type of receiving information about the production of agricultural products, the majority of the participants selected 'Info campaigns in supermarkets, open markets, etc' (24%) and 'Websites of relevant organisations' (22%), while 'Social media', 'TV/Radio/Newspapers', 'Apps', and 'Open events' received 16, 15, 11, 10%, respectively (Figure 38).

1.7. Public & Private Institutions' survey

1.7.1. Descriptive Analysis

1.7.1.1. Demographics and main variables

This section presents the main findings of the descriptive characteristics of the sample and the responses that were collected from all involved countries. Starting from the sample's distribution among the public and private institutions, the total number of responses per country (Q1) are presented in Table 6. The responses are coming from Portugal, Greece, Spain (ranging from 17 to 22%) and followed by Austria and United Kingdom (ranging from 9 to 12%), and Italy, Cyprus, Ireland (ranging from 1 to 5%) (Figure 39). In Table 6, an analytical breakdown of the numbers of responses collected per country is also presented.

Table 6: Sample distribution per country

Country	Responses	Percentage
Austria	16	12%
Cyprus	2	1%
Greece	31	22%
Ireland	6	4%
Italy	7	5%
Spain	24	17%
Portugal	31	22%
UK	12	9%
Sweden	10	7%
Other	0	0%
Total	**139**	**100%**

Source: Authors' calculations

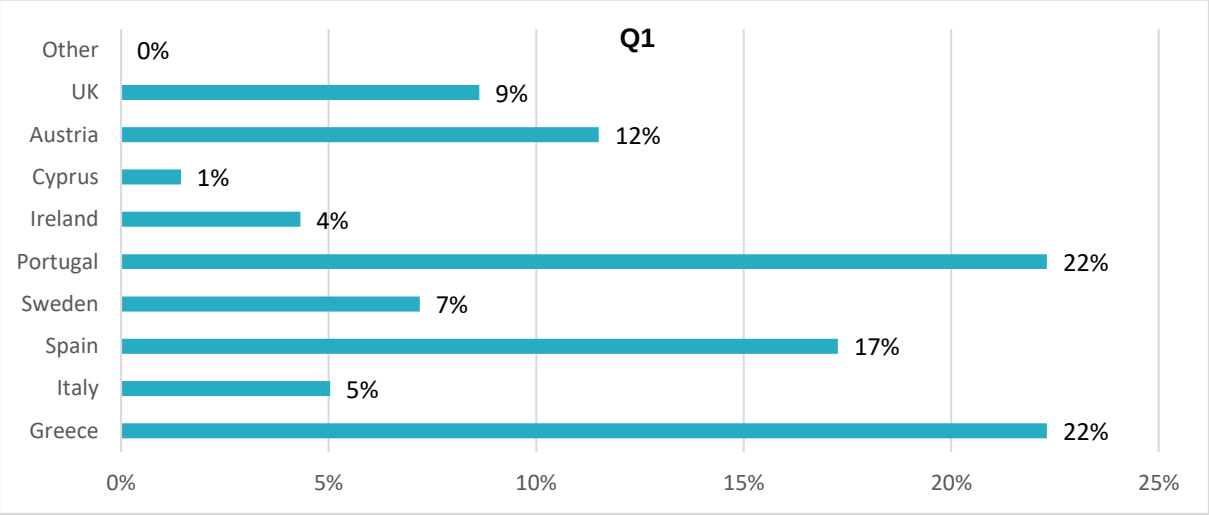


Figure 39: Sample distribution per country

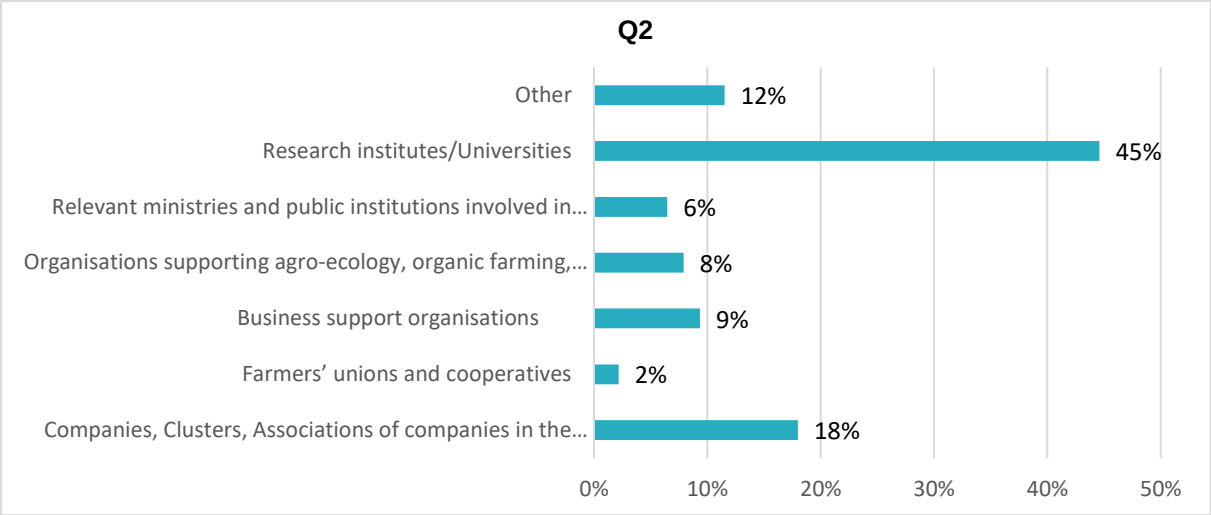


Figure 40: Sample distribution per type of institution

In Q2, the participants were asked to provide information about the type of their institution. Most of the participants worked in Research institutes/Universities (45%), followed by those representing Companies, Clusters, Associations of companies in the sectors of AOP or DST (18%) (Figure 40). The rest categories such as Farmers' unions and cooperatives (2%), Business support organisations (9%), Organisations supporting agro-ecology, organic farming, hydroponics, etc. (8%), Relevant ministries and public institutions involved in planning, regulation, inspection, etc (6%) and Other (12%) represented the 37% of the responses. A further classification (Q3) took place by clustering the participants to those declared as Institute representative (33%) or Individual (67%) (Figure 41).

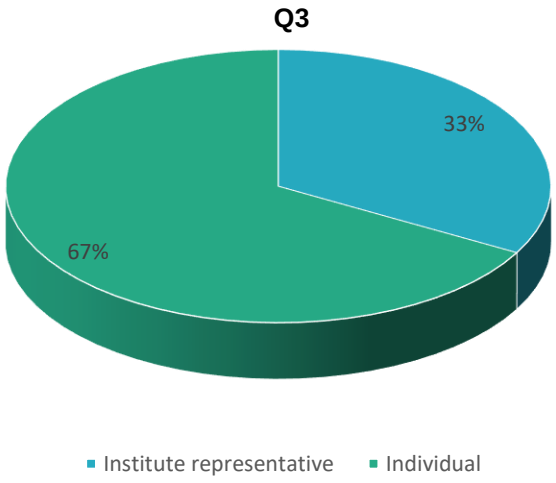


Figure 41: Institute representation

In Q4, the participants were asked to reply in what extend they agree with a series of statements concerning agro-ecological and organic practices (AOP). The outcomes from these sub-questions (15 in total) are presented in Figures 42 - 49.

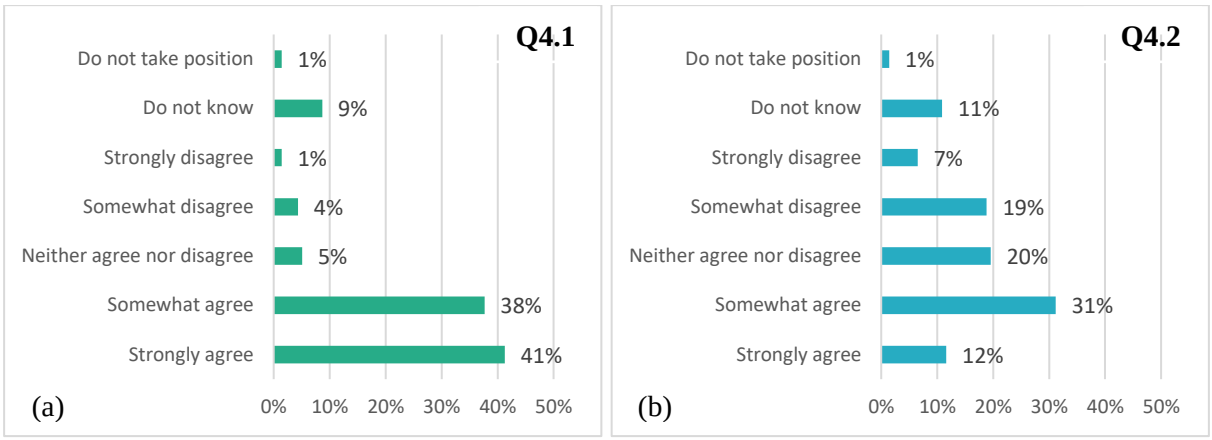


Figure 42: Responses to what extent the participants agree with the following statements: (a) 'The circulation of fertilisers used for organic farming, hydroponics or conventional agriculture are subject to specific and strict standards and regulations set by European and National legislation' and (b) 'Current regulations can be an obstacle in the development of new biopesticides and biofertilizers'

In Figure 42(a), the participants were asked to respond to what extent they agree with the statement 'The circulation of fertilisers used for organic farming, hydroponics or conventional agriculture are subject to specific and strict standards and regulations set by European and National legislation' (Q4.1). According to the results most of the participants agreed with the statement (79%), while 5% either disagreed and 5% replied neutrally ('neither agree nor disagree'). Furthermore, according to results presented in Figure 42(b), the 43% of the participants agreed with the statement 'Current regulations can be an obstacle in the development of new biopesticides and biofertilizers' (Q4.2), while 26% either disagreed and 20% replied neutrally ('neither agree nor disagree'). Only the 11% replied, 'Do not know' (Figure 42(b)).

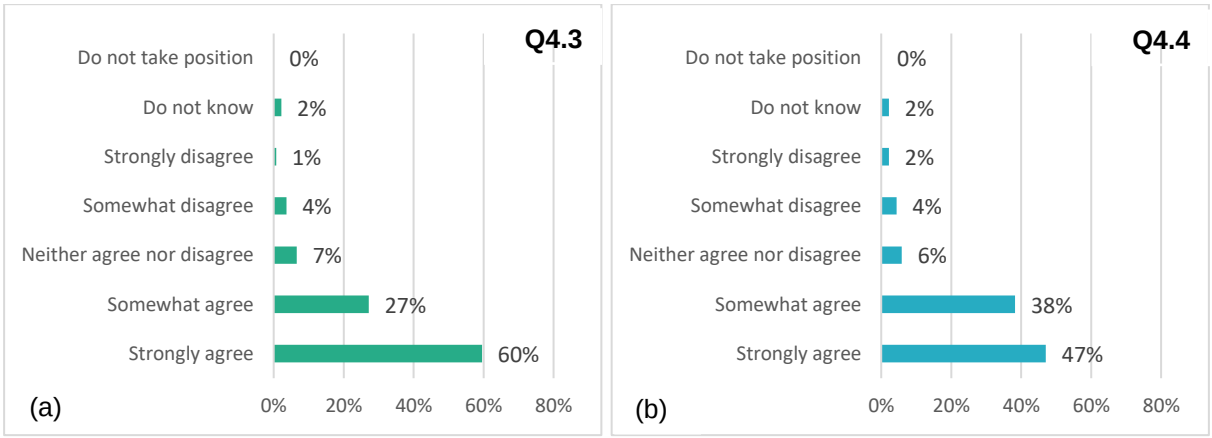


Figure 43: Responses to what extent the participants agree with the following statements: (a) 'Fertilisers may have an impact on the environment due to the use of non-sustainable practices by farmers' and (b) 'Fertilisers may have an impact on the environment due to the nature of fertilisers'

Moreover, the responses regarding in what extend they believe 'Fertilisers may have an impact on the environment due to the use of non-sustainable practices by farmers of the participants' (Q4.3) followed the order: strongly agree (60%) > Somewhat agree (27%) > Neither agree nor disagree (7%) > Somewhat disagree (4%) > Do not know (2%) > Strongly disagree (1%) (Figure 43(a)). With regards to the statement 'Fertilisers may have an impact on the environment due to the nature of fertilisers' (Q4.4), most of the participants (85%) strongly or somewhat agreed with the statement, while only 14% of the participants selected all the other responses (Figure 43(b)).

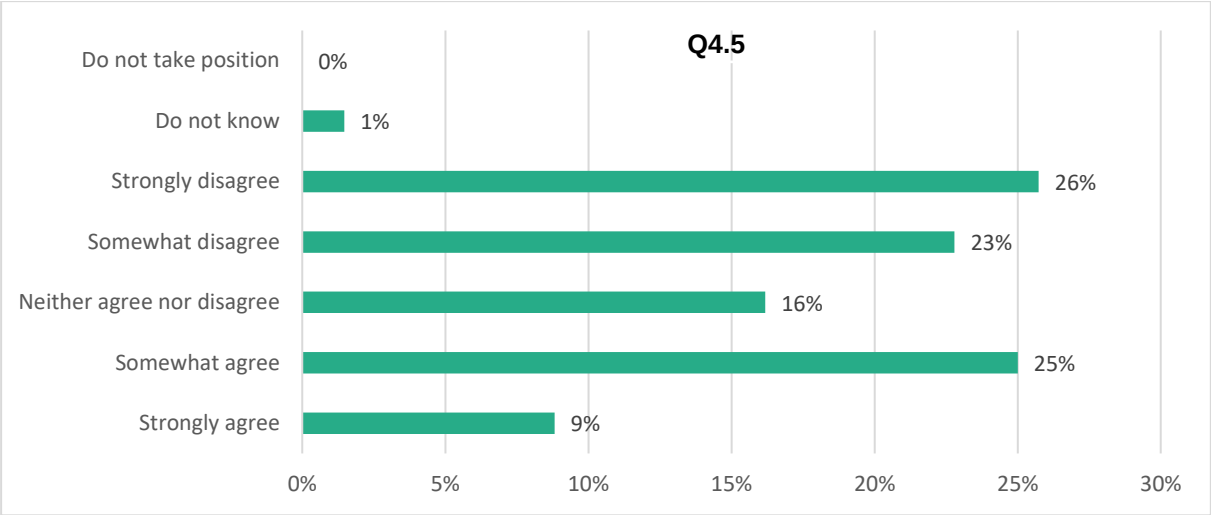


Figure 44: Responses to what extent the participants agree with the following statement 'Organic farming -alone- is a panacea for the sustainable management of agro-ecosystems'

In Q4.5, the participants were mainly disagreed with the statement 'Organic farming -alone- is a panacea for the sustainable management of agro-ecosystems', receiving 49%, while the 25% of the participants declared that 'Somewhat agree' and 26% that 'Neither agree nor disagree' (Figure 44).

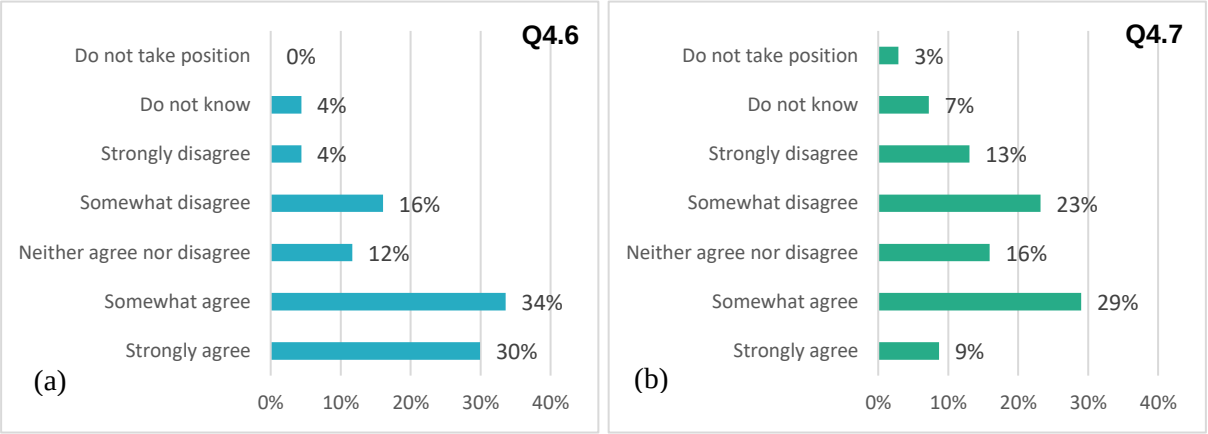


Figure 45: Responses to what extent the participants agree with the following statements: (a) 'The production cost of organic products is higher compared to the cost of other farming systems' and (b) 'If the production costs of organic products are higher, the supply chain will be able to absorb the difference in the cost of production'

In Figure 45(a), the participants were asked to respond to what extent they agree with the statement 'The production cost of organic products is higher compared to the cost of other farming systems' (Q4.6). According to the results, most of the participants agreed (64%) with the statement, while 20% either disagreed and 12% replied neutrally ('neither agree nor disagree'). Furthermore, according to results presented in Figure 45(b), participants responses for the statement 'If the production costs of organic products are higher, the supply chain will be able to absorb the difference in the cost of production' (Q4.7) were equally separated, namely the 38% agreed while 36% disagreed. The 16% replied neutrally ('neither agree nor disagree') (Figure 45(b)).

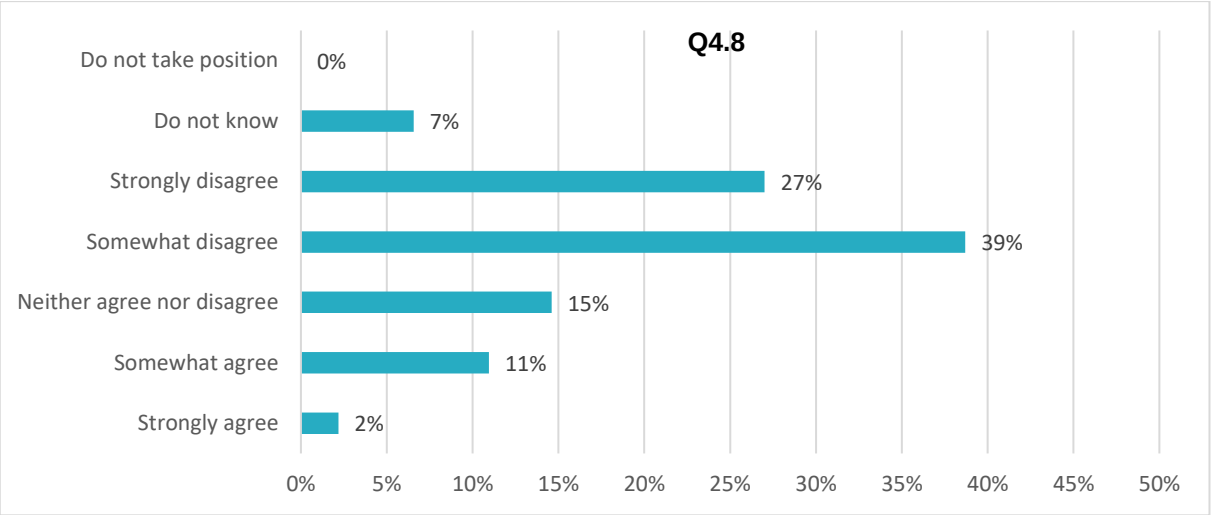


Figure 46: Responses to what extent the participants agree with the following statement 'The differences in impact of environment/product quality between growing plants in soil and growing plants using hydroponics are well known by producers, processors, retailers, consumers'

In Q4.8, the participants were mainly disagreed with the statement 'The differences in impact of environment/product quality between growing plants in soil and growing plants using hydroponics are well known by producers, processors, retailers, consumers', receiving a total 66% ('somewhat & strongly disagree' responses), while the 11% of the participants declared that 'Somewhat agree' and 15% that 'Neither agree nor disagree' (Figure 46). Only the 2% were replied that strongly agree.

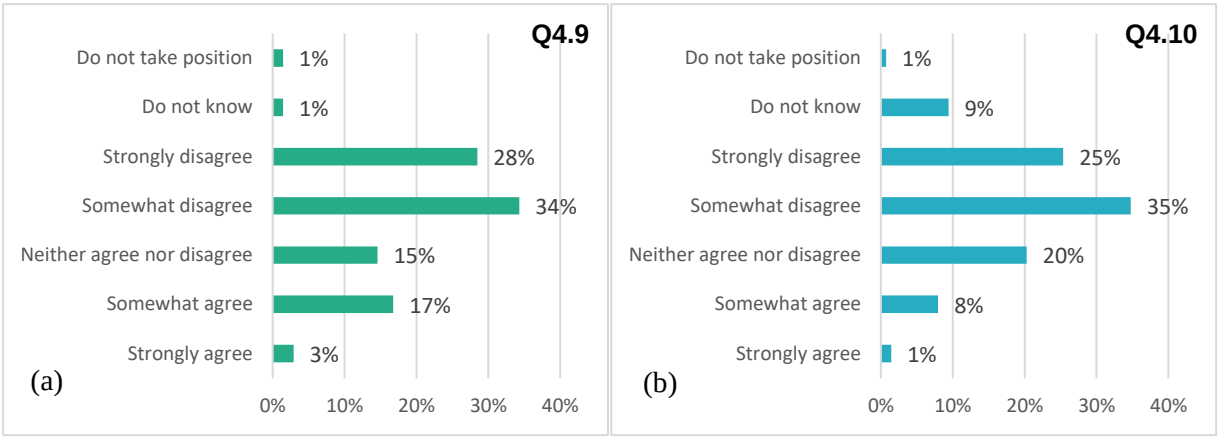


Figure 47: Responses to what extent the participants agree with the following statements: (a) 'The local producers, processors, retailers, consumers, and communities are well informed for the rational and proper use of fertilisers' and (b) 'The local producers, processors, retailers, consumers, and communities are receiving adequate support for reducing the dependence on hazardous pesticides'

Moreover, the responses regarding in what extend they believe that 'The local producers, processors, retailers, consumers, and communities are well informed for the rational and proper use of fertilisers' (Q4.9), the 62% disagreed, while only 20% agreed and 15% responded neutrally (Figure 47(a)). With regards to the statement 'The local producers, processors, retailers, consumers, and communities are receiving adequate support for reducing the dependence on hazardous pesticides' (Q4.10), most of the participants (60%) strongly or somewhat disagreed with the statement, while 9% either agreed and 20% replied neutrally ('neither agree nor disagree') (Figure 47(b)).

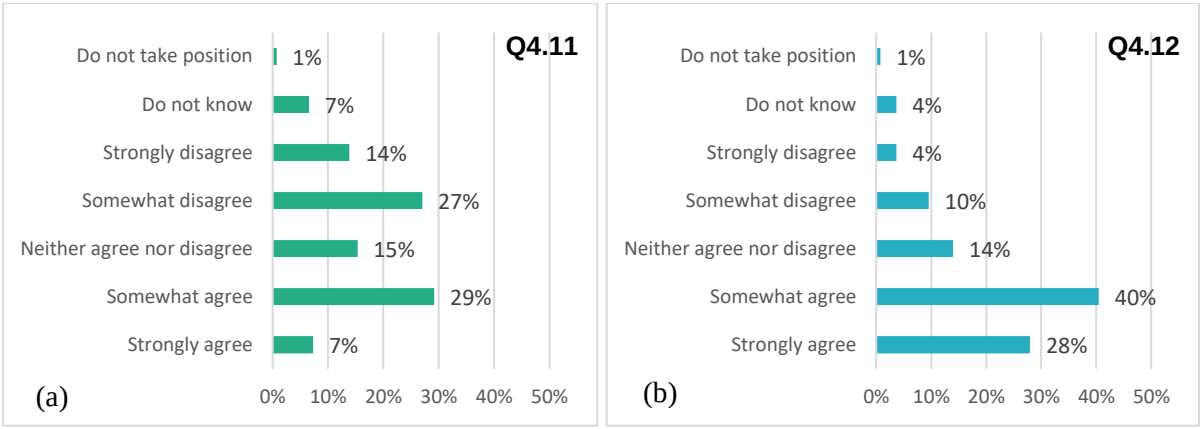
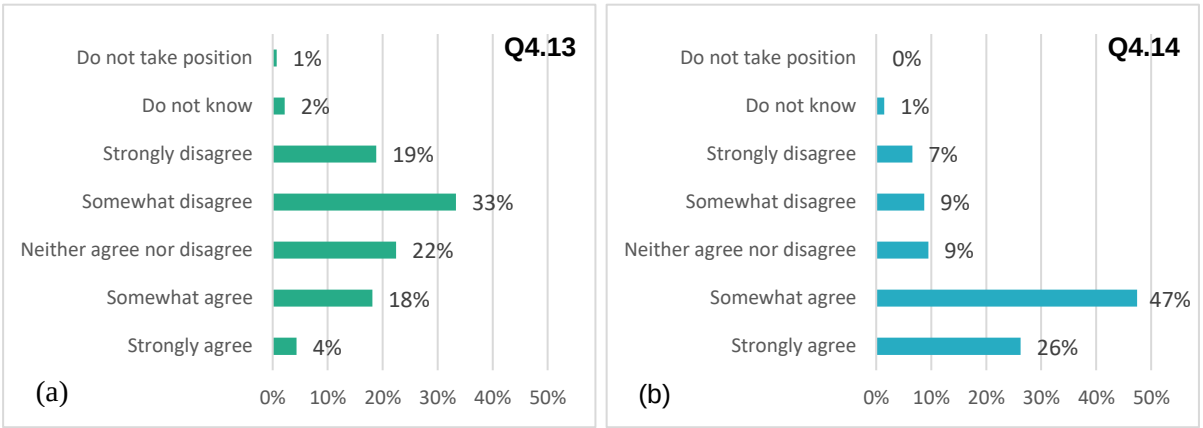


Figure 48: Responses to what extent the participants agree with the following statements: (a) 'Agro-ecological practices and organic farming products are mature enough for mass use in food production system' and (b) 'The use of Agro-ecological and organic practices benefits all F2F chain stakeholders (producers, processors, retailers, consumers)'

In Q4.11, the participants were mainly disagreed with the statement 'Agro-ecological practices and organic farming products are mature enough for mass use in food production, receiving a total 41% ('somewhat & strongly disagree' responses), while the 29% of the participants declared that 'Somewhat agree' and 15% that 'Neither agree nor disagree' (Figure 48(a)). On the contrary, in Q4.12, where the participants were asked the extend that they agree with the statement 'The use of Agro-ecological and organic practices benefits all F2F chain stakeholders (producers, processors, retailers, consumers)', the 68% agreed, while 14% responded 'Neither agree nor disagree' and 14% declared that disagree (Figure 48(b)).

According to results presented in Figure 49(a) (Q4.13), participants responses were equally separated for the statement 'The potential benefits that Agro-ecological and Organic Practices can bring to the agro-food sustainability are mostly economic', namely the 55% disagreed while 22% agreed. The 22% replied neutrally ('neither agree nor disagree'), while only 2% of the participants replied, 'Do not know' (Figure 45(b)). In the next 2 questions, the participants were asked in what extend they agree that the potential benefits that Agro-ecological and Organic Practices can bring to the agro-food sustainability could be environmental (Q4.14) or social benefits (Q4.15). As Figure 49(b) and Figure 49(c) illustrates most participants agreed, receiving a total percentage of 73% (Q4.14) and 49% (Q4.15), respectively.



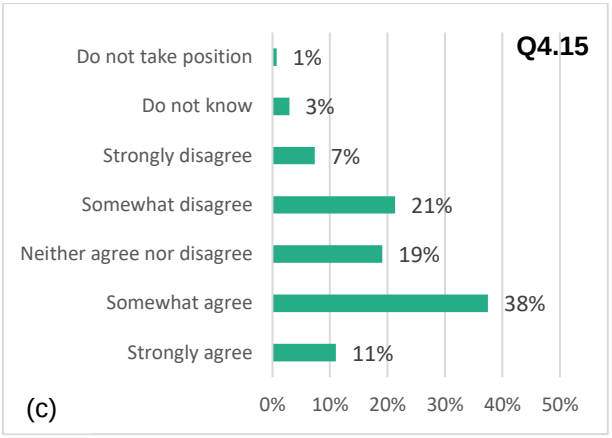


Figure 49: Responses to what extent the participants agree with the following statements: (a) 'The potential benefits that Agro-ecological and Organic Practices can bring to the agro-food sustainability are mostly economic' and (b) 'The potential benefits that Agro-ecological and Organic Practices can bring to the agro-food sustainability are mostly environmental' and (c) 'The potential benefits that Agro-ecological and Organic Practices can bring to the agro-food sustainability are mostly social'

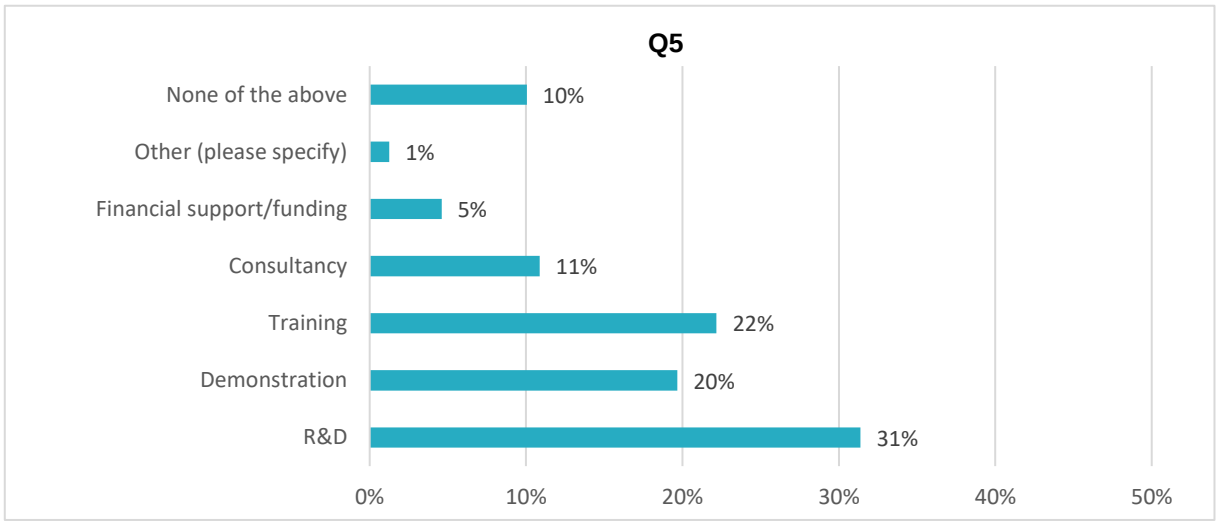


Figure 50: Responses on the type of initiatives taken by participant institution in order to promote or raise the awareness about AOPs

In Q5, each participant institution asked to indicate the type of initiatives taken to promote or raise the awareness about AOPs. As Figure 50 illustrates, 'R&D' (31%), 'Training' (22%), 'Demonstration' (20%) received most of the responses, resulting in at total 73%. 'Consultancy' and 'Financial support/funding' summarized 11% and 5%, respectively.

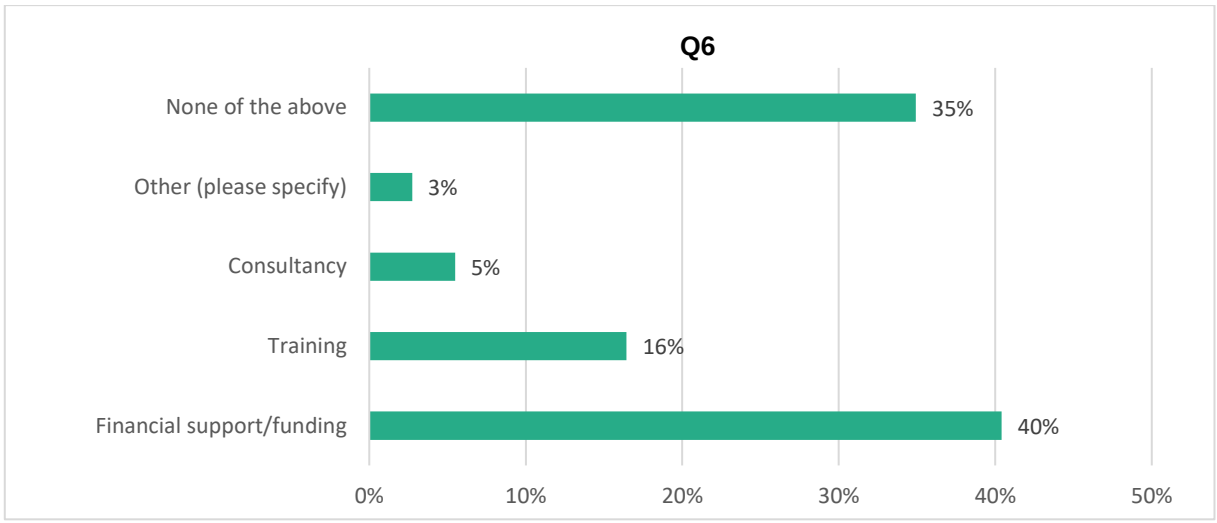


Figure 51: Responses on the type of incentive received by participant institution in order to promote or raise the awareness about AOPs

In Q6, each participant institution asked to indicate the type of incentive received in order to promote or raise the awareness about AOPs. Specifically, as Figure 51 illustrates, the responses followed the order: 'Financial support/funding' (40%) > 'None of the above' (35%) > 'Training' (16%) > 'Consultancy' (5%).

In Q7, the participants were asked to reply in what extend they agree with a series of statements concerning Precision Agriculture technologies. The outcomes from these sub-questions (9 in total) are presented in Figures 52-54.

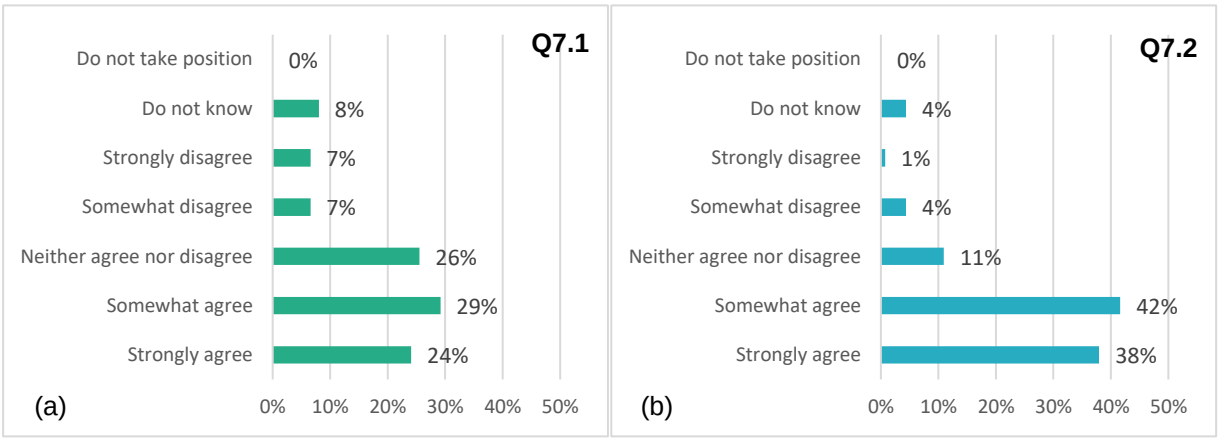


Figure 52: Responses to what extent the participants agree with the following statements: (a) 'The use of Precision Agriculture technologies offers a unique marketing/selling point for agricultural products' and (b) 'The use of Precision Agriculture technologies can reduce the production cost of agricultural products and increase total sales for farmers and companies who adopted them'

In Figure 52(a), the participants were asked to respond to what extent they agree with the statement 'The use of Precision Agriculture technologies offers a unique marketing/selling point for agricultural products' (Q7.1). According to the results most of the participants agreed (53%) with the statement, while 14% either disagreed and 26% replied neutrally ('neither agree nor disagree'). Furthermore, according to results presented in Figure 52(b), the 80% of the participants agreed with the statement 'The use of Precision Agriculture technologies can reduce the production cost of agricultural products and increase total sales for farmers and companies who adopted them' (Q7.2), while 5% either disagreed

and 11% replied neutrally ('neither agree nor disagree'). Only 4% of the participants replied, 'Do not know' (Figure 52(b)).

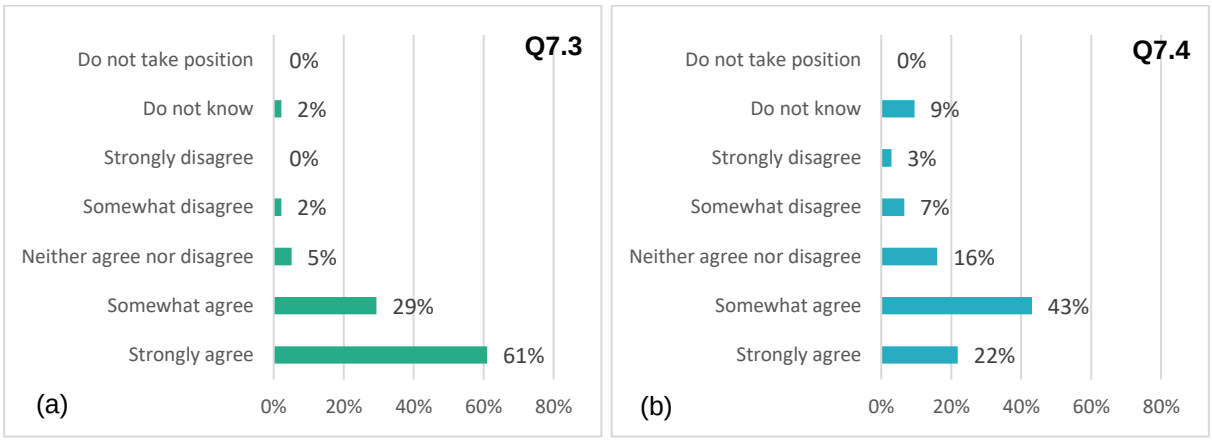


Figure 53: Responses to what extent the participants agree with the following statements: (a) 'The Precision Agriculture technologies can help reduce the use of pesticides and fertilisers, nutrient losses and pesticide residues in food and in the environment' and (b) 'The Precision Agriculture technologies 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'

In Q7.3, the 90 % of the participant institutes replied that they agree that 'The Precision Agriculture technologies can help reduce the use of pesticides and fertilisers, nutrient losses and pesticide residues in food and in the environment' (Figure 53(a)). A high percentage of the participant institutes (65%) was also positively responded to the statement 'The Precision Agriculture technologies 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', while only 16% replied neutrally and 10% disagreed (Figure 53(b)).

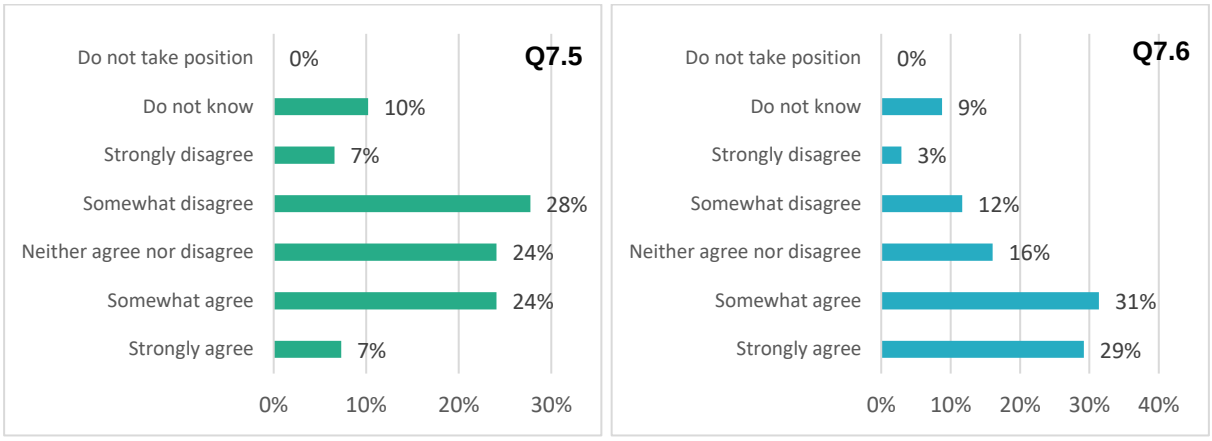


Figure 54: Responses to what extent the participants agree with the following statements: (a) 'The Precision farming solutions are mature enough for mass use in food production systems' and (b) 'The Precision farming solutions benefit all F2F chain stakeholders (producers, processors, retailers, consumers)'.

In Figure 54(a), the participants were asked to respond to what extent they agree with the statement 'The Precision farming solutions are mature enough for mass use in food production systems' (Q7.5). According to the results, most of the participants agreed (31%) with the statement, while 35% either disagreed and 24% replied neutrally ('neither agree nor disagree'). Furthermore, according to results presented in Figure 54(b), the 60% of the participants agreed with the statement 'The Precision farming solutions benefit all F2F chain stakeholders (producers, processors, retailers, consumers' (Q7.6), while 15% either disagreed and 16% replied neutrally ('neither agree nor disagree') (Figure 54(b)).

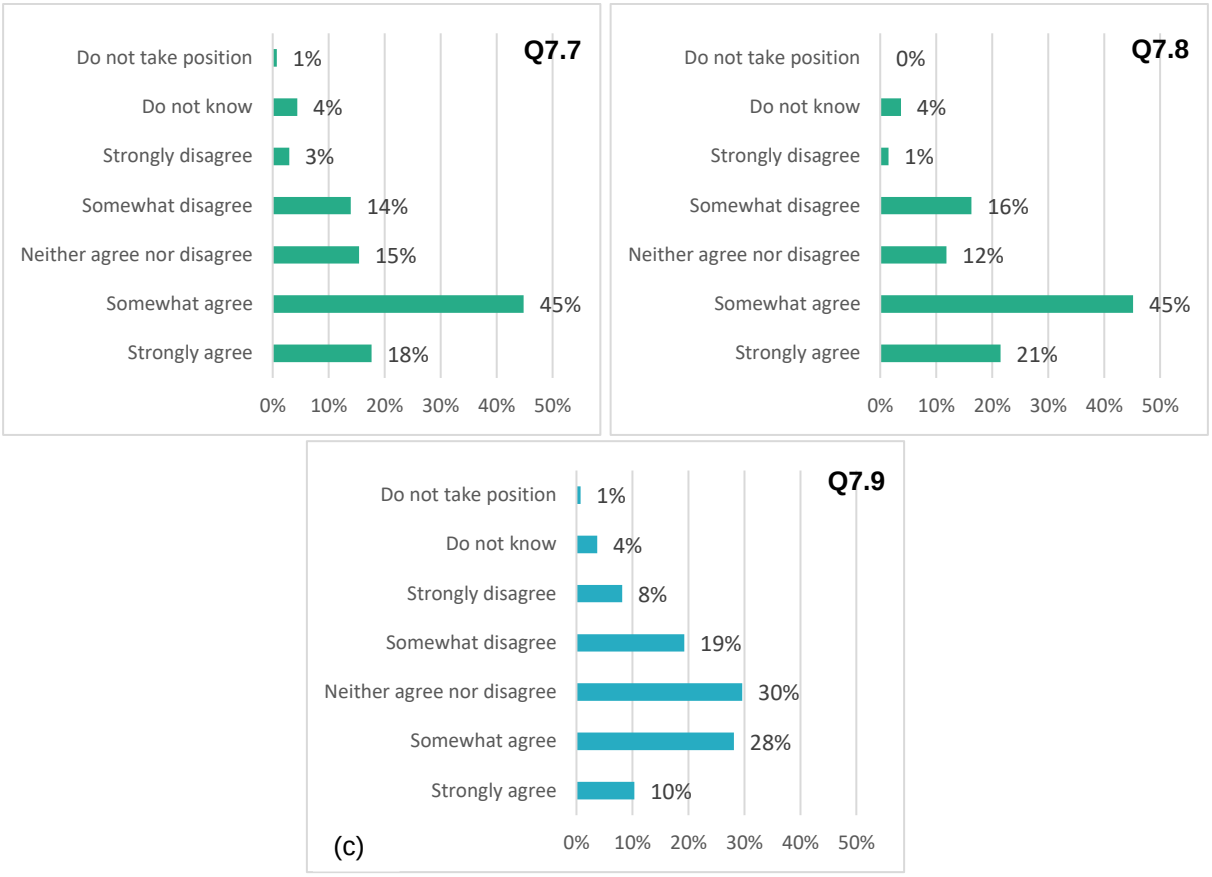


Figure 55: Responses to what extent the participants agree with the following statements: (a) 'The potential benefits that Precision Farming solutions can bring to the agro-food sustainability are mostly economical' and (b) 'The potential benefits that Precision Farming solutions can bring to the agro-food sustainability are mostly environmental' and (c) 'The potential benefits that Precision Farming solutions can bring to the agro-food sustainability are mostly social'

The next 3 questions deal with the extent of economical (Q7.7), environmental (Q7.8), and social benefits that Precision Farming solutions can bring to the agro-food sustainability. Specifically, 63% and 66% agreed that Precision Farming solutions can bring to the agro-food sustainability potential economic and environmental benefits, respectively (Figure 55(a) and (b)). However, in Q7.9, only the 38% of the participants agreed with the statement 'The potential benefits that Precision Farming solutions can bring to the agro-food sustainability are mostly social', while 27% either disagreed and 30% replied neutrally ('neither agree nor disagree') (Figure 55(c)).

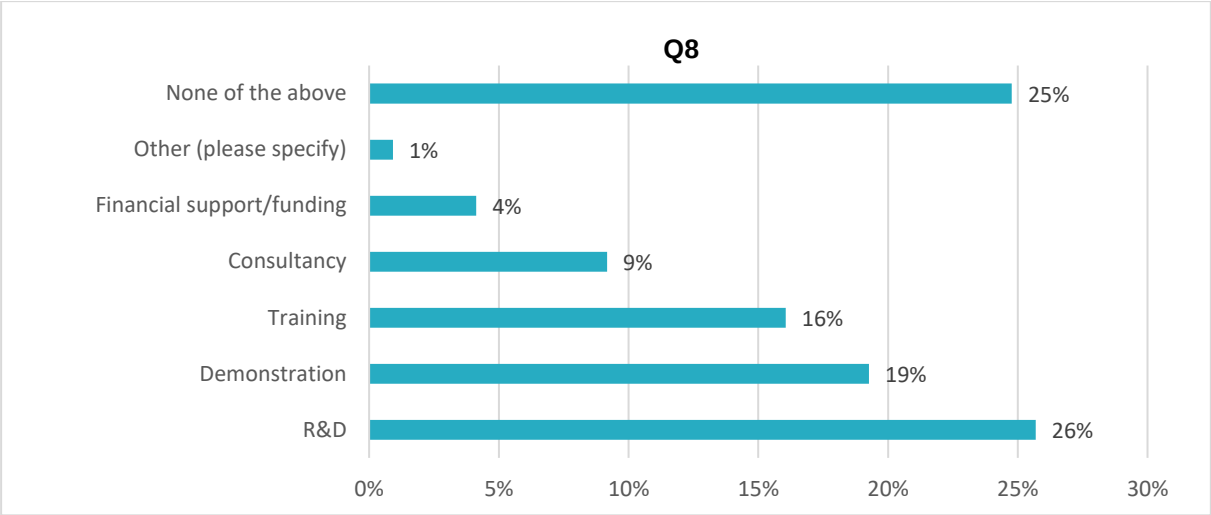


Figure 56: Responses to the initiatives taken from each participant institution to promote or raise the awareness about DSTs

In Q8, each participant institution asked to indicate the type of initiatives taken to promote or raise the awareness about DSTs. As Figure 56 illustrates, 'R&D' (26%), 'Demonstration' (19%), 'Training' (16%), received most of the responses, resulting in at total 61%. 'Consultancy' and 'Financial support/funding summarized 9% and 4%, respectively. Moreover, the 25% of the participants responded, 'None of the above'.

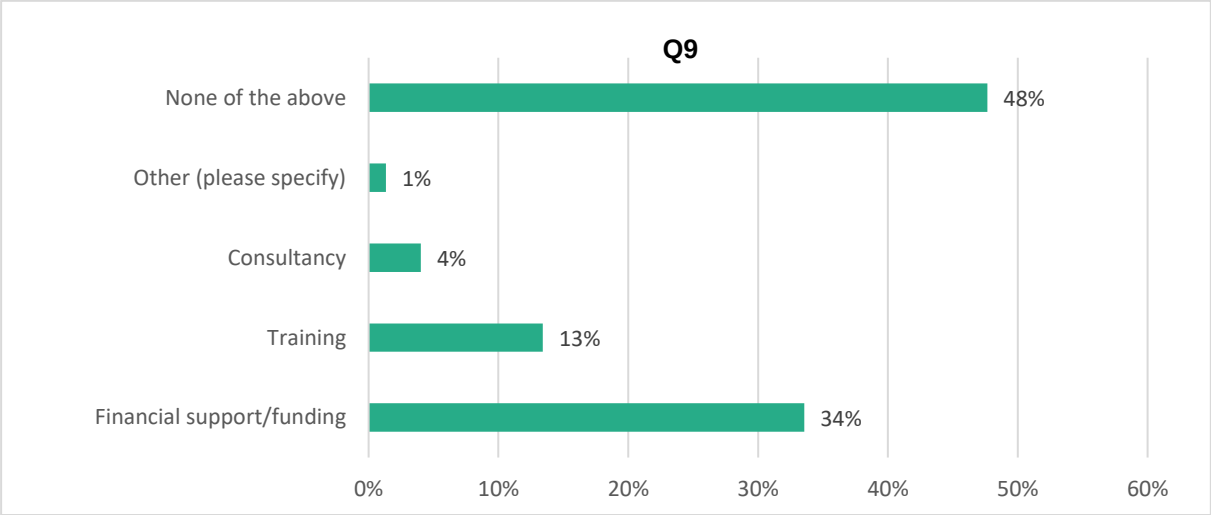


Figure 57: Responses to the incentives received from each participant institution to promote (or raising of awareness about) DSTs

In Q9, each participant institution asked to indicate the type of incentive received to promote or raise the awareness about DSTs. Specifically, as Figure 57 illustrates, the responses followed the order: 'None of the above' (48%) > 'Financial support/funding' (34%) > 'Training' (13%) > 'Consultancy' (4%).

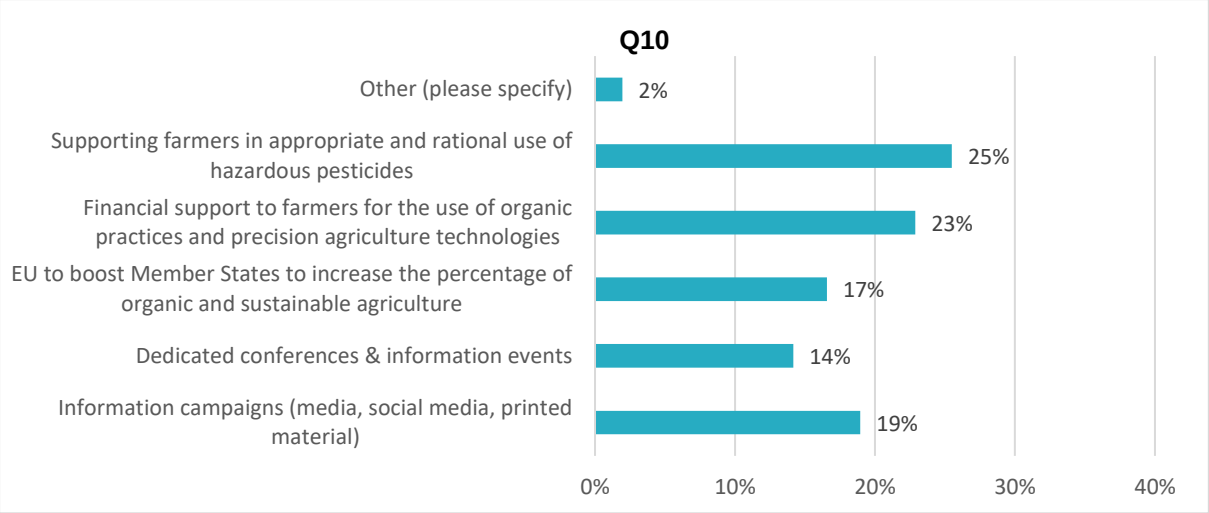


Figure 58: Responses how can action (transition to more sustainable production systems) be accelerated as 2030 targets are only 8 cultivation periods away (minimum)

Finally, the last question (Q10) was related to how action (transition to more sustainable production systems) can be accelerated as 2030 targets are only 8 cultivation periods away (minimum). The replies were almost equally separated between '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', receiving 25% and 23%, respectively, while responses like 'Information campaigns (media, social media, printed material)', 'EU to boost Member States to increase the percentage of organic and sustainable agriculture', 'Dedicated conferences & information events' collected 19%, 17%, and 14%, respectively (Figure 58).

Conclusions & Recommendations

The scope and core objective of Task 1.1 is to run two surveys for:

- Citizens (especially focused to those interested in agricultural production and have tried to produce their own agricultural products.) in order to gather the opinions and impressions from the citizens of the project partners' countries on the project key issues, namely the Agroecological practices, the differences among the conventional and the organic farming, and the use of DSTs technologies on the agrifood production.

- Public and private institutions in order to gather their opinions and views on the key issues of the project and to deepen the understanding about how relevant stakeholders consider the function and the use of pesticides and fertilizers and the exploitation of DSTs.

This section aims to provide the main conclusions and recommendations regarding the increase of the awareness, the level of information and the penetration of the AOPs and DSTs not only from the side of citizens but also the side of public and private institutions.

This section contains two parts. The first one contains a list of conclusions arising from the results of both surveys and the second one a list with recommendations which will help partnership to plan the future activities of the project to as much as possible impactful actions. Even though, the recommendations serve as theoretical suggestions and not as technical feedback, they can be exploited to the project's technical work tasks, offering a motivation for some components to be designed and refined.

1.8. Main Conclusions

1.8.1. Citizens

1.8.1.1. Awareness of F2F EU Strategy

- The EU F2F Strategy aims to make the food production systems, the food processing and distribution systems and the food consumption sustainable, and to prevent food loss and waste. Among the citizens' groups, those with non-experience in their own agri-food production are also less aware for the EU F2F Strategy and at countries level, Austria and Italy indicated the lowest levels of awareness.

1.8.1.2. Experience and opinions for Agro-ecological & Organic Practices (AOPs) and Digital and Space-based Technologies (DSTs)

- A good level of awareness for the various available AOPs is reported such as manure, organic farming, biofertilizers etc by the citizens and regardless of the participating country.
- Almost 2/3 of the citizens responded positively that the agricultural production with the use of AOPs may lead to products with improved quality characteristics like taste, colour, shape.
- A quite high percentage of the citizens declared that they are willing (ca. 80%) to buy food produced using organic practices even if the cost is higher.

- A high awareness for cultivation methods that have been developed in order plants to grow without soil (aquaponic and hydroponic) was reported, while at countries level, Austria, Italy, and Spain indicated the lowest levels of awareness.
- Almost 2/3 of the participants responded that have tried to grow their own agricultural products. Sweden and Portugal are the countries, while 25-34, 35-44 and 45-54 are the age groups with the highest involvement in growing their own agricultural products. Garden, balcony, and terrace were the most preferable places for cultivation, while the main reasons for cultivating was 'As a hobby' and 'to produce products with higher quality characteristics. Moreover, out of those who have tried to cultivate their own agricultural products declared that they have used biofertilizers (53%) or natural pesticides (28%).
- Participants reported that they mainly cultivate salad vegetables (25%), herbs (22%) and all sort of vegetables (20%) and less fruit trees and fruit plants (14 - 17%). This trend was similar among the participating countries.
- Almost 2/3 of the citizens reported that are aware of modern technologies application such as Smart farming or Precision agricultural technologies on agricultural food production.
- A moderate preference was reported for agricultural products to grow via the support of modern technologies, however a high percentage of the participants replied positively regarding the impact in society of these modern technologies on agricultural food production (impact on health and safety standards, human health, unemployment rate, ecosystem quality etc.).
- Regarding the necessity of an informative indication/labelling used in products produced under the support of modern technologies almost half of the participants responded positively, while also 2/3 of the participants preferred this information to be provided via 'A symbol'.
- The most preferred sources for receiving information about the production of agricultural products are Relevant public organizations, Agricultural Universities & Research Centers, and Farmers Unions & Agricultural Co-operations as well as Consumers organizations, while the most preferred mean for receiving relevant information are Info campaigns in supermarkets, open markets, etc, Websites of relevant organisations, social media, and TV/Radio/Newspapers.

1.8.2. Public and private institutions

1.8.2.1. Agro-ecological & Organic Practices (AOPs)

- A high percentage of the participants (80%) responded that the circulation of fertilisers used for organic farming, hydroponics or conventional agriculture are subject to specific and strict standards and regulations set by European and National legislation, while approximately 1/2 of the participants recognized that current regulations can be an obstacle in the development of new biopesticides.
- A positive behaviour was reported regarding the potential of AOPs to have an impact on: (i) the environment due to the use of non-sustainable practices by farmers and (b) the environment due to the nature of fertilisers.
- A moderate percentage believe that Organic farming -alone- is a panacea for the sustainable management of agro-ecosystems.
- Most of the participants believe that the cost of organic products is higher compared to the cost of other farming systems and a moderate percentage believe that this extra cost may be absorbed by the supply chain.

- A high percentage of the participants believe that the local producers, processors, retailers, consumers, and communities receive limited information related to rational and proper use of fertilisers and non-adequate support for reducing the dependence on hazardous pesticides.
- Concerning the level of maturity of the AOP in order to be used for mass use in food production system, a moderate percentage of participants agreed (36%). However, 2/3 of the participants responded positively if AOPs may benefit all F2F chain stakeholders (producers, processors, retailers, consumers).
- A quite low percentage of the participants agreed (ca. 20%) that AAOP can bring to the agro-food sustainability potential economic benefits, while a high percentage agreed that such practices may have benefits for the society and the environment.
- The participants reported that their institutes have taken initiatives to promote or raise the awareness about AOPs mainly via 'R&D', 'Demonstration', and 'Training'. Moreover, regarding the incentives received to promote AOPs, the most preferable were 'Financial support/funding' and 'Training'.

1.8.2.2. Digital and Space-based Technologies (DSTs)

- A moderate percentage of the participants recognized that the use of Precision Agriculture technologies offers a unique marketing/selling point for agricultural products as well as that those technologies can reduce the production cost of agricultural products and increase total sales for farmers and companies who adopted them.
- A positive behaviour was reported regarding the potential of such technologies to: (i) reduce the use of pesticides and fertilisers, nutrient losses and pesticide residues in food and in the environment and (ii) 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.
- Concerning the level of maturity of Precision farming solutions in order to be used for mass use in food production systems, a low percentage of participants agreed (31%). However, over 2/3 of the participants responded positively if such solutions may benefit all F2F chain stakeholders (producers, processors, retailers, consumers).
- Almost 2/3 of the participants agreed that Precision Farming solutions can bring to the agro-food sustainability potential economic and environmental benefits, while only 1/3 responded that such solutions may also have social benefits.
- The participants reported that their institutes have taken initiatives to promote or raise the awareness about DSTs mainly via 'R&D', 'Demonstration', and 'Training'. Moreover, regarding the incentives received to promote DSTs, the most preferable were 'Financial support/funding' and 'Training'.
- Regarding how action (transition to more sustainable production systems) can be accelerated as 2030 targets are only 8 cultivation periods away, the replies of the participants were almost equally distributed (ranging from 14 to 25%). 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.

1.9. Main Recommendations

1.9.1. Citizens

Recommendation 1: Communicate more effectively the F2F EU Strategy and its targets

The results indicated a moderate degree of awareness of the EU F2F Strategy by the citizens. Examining the awareness per citizens' type, seems that the citizens with non-experience in their own agri-food production are also less aware for the EU F2F Strategy. However, this moderate degree of awareness was also recorded in citizens who have previously tried to produce their agricultural products either in rural or urban areas. Considering the above, it would be helpful to develop informative activities, in an easily understandable and direct language, to increase the level of awareness.

Recommendation 2: Demonstrate the benefits of AOPs and DSTs on agricultural products

The existing AOPs and DSTs are quite known to the citizens and in fact they declared that such practices may lead to products with improved quality characteristics as well as that they are willing to buy food produced using organic practices even if the cost is higher. However, an increase in their engagement and adoption is needed, since the analysis also revealed a moderate preference for agricultural products growing via the support of modern technologies. Thus, the communication and demonstration of their benefits may encourage citizens to purchase such products.

Recommendation 3: Communicate the addition of an informative indication/labelling in products produced via the support of modern technologies

The necessity of an informative indication/labelling used in products produced under the support of modern technologies was reported by the citizens, with the reply 'A symbol' to be the most dominant. The latter indicates that this informative indication could be a motivation for the consumers to purchase such products and this outcome should be clearly disseminated to the food industry.

Recommendation 4: Communicate AOPs and DSTs on agricultural products

Although the survey revealed that the existing AOPs and DSTs are quite known to the citizens, the communication of such methods should be continuous. The most preferred sources for receiving information about the production of agricultural products are Relevant public organizations, Agricultural Universities & Research Centers and Farmers Unions & Agricultural Co-operations as well as Consumers organizations, while the most preferred mean for receiving relevant information are Info campaigns in supermarkets, open markets, etc, Websites of relevant organisations, social media, and TV/Radio/Newspapers.

1.9.2. Public and private institutions

Recommendation 1: Communicate AOPs on agricultural products to all stakeholders of supply chain

A high percentage of the participant institutes believe that the local producers, processors, retailers, consumers, and communities receive limited information related to rational and proper use of fertilisers and non-adequate support for reducing the dependence on hazardous pesticides. Thus, direct activities should be organised across the supply chain, which will increase the familiarity of all stakeholders with the AOPs, their knowledge for the reduction in the dependence on hazardous pesticide use and the loss of nutrients from fertilizers and their awareness for the practical use of the AOPs.

Recommendation 2: Communicate the enhancement of the current financial support of organisations developing AOPs and DSTs to increase their maturity level

The analysis of the survey reveals that participant institutions declared a low degree of maturity of AOPs and DSTs in order to be used for mass use in food production systems. However, a high percentage of the participants responded positively if such solutions may benefit all F2F chain stakeholders (producers, processors, retailers, consumers). A potential increase of the current financial support for organisations studying and developing such modern methods should be an objective in order to increase their maturity level.

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Annex I: Questionnaires

A. Questionnaire for Citizens

Welcome note

Dear participant, welcome to our survey!

The survey lasts about 10 minutes. There are no right or wrong answers, this is about your views. All data is anonymised, and your privacy is guaranteed.

Thank you for helping us gather relevant information!

PestNu is an acronym of a H2020 European Green Deal project which brings systemic solutions under circular economy along the farm-to-fork food production chain, using cutting edge Digital and Space-based Technologies (DST) combined with Agro-ecological and Organic practices (AOP) for reducing the dependence on hazardous pesticides, reducing the losses of nutrients from fertilisers, towards zero pollution of water, soil and air and ultimately fertiliser use.

PestNU consortium (20 partners from 9 different EU countries) targets within 36-months duration to deploy, upscale, field-test and demonstrate novel DST (eg. robots, sensors, Earth Observation mission systems etc) combined with AOP (eg. automated recycling system of agricultural wastes, biofertilisers, biopesticides etc) in novel circular economy food production systems, such as aquaponics and circular horticulture systems as closed/semi-closed hydroponic greenhouses, and in open-field vegetable cultivation, under different conditions, soils and crops (tomato, cucumber, pepper).

In this context a questionnaire was developed to gather the opinions and impressions from the citizens of the project partners' countries on the project key issues, meaning the Agroecological practices, the differences between the conventional and the organic farming and the use of DSTs technologies on the agrifood production.

The questionnaire is addressed to citizens in general, with a special focus to citizens interested in agricultural production and have tried to produce their own agricultural products.

Please help us by sharing your experience and opinions!!!

If you have any questions or comments, you can contact us: Project Coordinator, Dr Ria Pechlivani/CERTH (riapechl@iti.gr) or Survey Studies Leader, Dr Foteini Salta/SEVT (fotsal@sevt.gr).

Informed Consent form for survey

By ticking the consent boxes below, I participate in this activity voluntarily. I understand that my participation will involve providing multiple-choice or written responses to a survey, where I will be invited to offer my views about agricultural needs for new technologies.

I understand the following:

• I have read the information explaining the project and understand how this research activity will collect and process my responses, and my personal data if I choose to provide it.

• I will be asked to provide professional or personal views and that the record of my involvement in the research will be kept confidential.

• I have the right to ask questions about my participation in the survey and receive clear answers before making any decision.

• I may refuse to answer any questions I do not wish to discuss. I am free to end my participation at any time.
• My responses to this survey are recorded and digital copies will be kept in secure folders. Any physical copies which are made of my responses will be safely stored by the PESTNu team and will be destroyed when they are no longer needed or five years after the project comes to an end (whichever is sooner).
• If the information I provide is used for the writing of a piece of work to be delivered to the European Commission, or scientific research paper, the consortium will remove my name from that information so that my identity and experiences remain confidential (unless attribution is required, and I have consented to it).
• I have been made aware of my rights regarding my personal data and how to exercise them.
• I have been given the contact details of the research team and I have been informed that I am free to contact:

My participation is voluntary. I have not been pressured or coerced in any way to provide answers to this survey.
Yes
No
I agree that my responses to this survey can be used by the PestNu Consortium for their work in the project, and my responses can be used for scientific research papers
Yes
No

Introductory Data

Q1. Citizens
- who have tried to produce by their own some agricultural products in rural areas
- who have tried to produce by their own some agricultural products in urban areas (cities and towns)
- with non experience in any kind of own agricultural production

Q2. Age Group
- 18-24
- 25-34
- 35-44
- 45-54
- 55-64
- 65-74
- >74

Q3 Country
- Greece
- Italy
- Spain
- Sweden
- Portugal
- Ireland
- Cyprus
- Austria
- UK
- Other

Q4. The European Commission has launched the Farm 2 Fork EU strategy for sustainable, safe, nutritious, and healthy food production aiming to make food systems fair, healthy and environmentally-friendly. The Farm to Fork Strategy aims to make sustainable the food

production systems, the food processing and distribution systems and the food consumption and to prevent food loss and waste. Have you heard of this Strategy?

- Yes
- No

Experience and opinions for Agro-ecological and Organic Practices (AOPs) and Digital and space-based technologies (DSTs)

Agro-ecological practices: Biofertilizers, natural pesticides and promotion of natural enemies, crop choice, crop variety and rotations, irrigation and drainage, intercropping and relay intercropping, agroforestry with timber, fruit, or nut trees, allelopathic plants, direct seeding into living cover crops or mulch, and integration of semi-natural landscape elements at field and farm or their management at landscape scale, etc.

***Organic farming practices*:** The use of non-chemical/non-synthetic pesticides and fertilizers (if required) is preferred (industrial bio-pesticides, natural pesticides, bio-fertilisers, etc), which are more environmentally friendly. Emphasis is placed, also, on techniques such as crop rotation, companion planting and temporary land set-aside.

Digital and space-based technologies are tools, systems, and methods for precision and smart agriculture eg. Geographical information systems, remote sensors for water and nutrient stress and insect detection, proximate sensors for soil (N concentration and pH) and crop conditions, robots both ground and aerial for monitoring yields, Decision Support Systems for integrated pest and nutrient management, etc

Q5. Agro-ecological and organic practices (AOP) are used for agricultural production as an alternative to conventional farming. Which of the following AOP practices have you heard of?

Biofertilizers / Biostimulants
Natural pesticides
Crop choice, crop variety, and rotations
Irrigation and drainage
Intercropping and relay intercropping
Agroforestry with timber, fruit, or nut trees
Allelopathic plants (plants that limit growth of weed)
Organic farming
Manure
Ash
None of them

Q6. To what extent do you agree with the following statement: The agricultural production with the use of Agro-ecological and organic practices leads to products with improved quality characteristics (taste, colour, shape)?

1. Strongly agree
2. Somewhat agree
3. Neither agree nor disagree
4. Somewhat disagree
5. Strongly disagree

Do not know

Q7 If in Q6 you have answered 4 or 5, please indicate the reasons

- There are not major differences (improvements) in taste
- The appearance AOP products is inferior to the conventional ones
- I don’t trust farmers for the proper use of the AOPs
- Other (Please indicate)

Q8. Would you buy food produced using organic practices even if the cost is higher?
- Yes
- No

Q9. In recent years, methods of cultivation have been developed that grow plants without soil. Have you heard of these cultivation methods?
- Hydroponic
- Aquaponic
- I haven't heard of either of them

Q10. Have you ever tried to grow your own agricultural products?
- Yes
- No

Q11. If in Q10 you replied yes, where have you grown your own agricultural products?
- Garden
- Community garden
- Terrace
- Balcony
- Field
- Other (Please describe)

Q12. If in Q10 you replied yes, please indicate the reasons for doing it:
- To produce products with higher quality characteristics
- To reduce costs
- To control the pesticide use
- To control water and nutrient losses
- To help the environment
- To reduce food miles
- To get outside
- As a small business
- As a hobby
- Other (Please indicate)

Q13. If in Q10 you replied yes, please indicate what you have cultivated?
- herbs
- salad vegetables
- all sort of vegetables
- fruit plants
- fruit trees
- other (please indicate)

Q14. If in Q10 you replied yes, please indicate if you have used some Organic Practices:
- Biofertilizers
- Natural pesticides
- Other (Please indicate)

Q15. In recent years agricultural food production is supported by modern technologies mainly referred to as Smart farming or Precision agricultural technologies (sensors, robots, drones, data management, etc. Have you heard of these technologies?
- Yes
- No

Q16. If in Q15 you replied yes, do you think that the use of these technologies can improve the quality characteristics of agricultural products and, for instance, contribute to reducing pesticide residues in food and in the environment?

1. Strongly agree
2. Somewhat agree
3. Neither agree nor disagree
4. Somewhat disagree
5. Strongly disagree
6. Don't know

Q17. If in Q16 you have answered 4 or 5, please indicate the reasons

- There aren't any differences in taste and appearance
- I don't trust farmers for the proper use of the modern technologies
- The products had no labelling for low inputs (e.g., in pesticides, fertilisers)
- Other (Please indicate)

Q18. Would you prefer your agricultural products to have been grown with the support of modern technologies?

- Yes
- No
- I don't know

Q19. Do you believe that modern technologies will have a positive or negative impact in society (impact on health and safety standards, human health, unemployment rate, ecosystem quality etc.)?

1 - Very Positive
2 – Positive
3 - Neutral
4 – Negative
5 – Very negative
6 – I don't know

Q20. Do you think there should be some informative indication/labelling if a product has been produced under the support of modern technologies?

- Yes
- No
- I don't know

Q21. If yes, which of the following methods would you prefer?

- A symbol
- A QR Code
- Other (Please describe)
- I don't know

Q22. Do you think you get enough information about how agricultural products on the market are produced?

1. Strongly agree
2. Somewhat agree
3. Neither agree nor disagree
4. Somewhat disagree
5. Strongly disagree

Don't know

Q23. If in Q22 you have answered 4 or 5, please indicate the reasons

……
……

Q24. Please indicate who would you trust to provide you with information about how agricultural products are produced.

- Relevant public organisations (Ministries of Agriculture and Agrofood, National Agricultural organisations for the protection and insurance of agricultural activity, etc)
- Farmers Unions & Agricultural Co-operations
- Agriculture Universities & Research Centres
- Consumer organisations
- In the shops
- Other (Please indicate)

Q25. How would you like to receive information about the production of agricultural products?

Websites of relevant organisations
Social media
TV/Radio/Newspapers
Info campaigns in supermarkets, open markets, etc
Open events
Apps
Other (Please indicate)

Personal Data Management

The Data controller is: Federation of Hellenic Food Industries (SEVT). 340, Kifissias Avenue 154 51 Neo Psychiko, Greece. Contact: Dr Foteini Salta (fotsal@sevt.gr).
All responses to this questionnaire are anonymous for the researchers and organisations working on the project, we cannot identify you from your answers.
This survey is managed by the Federation of Hellenic Food Industries, and you can find information on the Hellenic Data Protection Authority here: https://www.dpa.gr/en
For more information:
-on the PestNu project, you should contact Dr Ria Pechlivani, PestNu Project Coordinator (riapechl@iti.gr)
-on this survey, you should contact Dr Foteini Salta, Project Manager/SEVT (fotsal@sevt.gr)
-on the processing of your personal data, you should contact Dr Matthew Hall, Research Analyst/Trilateral Research (matthew.hall@trilateralresearch.com).

End of Survey

Thank you for taking part in this survey and contributing to our understanding of what citizens think about digital and space-based technologies and agro-ecological and organic practices for reducing pesticide use and nutrients loss.
Your input will be imperative for us to identify key elements and perceptions that should be considered during the implementation of our project.
Do you have any questions or comments? You can contact us: Project Coordinator, Dr Ria Pechlivani/CERTH (riapechl@iti.gr) or Survey studies Leader, Dr Foteini Salta/SEVT (fotsal@sevt.gr).
Feel free to follow the PestNu social media accounts for more information!
- LinkedIn: https://www.linkedin.com/company/76532558
- Facebook: https://www.facebook.com/PestNu/
- Twitter: https://twitter.com/PestNu

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B. Questionnaire for Public & Private Institutions

Welcome note

Dear participant, welcome to our survey!

The survey lasts about 10 minutes. There are no right or wrong answers, this is about your views. All data is anonymised, and your privacy is guaranteed.

Thank you for helping us gather relevant information!

PestNu is an acronym for a H2020 European Green Deal project (with a duration of 3 years) which brings systemic solutions under circular economy along the Farm to Fork food production chain, using cutting edge Digital and Space-based Technologies (DST) combined with Agro-ecological and Organic practices (AOP) for reducing the intensive use of conventional pesticides, reducing the losses of nutrients from fertilisers, towards zero pollution of water, soil and air and ultimately fertiliser use.

PestNu consortium (20 partners from 9 different EU countries) aims to deploy, upscale, field-test and demonstrate novel DST (eg. robots, sensors, Earth Observation mission systems etc) combined with AOP (eg. automated recycling system of agricultural wastes, biofertilisers, biopesticides etc.) in novel circular economy food production systems, such as aquaponics and circular horticulture systems as closed/semi-closed systems (hydroponic greenhouses), and in open-field vegetable cultivation, under different conditions, soils, and crops (tomato, cucumber, pepper, lettuce).

We are using this questionnaire to gather the opinions and views from the public and private institution representatives of the project partners' countries on the key issues of the project and to deepen our understanding about how relevant stakeholders consider the function and the use of pesticides and fertilisers and the exploitation of DSTs. The responses from the survey will guide us to plan future project activities.

Do you have any questions or comments? You can contact us: Project Coordinator, Dr Ria Pechlivani/CERTH (riapechl@iti.gr) or Survey Studies Leader, Dr Foteini Salta/SEVT (fotsal@sevt.gr).

Informed Consent form for survey

By ticking the consent boxes below, I participate in this activity voluntarily. I understand that my participation will involve providing multiple-choice or written responses to a survey, where I will be invited to offer my views about agricultural needs for new technologies.

I understand the following:
• I have read the information explaining the project and understand how this research activity will collect and process my responses, and my personal data if I choose to provide it.
• I will be asked to provide professional or personal views and that the record of my involvement in the research will be kept confidential.
• I have the right to ask questions about my participation in the survey and receive clear answers before making any decision.
• I may refuse to answer any questions I do not wish to discuss. I am free to end my participation at any time.
• My responses to this survey are recorded and digital copies will be kept in secure folders. Any physical copies which are made of my responses will be safely stored by the PestNu team and will be destroyed when they are no longer needed or five years after the project comes to an end (whichever is sooner).
• If the information I provide is used for the writing of a piece of work to be delivered to the European Commission, or scientific research paper, the consortium will remove my name from that information

so that my identity and experiences remain confidential (unless attribution is required, and I have consented to it).
• I have been made aware of my rights regarding my personal data and how to exercise them.
• I have been given the contact details of the research team and I have been informed that I am free to contact:

My participation is voluntary. I have not been pressured or coerced in any way to provide answers to this survey.
Yes
No

I agree that my responses to this survey can be used by the PestNu Consortium for their work in the project, and my responses can be used for scientific research papers
Yes
No

Introductory Data
Q1. Country
- Greece
- Italy
- Spain
- Sweden
- Portugal
- Ireland
- Cyprus
- Austria
- UK
- Other

Q2. Type of Institution
- Companies, Clusters, Associations of companies in the sectors of AOP or DST
- Farmers' unions and cooperatives
- Business support organisations
- Organisations supporting agro-ecology, organic farming, hydroponics, etc.
- Relevant ministries and public institutions involved in planning, regulation, inspection, etc
- Research institutes/Universities
- Other (please specify)

Q3. I answer the questions as:
- Institute representative
- Individual

Agro-ecological and Organic Practices (AOPs)
Agro-ecological practices: Among many agro-ecological practices the most common can be crop rotations, cover cropping, crop-livestock mixtures, agroforestry, polycultures and intercropping, multi-lines and variety mixtures (genetic diversification), field crop border diversification and corridors linking fields and natural vegetation (TWN & SOCLA, 2015)

Organic farming practices: Eco-practices in agriculture maintain the proper balance and save natural resources (EOS, 2020). Among many Organic farming practices the most common can be Crop Rotation, Green Manures & Cover Crops, Manuring & Composting, Bio-fertilisers, Bio-stimulants, Bio-Pesticides, Biological Pest Control, Intercropping & Companion Planting, Sanitation, Tillage, Mulching (Goldammer, 2017).

In the PestNu project, Agro-ecological and Organic Practises listed below will be further deployed, upscaled, field-tested and demonstrated:
- Automated self-controlled system for microalgae based biofertilizer production
- Microalgae biofertilizer based on recycled drainage wastewaters
- Biopesticide with nutritional effect produced by recycled materials from agrofood Industries
- Integrated Fertilisation/Nutritional programs

Q4. To what extent do you agree with the following statements, concerning agro-ecological and organic practices (AOP)?

	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree	Do not know	Do not take position
1.The circulation of fertilisers, used for organic farming, hydroponics or conventional agriculture, are subject to specific and strict standards and regulations set by European and National legislation							
2.Current regulations can be an obstacle in the development of new biopesticides and biofertilizers							
3.Fertilisers may have an impact on the environment due to the use of non-sustainable practices by farmers							
4.Fertilisers may have an impact on the environment due to the nature of fertilisers							
5. Organic farming -alone- is a panacea for the sustainable management of agro-ecosystems							
6.The production cost of organic products is higher compared to the cost of other farming systems							
7.If the production costs of organic products are higher, the supply chain will be able to absorb the							

difference in the cost of production							
8.The differences in impact of environment/product quality between growing plants in soil and growing plants using hydroponics are well known by producers, processors, retailers, consumers							
9.The local producers, processors, retailers, consumers and communities are well informed for the rational and proper use of fertilisers							
10.The local producers, processors, retailers, consumers and communities are receiving adequate support for reducing the dependence on hazardous pesticides							
11.Agro-ecological practices and organic farming products are mature enough for mass use in food production system							
12.The use of Agro-ecological and organic practices benefits all Farm to Fork chain stakeholders (producers, processors, retailers, consumers)							
13.The potential benefits that Agro-ecological and Organic Practices can bring to the agro-food sustainability are mostly economic							
14.The potential benefits that Agro-ecological and Organic Practices can bring to the agro-food							

sustainability are mostly environmental							
15.The potential benefits that Agro-ecological and Organic Practices can bring to the agro-food sustainability are mostly social							

Q5. Has your institution taken any initiatives to promote or raising of awareness about AOPs?

- R&D
- Demonstration
- Training
- Consultancy
- Financial support/funding
- Other (please specify)
- None of the above

Q6. Has your institution received any type of incentive to the promotion of (or raising of awareness about) AOPs?

- Financial support/funding
- Training
- Consultancy
- Other (please specify)
- None of the above

Digital and space-based technologies (DSTs)

Digital and space-based technologies are tools, systems, and methods for precision and smart agriculture eg. Geographical information systems, remote sensors for water and nutrient stress and insect detection, proximate sensors for soil (N concentration and pH) and crop conditions, robots both ground and aerial for monitoring yields, Decision Support Systems for integrated pest and nutrient management, etc

In the PestNu project, Digital and Space Technologies (DST) listed below will be further deployed, upscaled, field-tested, and demonstrated in aquaponic/hydroponic greenhouses and open-field vegetable cultivation:

- Artificial Intelligence robotic trap for real-time insects monitoring and management
- Satellite-based monitoring systems of crop conditions such as soil/plant nutrients (e.g. fertilisers) and pest plant inputs (e.g. herbicides, bactericides etc)
- Autonomous self-navigating robot for pesticide (insects, fungal diseases) monitoring and 3D spot spraying.
- In-situ & real-time UVC nutrient analysers (Nitrite/ Nitrate, Phosphate/ Ammonium).

Q7. To what extent do you agree with the following statements, concerning Precision Agriculture technologies?

	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree	Do not know	Do not take position
1.The use of Precision Agriculture technologies offers a							

unique marketing/selling point for agricultural products							
2.The use of Precision Agriculture technologies can reduce the production cost of agricultural products and increase total sales for farmers and companies who adopted them							
3.The Precision Agriculture technologies can help reduce the use of pesticides and fertilisers, nutrient losses and pesticide residues in food and in the environment							
4.The Precision Agriculture technologies 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							
5.The Precision farming solutions are mature enough for mass use in food production systems							
6.The Precision farming solutions benefit all Farm to Fork chain stakeholders (producers, processors, retailers, consumers)							
7.The potential benefits that Precision Farming							

solutions can bring to the agro-food sustainability are mostly economical							
8.The potential benefits that Precision Farming solutions can bring to the agro-food sustainability are mostly environmental							
9.The potential benefits that Precision Farming solutions can bring to the agro-food sustainability are mostly social							

Q8. Has your institution taken any initiatives to promote or raise the awareness about DSTs?

- R&D
- Demonstration
- Training
- Consultancy
- Financial support/funding
- Other (please specify)
- None of the above

Q9. Has your institution received any type of incentive to the promotion (or raising of awareness about) of DSTs?

- Financial support/funding
- Training
- Consultancy
- Other (please specify)
- None of the above

Q10. How can action (transition to more sustainable production systems) be accelerated as 2030 targets are only 8 cultivation periods away (minimum)?

- Information campaigns (media, social media, printed material)
- Dedicated conferences & information events
- EU to boost Member States to increase the percentage of organic and sustainable agriculture
- Financial support to farmers for the use of organic practices and precision agriculture technologies
- Supporting farmers in appropriate and rational use of hazardous pesticides
- Other (please specify)

Personal Data Management

WHAT PERSONAL DATA WILL BE COLLECT FROM YOU?

With your consent, we will collect your email address to receive information on the project and future training activities.

The Data controller is: Federation of Hellenic Food Industries (SEVT). 340, Kifissias Avenue 154 51 Neo Psychiko, Greece. Contact: Dr Foteini Salta (fotsal@sevt.gr).

The purpose of processing will be to contact you with further information about the PestNu research project. The legal basis for processing is your consent. Your personal details will be kept separately from your survey responses and will not be published. The survey responses will inform research reports from the PESTNU project, but any information made public will not identify individuals.
Personal data will only be shared within the PestNu project partners working on this research and will not be publicly available.
All data will be destroyed when no longer needed, or five years after the end of the project (whichever is sooner).

WHAT ARE YOUR RIGHTS AS A DATA SUBJECT?
In accordance with principles of research ethics and EU data protection regulations, you have rights regarding how your personal data is processed. Here are your rights and how we can fulfil them:

-Rights to access personal data processed about you, and the right for the data to be in a portable form – If you request access to personal data that we hold about you, we will provide you with these data in an easily accessible format.
-Right to rectify personal data held about you – If you think the personal data that we hold about you is in accurate or incomplete, you can correct or complete it.
-Right to restrict the processing of your personal data – If you want to restrict the way we process your personal data, you can request that we do so.
-Right to request your personal data is erased - If you want us to delete your personal data from our systems, you can request that we do so.
-Right to leave the research activity - If you wish to withdraw from participating in this survey, you can do so at any time without negative consequences and your personal data will not be processed.
Right to complain to a supervisory authority - If you feel we have not adequately dealt with your requests, you can complain to the national data protection authority.
This survey is managed by The Federation of Hellenic Food Industries, and you can find information on the Hellenic Data Protection Authority here: https://www.dpa.gr/en
We aim to fulfil all requests. In accordance with data protection legislation, some requests may be rejected.

WHO SHOULD YOU CONTACT FOR MORE INFORMATION?
For more information:
-on the PestNu project, you should contact Dr Ria Pechlivani, PestNu Project Coordinator (riapechl@iti.gr).
-on this survey, you should contact Dr Foteini Salta, Project Manager/SEVT (fotsal@sevt.gr).
-on the processing of your personal data, you should contact Dr Matthew Hall, Research Analyst/Trilateral Research (matthew.hall@trilateralresearch.com).

End of Survey
Thank you for taking part in this survey and contributing to our understanding of what Public and private institutions think about digital and space-based technologies and agro-ecological and organic practices for reducing pesticide use and nutrients loss.
Your input will be imperative for us to identify key elements and perceptions that should be considered during the implementation of our project.
Do you have any questions or comments? You can contact us: Project Coordinator, Dr Ria Pechlivani/CERTH (riapechl@iti.gr) or Survey studies Leader, Dr Foteini Salta/SEVT (fotsal@sevt.gr).
Feel free to follow the PestNu social media accounts for more information!
- LinkedIn: https://www.linkedin.com/company/76532558
- Facebook: https://www.facebook.com/PestNu/
- Twitter: https://twitter.com/PestNu_
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