D1.2 Report on training programs in different countries

WP 1 Baseline definition and key drivers identification

Inhort

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RENOVATE

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Abbreviations

AV	Audio-Visual
DSS	Decision Support System
IP	Integrated Production
IPM	Integrated Pest Management
MS	Member State
NAP	National Action Plan
PAE	Pesticide Application Equipment
PPE	Plant Protection Equipment
PPP	Plant Protection Product
SUD	Sustainable Use of pesticides Directive
TIPI	Ten Item Personality Inventory

Executive Summary

This report analyses pesticide uses training schemes across eight EU MS, comparing their structure, content, and target groups under the SUD. It identifies strong alignment with EU requirements but highlights the need to enhance coverage of digital tools, precision agriculture, and DSSs to modernize training and support sustainable crop protection.

In addition, the findings of this report provide the basis for the development of the RENOVATE digital training platform, including its gamification strategy aimed at increasing user engagement and motivation.

1. Limitations and scope of analysis

This analysis is based solely on the information provided by RENOVATE's partners and national sources available at the time of reporting. Training schemes may undergo modifications due to legislative updates or regional administrative decisions, which may not be fully captured in this deliverable, D1.2.

This deliverable has been complemented with questionnaire-based evidence on the PPP users' expectations, motivational factors and digital readiness. These insights guide the integration of a gamification approach within the RENOVATE platform (i.e. narrative elements, feedback, rewards and challenges) to enhance motivation, support user onboarding and foster sustained engagement with innovative training materials.

2. Introduction

Training in pesticide use educates individuals in this field of activity on the correct, safe, and environmentally responsible application and management of pesticides to minimize harm to human health, the environment, and non-target organisms. The importance of training in pesticide use is multi-faceted, providing benefits for individuals and the broader community. The most

important aspects covered during training include legal compliance, improved decision-making, implementing new technologies for sustainable agriculture, IPM, environmental protection, user safety, public health, risk mitigation measures, and increased efficacy and efficiency.

Legal situation

Being aware of the importance of education the Sustainable Use Directive (SUD) 2009/128/EC requires each EU MS to set up systems of both initial and additional training for professional PPP users and PPP providers as well as advisors consulting on pesticide use in order to achieve the main goal being a sustainable use of pesticides by reducing the risks and impacts of pesticide use on human health and the environment and promoting the use of IPM and of alternative approaches. According to the SUD it is essential that those who deal with use of pesticides are fully aware of the potential risks to human health and the environment and of the appropriate measures to reduce those risks as much as possible. Training activities for professional users may be coordinated with those organized in the framework of other legally established training schemes in accordance with the relevant national legislation. For non-professional users who in general do not have the same level of education and training, recommendations should be given on safe handling and storage of pesticides as well as on disposal of the packaging.

Article 5 of the SUD requires the MSs to ensure that through the appropriate training the professional PPP users, PPP providers and advisors acquire sufficient knowledge regarding the subjects listed in Annex I, taking account of their different roles and responsibilities, and to establish certification systems that, as a minimum, will provide evidence of sufficient knowledge of these subjects.

Annex I specifies 13 subjects to be covered by the training programs:

1) legislation regarding pesticides and their use,
2) risks of illegal (counterfeit) PPPs,
3) hazards and risks associated with pesticides (risks to humans, symptoms of pesticide poisoning, risks to non-target plants),
4) IPM strategies,
5) comparative assessment of pesticides at user level to make proper decisions,
6) measures to minimise risks,
7) risk-based approaches,
8) preparing PAE for work, including its calibration,
9) use of PAE and its maintenance,
10) emergency action to protect human health,
11) special care in protection areas established under Water Framework Directive 2000/60/EC,
12) health monitoring,
13) record keeping of any use of pesticides.

To implement the SUD the MSs developed National Action Plans (NAPs) that outline mandatory initial and additional training programs, certification systems, and designate training bodies such as national or regional agricultural advisory services, agricultural schools, vocational training centres, professional associations, and government agencies. The NAPs detail the training requirements for different target groups being predominantly professional PPP users, PPP providers and advisors. Thus, organization of the training system at the national level remains the responsibility of each MS and depends on local conditions.

RENOVATE context

As stated in the RENOVATE project application, in the context described above, where there are a legislative framework and a range of new technologies available, training and sharing practical knowledge for farmers and advisors is key to ensure sustainability in the food production process.

Therefore, the current need is to strengthen the training with new, attractive forms and content as it is crucial for increasing farmers' skills and awareness on good farming practice and technological progress facilitating precise, safe, rational, efficacious and cost-effective methods of pesticide use. Training is then looked upon as one of the most important tools to improve the use of pesticides in all key aspects discussed here.

RENOVATE is specifically focused on specialty crops (orchards, vineyards, as well as citrus, olive and almond groves), promoting innovative technological and digital solutions, and the key stakeholders: young farmers, advisors and manufacturers.

Thus, the objective of RENOVATE is to develop a unique, attractive and understandable training platform that would enhance farmers' access to specialized training and knowledge ready for practice to increase the adoption of innovative crop protection techniques. Problems and difficulties on the adoption of new technologies and possible solutions can be identified by reviewing the existing training systems, being fundamental tools of knowledge transfer and analysing differences in their structure, programs and organization in different EU MSs.

Objectives

In the EU MSs there are mandatory training programs for PPP users, PPP providers and advisors that cover subjects specified in Annex I of SUD. However, there are also vocational training courses covering technical and organizational aspects of plant protection (only selected subjects of Annex I) for recipients whose activities are not directly related to the use of pesticides, such as inspectors of PPE, researchers or administrative officials, who participate in the creation and/or transfer of knowledge on pesticide use and can contribute to improving its effectiveness.

Concerns have arisen about the quality of all these training activities, timelines and relevance of the program's content, as well as attractiveness of the form of communication. Besides there are still differences in the education level among European training recipients.

The objective of this deliverable is to report on training schemes existing in the countries represented in the project consortium and to analyse differences between them in terms of scope of topics, program, duration as well as type of trainers and attendants. The report includes all training activities involving the use of PPPs, both mandatory trainings for professional users or service providers, and voluntary trainings for non-professional users. The focus, however, is on training for professional PPP users, PPP providers and advisors according to the requirements of SUD directive.

In addition, this deliverable aims to implement the evidence on the PPP users' expectations, motivational profiles, and digital readiness, collected through a cross-country questionnaire. This integrated perspective allows the comparison of formal training systems and the understanding of end-users' preferences, supporting the development of more engaging training solutions within the RENOVATE framework. Furthermore, these findings provide the empirical basis for the definition of user personas, as further elaborated in Deliverable 2.1.

3. Methodology of Training Survey

The information on training schemes was collected from all eight countries of partners participating in the RENOVATE project: BE, CY, CZ, ES, FR, IT, PL, and PT.

To ensure data consistency and completeness, an Excel-based questionnaire was developed and agreed upon with partners for entering responses or selecting predefined answers. The questionnaire table included the following groups of issues, within which responses to questions about specific aspects were to be entered:

- **Title of training**
- **Participation** (Paid / Free)
- **Duration** (Days / Hours)
- **Type of training** (Obligatory / Voluntary / Professional / Educational / Other)
- **Recipients targeted by training** (PPP Users / IP Growers / Advisors / Trainers / Teachers / Students / PPP Providers / PAE Diagnosticians / PAE Dealers / Administration / Other)
- **Training providers / organizers** (Training Units / Advisory Services / Schools-/ Universities / Research Units / Branch Organizations / Industry / Certification Units / Administration / Other)

- **Trainers** (Dedicated Trainers / Advisors / Teachers / Researchers / Industry-Business / Other)
- **Requirements for training providers** (Type of Requirements / Qualifications of Trainers / Experience of Trainers / Facilities / Equipment / Number of trainees / Training materials / Other)
- **Type of training materials** (Version of Materials / Availability / Form of Materials / Other)
- **Topics related to PPP application** (PPP Application Equipment / New Technologies / Precision Plant Protection / Sprayer Adjustment / Sprayer Calibration / Sprayer Inspection / DSS & Tools / Dose Expression and Calculation / Drift Reduction / Point Source Contamination / Diffuse Source Contamination / Risk Mitigation Measures / Operator's Safety / IPM / Organic Farming / Other)
- **Certificate of completion** (Official Document / Memento)
- **Comments**

Data from individual countries were collected and analysed by INHORT, the leader of task T1.2. In this report, the training courses are presented in tables, grouped by subject and target group, including both basic and refresher courses.

4. Methodology of User Expectations Survey

Participants and procedure

To gather the data from end-users, a structured questionnaire was administered to PPPs users, PPP providers and advisors in all eight countries of partners participating in the RENOVATE project: BE, CY, CZ, ES, FR, IT, PL, and PT. The questionnaire was administered in both paper-and-pencil format during in-person sessions or through an online platform. Participants were recruited through direct personal contact, email invitations, and by sharing the questionnaire via online platforms and social media. Furthermore, for the online distribution, a dedicated form was used (https://forms.office.com/e/y2uQWZz9QK?origin=lprLink&lang=en-gb), which facilitated the administration of the questionnaire in multiple languages (English, French, Spanish, Portuguese, Polish, Czech, Dutch, Italian, and Greek) across the eight participating countries. This approach enabled respondents to complete the survey in their preferred language.
Participation in the study was voluntary. Eligibility criteria for participants included a minimum age of 18 and the ability to give informed consent. They were also assured that they could withdraw from completing the questionnaire at any time without penalty and without the need to provide a reason. All data collected were anonymized to ensure the confidentiality and privacy of all participants. Prior their engagement in any interventions, participants were presented a brief description to the questionnaire, which outlined the specific aims of the survey and the wider objectives of the **RENOVATE** project. The

description was provided in written form for online administration and delivered orally during in-person completion.

Instruments

The structured questionnaire was developed based on previous studies to ensure its content validity and relevance to the target population. The demographic component was organized into different main sections:

1) **context of use** that includes information regarding digital device literacy and items aimed at understanding the environmental and situational conditions under which users are typically engage with digital technologies and digital devices at home and/or at work;
2) **gaming experience and preferences**, intended to assess prior exposure to, and attitudes towards, game-based environments.
3) **expectation** toward the development and adoption of the forthcoming RENOVATE platform; and
4) **socio-demographic** which includes information on role within the agricultural sector and users' involvement with the distribution of PPP. Survey questions about demographics are crucial for characterizing the population of survey participants, highlighting any inequalities, and eventually promoting equity (Ziegenfuss et al., 2021).

Furthermore, users' expectation and learning preferences were assessed using an adapted version of the Intrinsic Motivation Inventory (IMI) tailored to learning contexts. Additionally, personality traits were measured using the **Ten Item Personality Inventory** (**TIPI)** (Goslin et al., 2003), which was selected for its shortness and validated in different previous research.

Context of use

- Section 1a: Digital device literacy (see Annex 1).
- Section 1b: Gaming experience, preferences and literacy (see Annex 2).

User motivational profile

- Section 2: Expectation and Learning Preferences (see Annex 3).
- Section 3: Personality traits (see Annex 4).

Users demographic profile

- Section 4: socio-demographic information (see Annex 5).

Analysis

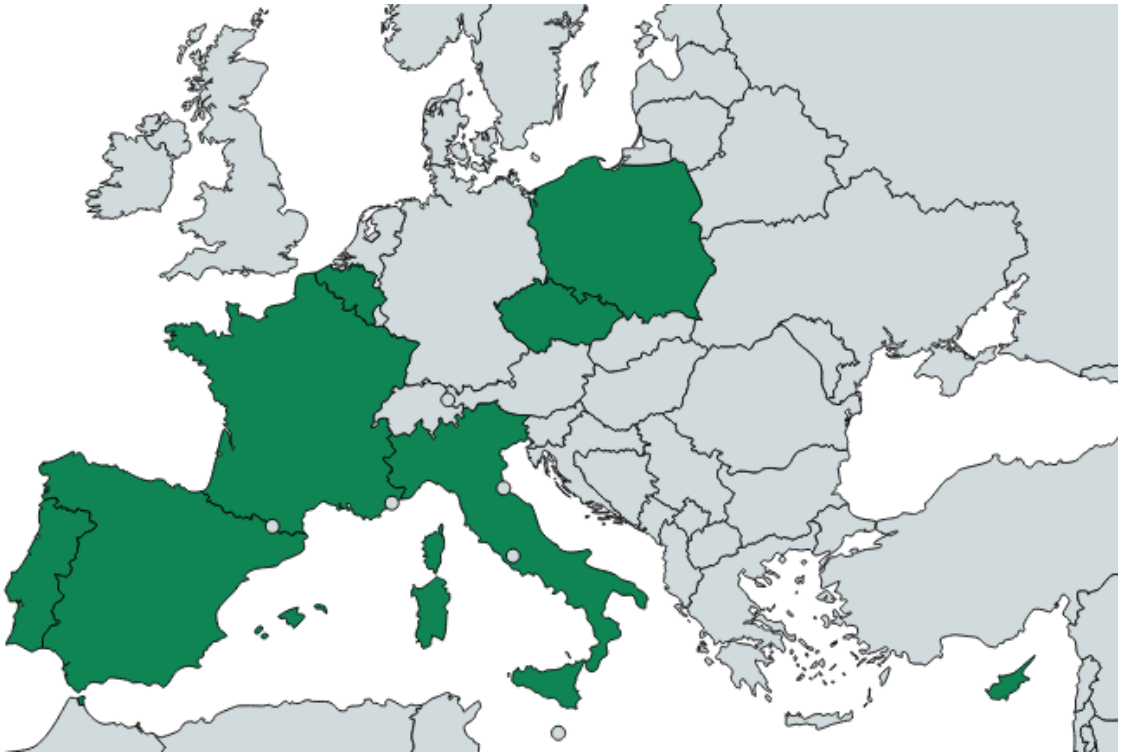
Descriptive data of the participants' responses will be presented and analysed. These analyses were first conducted in an aggregated form to provide an overall overview across all participating countries and subsequently carried out

separately for each country. In addition, analyses were performed considering socio-demographic variables (gender, age – i.e. considering young users - and user category - i.e. being farmer or advisor) to explore potential differences.

5. Results of Training Survey

In general, four main approaches were identified in the organization of mandatory training schemes in the surveyed countries:

- Trainings designed for specific target groups (PT, PL, IT, ES, CY)
- Trainings with a graduated level of professional competence in the use of PPPs (CZ)
- Training covering a broad spectrum of topics, adaptable to different recipients (FR)
- Numerous *ad hoc* optional trainings implemented instead of a mandatory training scheme (BE).



Belgium

There is no fixed national schedule in Belgium for mandatory trainings. Instead, a broad range of ad hoc training options is offered, and the growers can select to which they participate. They must complete five approved training courses of 2 hours each, within a five-year period. However, many additional opportunities are also available.

Most of these training courses are free of charge. They are organized by research units and conducted by researchers. The content depends on specific training.

As an example, below is a list of training offered between June 2024 and January 2025, i.e., the 8 months prior completing the inventory of training for this report.

TABLE 1 Overview of Non-Mandatory Trainings for Growers in Belgium

Activity	Duration	Topics
Correct sprayer calibration and protection of the operator (Fruitfocus)	4 hours	-
Precision application (Greenspray project steering committee)	3 hours	-
Drift reduction for orchard sprayers	6 hours	-
Drift reduction for orchard sprayers	4 hours	-
Use of EVA application	1 hour	-
How to reduce PPP use?	2 hours	-
How to reduce PPP use?	3 hours	-
Munckhof event variable spraying	4 hours	-
Precision application (Greenspray project steering committee)	3 hours	-
Fair show: precision application in fruit growing (Fructura Fair)	1 day	-
How to reduce PPP use?	2 hours	-
Reflection of precision agriculture with stakeholders	3 hours	-

Summary for Belgium

The training events listed above were aimed at key recipients, namely PPP users, IP Growers, advisors, PPP providers, PAE dealers and administration staff, meaning that they were focused on applicators and service providers (Figure 1). Teachers and students need to rely on other sources of knowledge. Diagnosticians from state PAE inspection units are trained in a separate scheme.

All major topics were covered by the training offered, except for point source contamination, IPM and regulatory aspects (Figure 2).

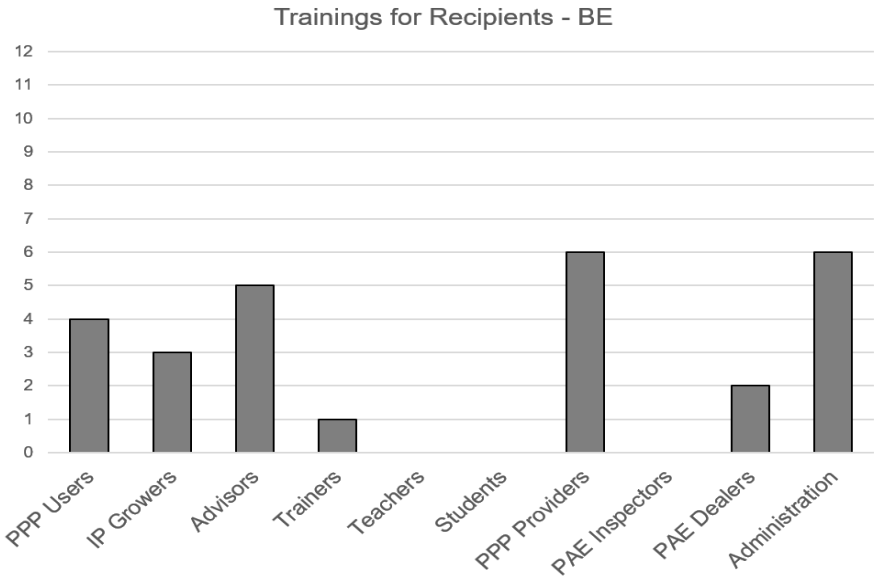


Figure 1. Number of training courses for individual recipients in Belgium

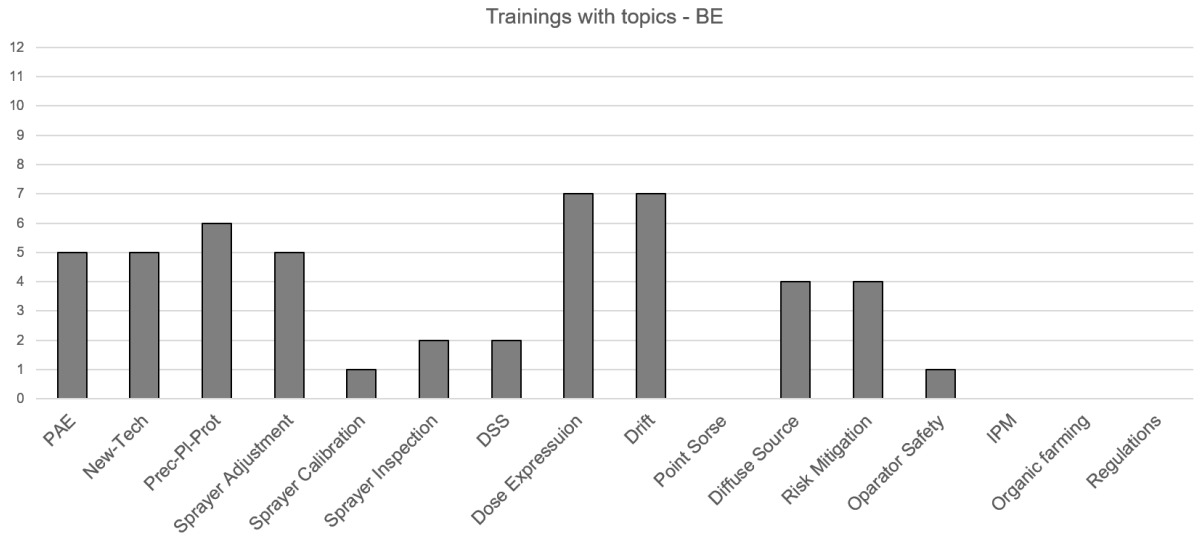


Figure 2. Number of training courses in Belgium with specific topics in the program

Cyprus

In Cyprus the training scheme is regulated by the National Regulation on the Sustainable Use of Pesticides (2012) and the Legislative decree on the Sustainable Use of Pesticides (2023), both forming part of the NAP (2023-2027) and based on the provisions of EU Directive 128/2009 and the Council Decision of Biocides and Pesticides.

Training is targeted at four specific groups of recipients: users of PPPs, PPP providers, advisors, and PAE inspectors. The first category includes users of different types of equipment used in various areas of activity, as well as fruit growers conducting integrated crop production. The second category includes providers of PPPs, the third category advisors and the fourth category diagnosticians of PAE.

Training courses are provided to meet the requirements of the Legislation and Decision mentioned. Trainers are experts from the Department of Agriculture of Cyprus with at least higher education.

In Cyprus, mandatory trainings on the use of PPPs are free of charge. They are offered in elementary and competent levels, both following a similar format and covering a comparable range of topics. The elementary level is designed for PPP users, while the competent level provides a more in-depth approach for advisors.

The Department of Agriculture regulates the obligations, general rules, requirements for trainers and training facilities, as well as scope of training topics. Training materials are developed by (or on behalf) of the Department of Agriculture. Each training course is limited to 30 participants which allows efficient performing practical exercises being part of training programs. Efforts are also underway to develop a web-based learning platform.

Table 2 Training in PPP use for the Users		
Title of training	Elementary training in PPP use Competent training in PPP use	
Recipients	PPP Users	
Duration incl. spray appl. issues	Elementary training: 1 day / 6 hours 1 hour	Competent training: 1 day / 6 hours 1 hours
Training providers	Agricultural Officers	
Facilities & Equipment	Elementary training: Lecture Room with AV media	Competent training: Lecture Room with AV media Exercise Hall PAE PAE testing equipment
Trainers Qualifications	Experts from the Competent Authority Higher education	

Training materials	Offered / available on internet: Flyers	Presentations
Topics	Legislation PPP application equipment New technologies Precision plant protection Sprayer adjustment Sprayer calibration Sprayer inspection DSS & Tools	Legislation Dose expression Drift reduction Point source contamination Diffuse source contamination Risk mitigation measures Health risk and measures in case of an accident Limitations on specific/protected areas Operator's safety and protection IPM PPPs' record keeping

Table 3 Training in PPP use for the PPP Providers		
Title of training	Elementary training in PPP use Competent training in PPP use	
Recipients	PPP providers	
Duration incl. spray appl. issues	Elementary training: 1 day / 6 hours 1 hour	Competent training: 1 day / 6 hours 1 hours
Training providers	Agricultural Officers	
Facilities & Equipment	Elementary training: Lecture Room with AV media	Competent training: Lecture Room with AV media Exercise Hall PAE PAE testing equipment
Trainers Qualifications	Researchers, Experts from the Competent Authority Higher education	
Training materials	Offered / available on internet: Flyers	Presentations
Topics	Legislation PPP application equipment	Dose expression/calculation Point source contamination Diffuse source contamination Risk mitigation measures Health risk Operator's safety PPPs' formulation PPPs' record keeping Limitations on specific/protected areas

Table 4 Training in PPP use for the Advisors	
Title of training	Elementary training in PPP use

	Competent training in PPP use	
Recipients	Advisors	
Duration incl. spray appl. issues	Elementary training: 1 day / 6 hours 1 hour	Competent training: 2 days / 12 hours 10 hours
Training providers	Agricultural Officers	
Facilities & Equipment	Elementary training: Lecture Room with AV media Exercise Field – Practical demonstration and practices	Competent training: Lecture Room with AV media Exercise Hall PAE PAE testing equipment
Trainers Qualifications	Experts from the Competent Authority Higher education	
Training materials	Offered / available on internet: Flyers	Presentations
Topics	Legislation PPP application equipment New technologies Precision plant protection Sprayer adjustment Sprayer calibration Sprayer inspection DSS & Tools	Legislation Dose expression/calculation Drift reduction PPP application equipment Point source contamination Diffuse source contamination Risk mitigation measures Health risk Operator's safety IPM Risks in the use of illegal PPPs Harmonised Risk Indicators PPPs' poisoning Limitations on specific/protected areas Plant protection PPPs' record keeping

Mandatory training in inspection of PAE for diagnosticians. The training in inspection of PAE is to obtain certification as a diagnostician, either to manage inspection centers or to work as a sprayer inspector. In either case, this certification is mandatory. The sprayer inspector license does not have to be renewed. However, the Inspection Centre must renew its license every two years.

Table 5 Mandatory trainings on inspection of PAE for Diagnosticians	
Title of training	Training for Sprayer Inspectors (PAE)
Recipients	PAE Diagnosticians
Duration incl. spray appl. issues	5 days / 40 hours 40 hours
Training providers Facilities & Equipment	Department of Agriculture of Cyprus Specified by regulations: Lecture Room with AV media, Exercise Field – Practical demonstration and practices, PAE testing equipment

Trainers Qualifications	Experts from the Competent Authority	
Training materials	Manuals, Presentations, Videos, PPE, Tools/Small equipment	
Topics	Legislation PPP application equipment Nozzles Inspection procedure based on EN/ISO/16122:2015	Sprayer adjustment Sprayer calibration Sprayer inspection Software demonstration Practical exercises Theoretical Exams Practical Exams

Summary for Cyprus

In Cyprus, four types of training courses on PPP use are offered, targeting PPP users, PPP providers, advisors, and sprayer inspectors.

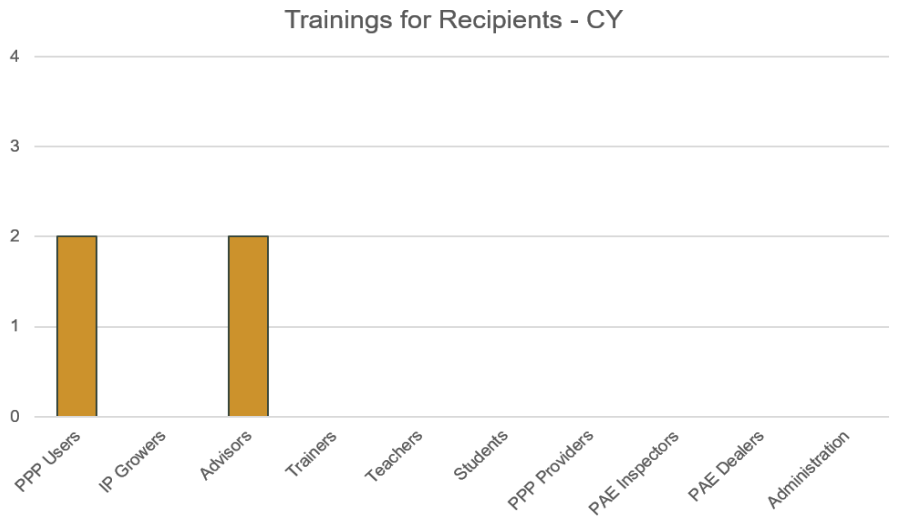


Figure 3. Number of training courses for individual recipients in Cyprus

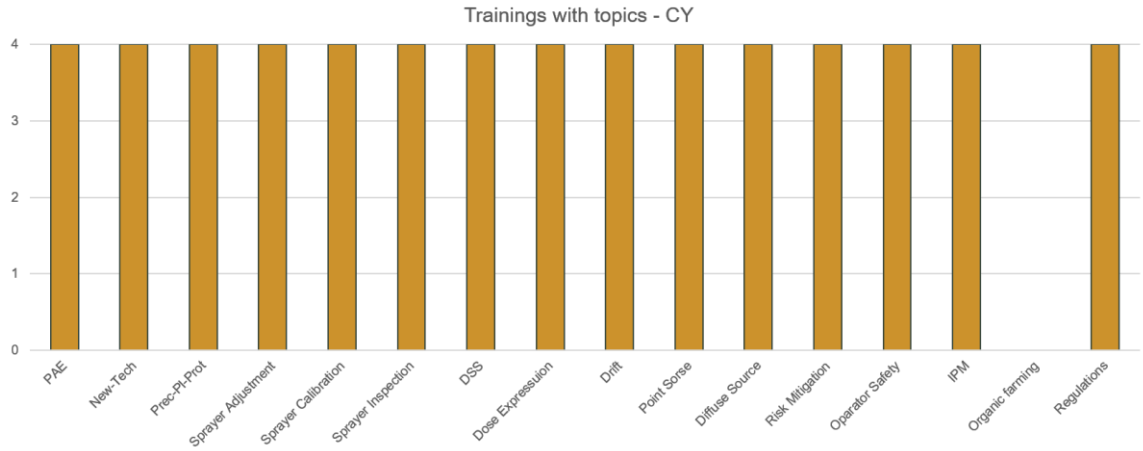


Figure 4. Number of training courses in Cyprus with specific topics in the program

Czech Republic

Rules are defined by Act no. 326/2004 Coll. on Phytosanitary Care, which specifies the requirements for trainers, training facilities, and training topics. These provisions are further regulated and implemented by Decree no. 207/2012 Coll. on professional equipment for PPP application, issued by the Ministry of Agriculture, and by relevant ministerial gazettes. The same framework applies to all three grades of professional competence.

Table 6 Training Framework for Professional Competence in PPP Use			
Title of training	1st grade of professional competence for use of PPP 2nd grade of professional competence for use of PPP 3rd grade of professional competence for use of PPP		
	1st grade	2nd grade	3rd grade
Recipients	PPP Users	PPP Users PPP Providers Administration	PPP Users Advisors Trainers PPP Providers Administration
Duration incl. spray appl. issues	1 day / 12 hours 4 hours	2 days / 15 hours 4 hours	2 days / 18 hours 4 hours
Training providers	Training units		
Facilities & Equipment	Lecture Room with AV media Exercise Hall PAE demo components PAE testing equipment		
Trainers Qualifications	Dedicated Trainers, Advisors, Teachers, Researchers Higher education		
Training materials	Offered / available on internet: Flyers, Manuals, Presentations, Videos		
Topics	Legal aspects PAE Sprayer adjustment Sprayer calibration Sprayer inspection Dose expression Drift reduction Point source contamination Diffuse source contamination Risk mitigation measures Operator's safety IPM	Legal aspects PAE New technologies Sprayer adjustment Sprayer calibration Sprayer inspection Dose expression Drift reduction Point source contamination Diffuse source contamination Risk mitigation measures Operator's safety IPM Organic farming	Legal aspects PAE New technologies Precision plant protection Sprayer adjustment Sprayer calibration Sprayer inspection Dose expression Drift reduction Point source contamination Diffuse source contamination Risk mitigation measures Operator's safety IPM Organic farming

Summary for Czech Republic

The three-level training system for the application of PPPs are aimed at key target groups: users and providers of PPPs, as well as advisors and trainers (Figure 5). The list of recipients also includes administration staff. A significant recipient group without dedicated training consists of diagnosticians of PPE.

The training programs cover all topics related to the application of PPPs, except for DSSs (Figure 6). The 1st Grade already include a broad range of topics, while subsequent levels further expand the scope to incorporate new technologies and precision plant protection.

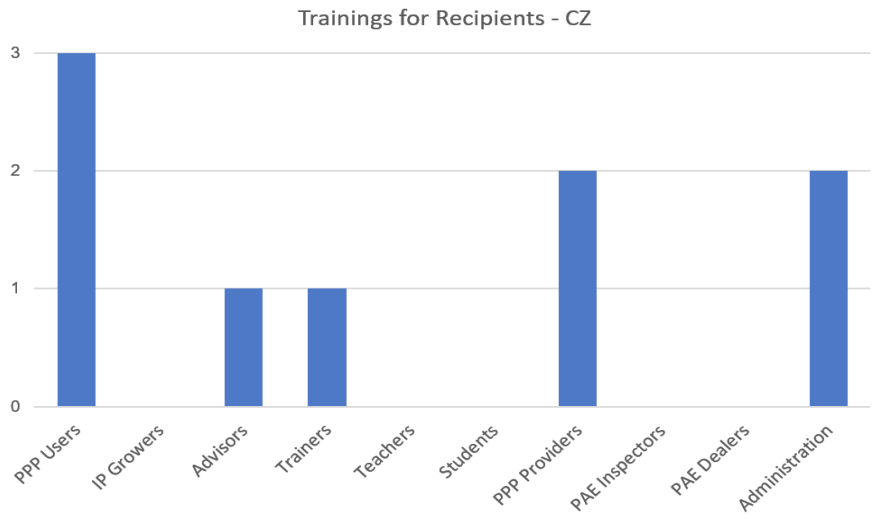


Figure 5. Number of training courses for individual recipients in Czech Republic

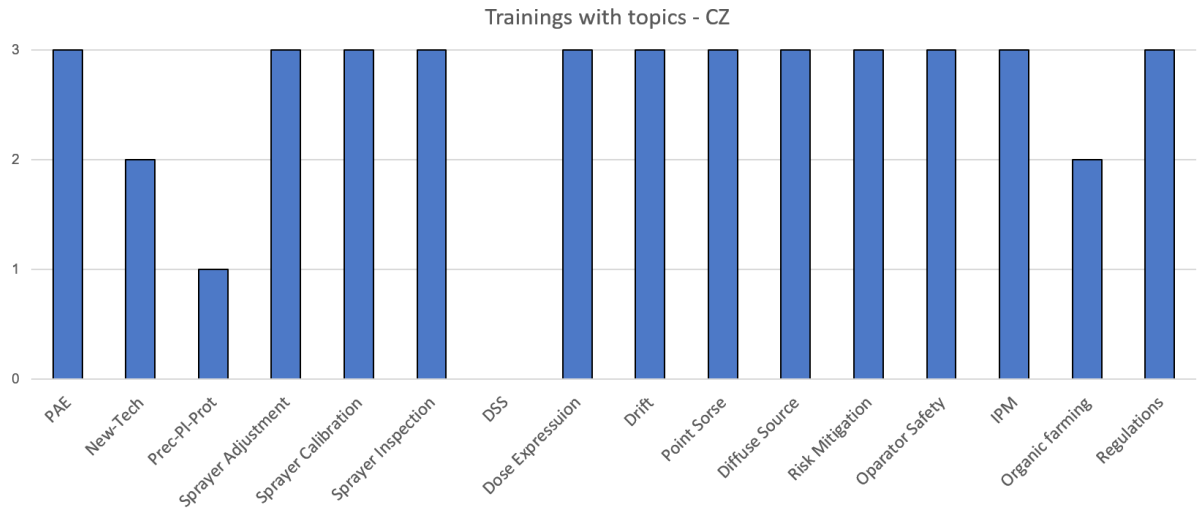


Figure 6. Number of training courses in Czech Republic with specific topics in the program

France

Certiphyto is the only mandatary training required for each person who applies (professional use), advises (professional and non-professional use), or sells PPPs (professional and non-professional use). This includes do-it-yourself and garden stores that advise and sell non-professional products to the public.

Some technical and high education diploma in agronomy may grant equivalence to initial certification.

The structure of the training is standardized with mandatory chapters, but each certified training centre (approved by the French Ministry of Agriculture) may propose specific content adapted to local concerns. The Ministry also certifies the content of each training course.

Mandatory chapters include:

1. Regulation on PPP usage
2. PPP impact on human health and means of prevention
3. Techniques available to reduce PPP use
4. Alternative methods for plant protection.

Formally, sprayer operation and application techniques may sometimes not to be part of the training. There are proposals to include more content related to calibration and sprayer setup through voluntary training for farmers and advisers. INRAE oversees a national project called NEOPULVE, which may be used for the renewal of Certiphyto certification in the future.

Table 7 Certiphyto training		
Title of training	Certiphyto Certiphyto - refresher	
Recipients	Required for: PPP Users, IP Growers, Advisors, Students, PPP Providers (incl. sale for nonprofessional users) Recommended for: Trainers, PAE Diagnosticians, PAE Dealers, Administration	
Duration	Basic training: 2 days / 14 hours	Refresher training: 1 day / 7 hours
Training providers	Training Units, Advisory services, Schools/Universities	
Facilities & Equipment	Lecture Room with AV media	
Trainers Qualifications	Dedicated Trainers after completing a train-the-trainer course Higher education	
Training materials	Distributed printed and shared digital manuals	
Mandatory topics	Legal aspects of PPP use PPP impact on human health and means of prevention	Alternative methods of plant protection Techniques reducing PPP use
Topics to be selected for specific training	PPP application equipment New technologies Precision plant protection	Drift reduction Point source contamination Diffuse source contamination

	Sprayer adjustment Sprayer calibration Sprayer inspection DSS & Tools Dose expression/calculation	Risk mitigation measures Health risk Operator's safety IPM Organic farming

Summary for France

The flexibility of the French Certiphyto training courses allows them to be tailored to any target group, thereby meeting the needs of all recipients (Figure 7). The training programs do not cover topics related to sprayer operation (calibration, adjustment, inspection) or new technologies and precision plant protection (Figure 8).

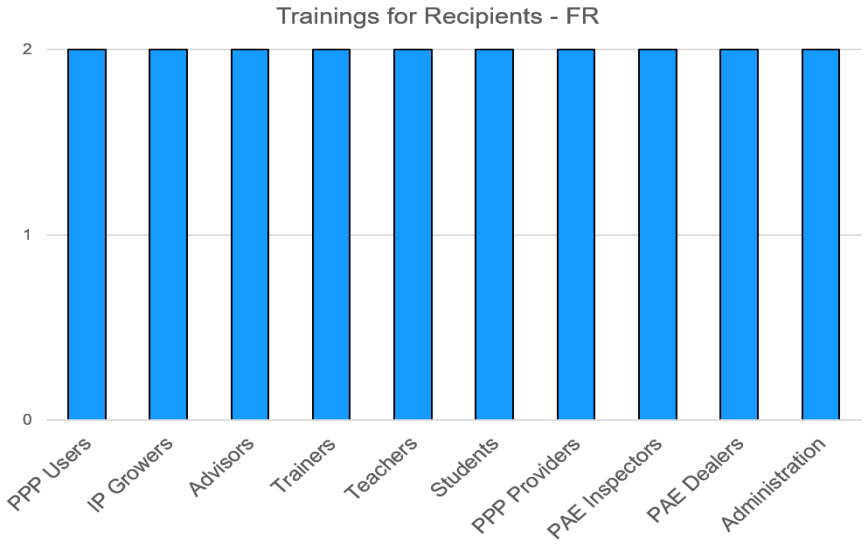


Figure 7. Number of training courses for individual recipients in France

Figure 8. Number of training courses in France with specific topics in the program

Italy

In Italy, there are four types of mandatory training targeted at the main groups of recipients: (i) users of PPPs; (ii) providers of PPPs; (iii) advisors, and (iv) diagnosticians of PAE. The organization and the management of these training courses fall under the responsibility of the Regional Administrations. In some regions, the official certificate is issued only in digital form.

Table 8 Mandatory training in professional use		
Title of training	Training authorizing the purchase and professional use of PPP Training authorizing the purchase and professional use of PPP - refresher	
Recipients	PPP users, PAE Dealers, PAE Manufacturers	
Duration incl. spray appl. issues	Basic training: 5 days / 20 hours 4 hours	Refresher training: 2 days / 8 hours 2 hours
Training providers	Training Units Universities (Agri Dept)	Farmer Unions Professional Councils
Facilities & Equipment	Specified by regulations: Lecture Room with AV media Exercise Hall Exercise Field	 PAE PAE components PAE testing equipment
Trainers Qualifications	Dedicated trainers, Researchers Higher education	
Training materials	Offered / available on internet: Presentations Tools/Small equipment	 Videos
Topics	Legal aspects PPP application equipment New technologies Sprayer adjustment Sprayer calibration Sprayer inspection Dose expression/calculation	Drift reduction Point source contamination Diffuse source contamination Risk mitigation measures Operator's safety IPM

Table 9 Mandatory training for providers of PPPs		
Title of training	Training for PPP Dealers Training for PPP Dealers - refresher	
Recipients	PPP Providers	
Duration incl. spray appl. issues	6 days / 28 hours 4 hours	2 days / 8 hours 2 hours
Training providers	Training Units Universities (Agri Dept)	Farmer Unions Professional Councils
Facilities & Equipment	Specified by regulations: Lecture Room	
Trainers Qualifications	Advisors, Teachers, Researchers Higher education	
Training materials	Offered / available on internet:	

	Manuals Presentations	Videos
Topics	Legal aspects PPP application equipment New technologies Sprayer adjustment Sprayer calibration Sprayer inspection Dose expression/calculation	Drift reduction Point source contamination Diffuse source contamination Risk mitigation measures Operator's safety IPM

Table 10 Mandatory training in consulting on use of PPPs		
Title of training	Training for consultants on use of PPP Training for consultants on use of PPP - refresher	
Recipients	Advisors	
Duration incl. spray appl. issues	Basic training: 6 days / 28 hours 4 hours	Refresher training: 2 days / 8 hours 2 hours
Training providers	Training Units Universities (Agri Dept)	Farmer Unions Professional Councils
Facilities & Equipment	Specified by regulations: Lecture Room	
Trainers Qualifications	Advisors, Teachers, Researchers Higher education	
Training materials	Offered / available on internet: Manuals Presentations	Videos
Topics	Legal aspects PPP application equipment New technologies Sprayer adjustment Sprayer calibration Sprayer inspection Dose expression/calculation	Drift reduction Point source contamination Diffuse source contamination Risk mitigation measures Operator's safety IPM

Table 11 Mandatory training in inspection of PAE		
Title of training	Training in inspection of PAE in use	
Recipients	PAE Diagnosticians	
Duration incl. spray appl. issues	5 days / 40 hours 40 hours	
Training providers	Training Units	Universities (Agri Dept)
Facilities & Equipment	Specified by regulations: Lecture Room with AV media Exercise Hall Exercise Field	 PAE PAE components PAE testing equipment
Trainers Qualifications	Advisors, Teachers, Researchers Higher education	
Training materials	Offered / available on internet:	Videos

	Manuals Presentations	
Topics	Legal aspects PPP application equipment New technologies Sprayer adjustment	Sprayer calibration Sprayer inspection Dose expression/calculation Drift reduction

Table 12 Voluntary training in safe use of PPPs		
Title of training	Face to face TOPPS course on prevention of PPP point and diffuse sources Online TOPPS course on prevention of PPP point and diffuse sources	
Recipients	PPP users, IP Growers, Advisors, Trainers, Teachers, Students, PPP providers, PAE Diagnosticians, PAE Dealers, Administration	
Duration incl. spray appl. issues	F2F training: 1 day / 8 hours 6 hours	Online training: 1 day / 4 hours 3 hours
Training providers	DISAFA (Univ Turin)	Agrofarma (association)
Facilities & Equipment	Offered: Lecture Room with AV media Exercise Hall Exercise Field	 PAE PAE components PAE testing equipment
Trainers Qualifications	Researchers Higher education	
Training materials	Offered / available on internet: Manuals Presentations	 Videos Applications
Topics	PPP application equipment New technologies Precision plant protection Sprayer adjustment Sprayer calibration Sprayer inspection DSS & Tools	Dose expression/calculation Drift reduction Point source contamination Diffuse source contamination Risk mitigation measures Operator's safety IPM

Summary for Italy

In Italy, the availability of individual training courses for a wide range of recipients ensures that all key target groups are covered by mandatory training (Figure 9). The largest number of training courses is aimed at users, providers, and advisors, in line with the expectations of the SUD. The relatively high number of courses for dealers and diagnosticians of PPE is also noteworthy.

Two important topics, precision crop protection and DSS, are underrepresented in the current training system (Figure 10). They are mainly included in voluntary courses, but it would be beneficial to integrate these topics into mandatory training for both users and advisors of PPPs.

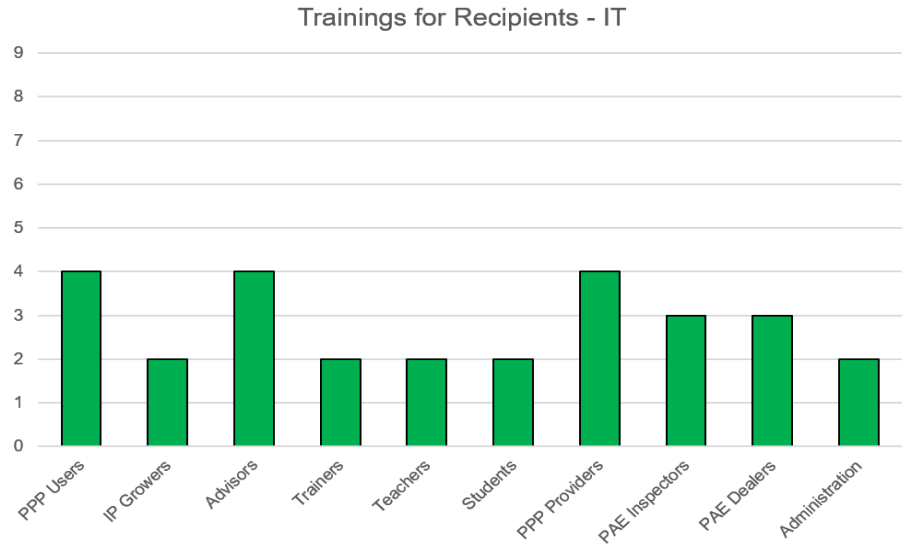


Figure 9. Number of training courses for individual recipients in Italy

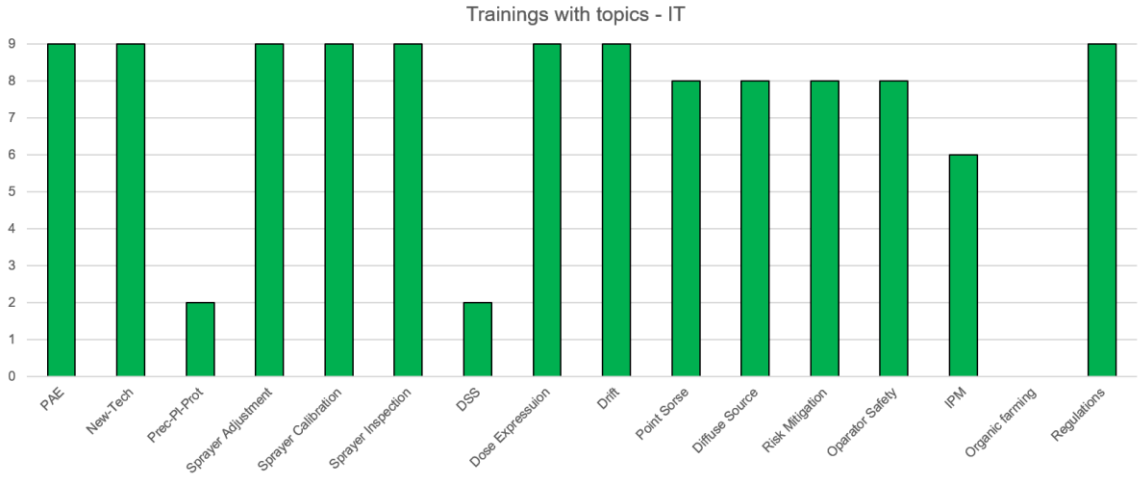


Figure 10. Number of training courses in Italy with specific topics in the program

Poland

In Poland the training scheme is regulated by the Regulation of the Ministry of Agriculture and Rural Development on Training in the Field of Plant Protection Products (Journal of Laws, 2022/824).

Training is targeted at specific recipients grouped into two categories: (i) users of PPPs, and (ii) entities providing services related to the broad use of PPPs. The first category includes users of different types of equipment used in various areas of activity -not just agriculture- such as ground equipment, aerial application or aviation equipment, fumigation, and railway equipment, as well as fruit growers engaged in integrated crop production. The second category includes providers of PPPs, advisors, IP trainers, and diagnosticians of PAE.

Training courses are conducted by entities that meet the requirements of the above-mentioned Regulation. Trainers must hold at least secondary education in agriculture, horticulture, forestry, agricultural engineering, or higher education with a minimum of 120 hours of agricultural-related coursework.

Mandatory training courses are fee-based. According to the Regulation, the number of participants per course is limited to 30, ensuring effective practical exercises, which form an integral part of the training. All training courses are delivered in person and offered in both basic and refresher versions.

Voluntary, free-of-charge, and regularly scheduled training courses complement the mandatory offer by promoting the safe use of PPPs among stakeholders not directly involved in pesticide applications, such as students, teachers, scientists, administration staff, and business advisors.

Training courses grouped by subjects and recipients, including voluntary programmes are presented in Tables 13-20.

<u>Mandatory training for professional users of PPPs (application license):</u>

Training for professional users covers four areas of PAE: (i) ground equipment (excluding railway vehicles, includes all types of field and orchard sprayers, together with specialized equipment like sprayers for protected crops); (ii) aerial equipment for protected crops; (iii) fumigation equipment; (iv) railway application equipment.

Each area includes both basic and refresher courses. Completion of the training and passing the exam authorizes the user to purchase and apply PPPs. The license is valid for five years and can be renewed after attending a refresher course. Practical exercises with sprayers (operation, calibration, adjustment, and preparation for inspection) are a key component of the program.

Table 13 Mandatory trainings for professional users of PPPs		
Title of training	Training in the use of PPP with ground equipment, excluding equipment used in the railway industry Training in the use of PPP with ground equipment, excluding equipment used in the railway industry Training in the use of PPP with agricultural aviation equipment Training in the use of PPP with agricultural aviation equipment - refresher Training in the use of PPP by fumigation Training in the use of PPP by fumigation – refresher Training in the use of PPP with equipment used in the railway industry Training in the use of PPP with equipment used in the railway industry - refresher	
Recipients	PPP users	
Duration incl. spray appl. issues	Basic training: 2 days / 14 hours 4,5 hours	Refresher training: 1 day / 7 hours 2,5 hours
Training providers	Training Units, Advisory Services, Schools/Universities,	Research units, Branch organizations
Facilities & Equipment	Specified by regulations: Lecture Room with AV media, Exercise Hall, Exercise Field,	relevant PAE, PAE testing equipment
Trainers Qualifications	Dedicated Trainers, Advisors, Teachers, Researchers Higher or secondary education in agriculture or forestry	
Training materials	Offered / available on internet: Manuals, Presentations, Videos,	Applications, PPE
Topics	Legal aspects PPP application equipment New technologies Precision plant protection Sprayer adjustment Sprayer calibration Sprayer inspection DSS & Tools (only basic tr.)	Dose expression/calculation Drift reduction Point source contamination Diffuse source contamination Risk mitigation measures Operator's safety IPM

Mandatory training in integrated crop production for IP growers. Separate training courses are available for three main production areas: (i) fruit crops; (ii) vegetable crops; and (iii) field crops.

These courses enable growers to qualify for IP certification. The license is valid for five years and may be renewed after completing refresher training.

Table 14 Mandatory training in integrated crop production for IP growers		
Title of training	Training in IP of fruit crops Training in IP of fruit crops – refresher Training in IP of vegetable crops Training in IP of vegetable crops – refresher Training in IP of agricultural crops Training in IP of agricultural crops - refresher	
Recipients	IP Growers	
Duration incl. spray appl. issues	Basic training: 2 days / 16 hours 3 hours	Refresher training: 1 day / 7 hours 1,5 hours
Training providers	Training Units Advisory Services	Schools/Universities Research units
Facilities & Equipment	Specified by regulations: Lecture Room with AV media Exercise Hall Exercise Field	 relevant PAE PAE components PAE testing equipment
Trainers Qualifications	Dedicated Trainers, Advisors, Teachers, Researchers, Business Consultants Higher or secondary education in agriculture or forestry	
Training materials	Offered / available on internet: Manuals, Presentations, Videos,	 Applications, PPE
Topics	Legal aspects PPP application equipment New technologies Precision plant protection Sprayer adjustment Sprayer calibration Sprayer inspection Dose expression/calculation	Drift reduction Point source contamination Diffuse source contamination Risk mitigation measures Operator's safety IPM Organic farming

Mandatory training in consulting for PPP providers. This training focuses on the marketing, handling, and application of PPPs. It is primarily intended for suppliers, advisors, trainers, and teachers. Successful completion and examination grant authorization to market PPPs and conduct advisory or educational activities in this field. The license is valid for five years and renewable after refresher training.

Table 15 Mandatory training in consulting for PPP providers		
Title of training	Training in consulting on PPPs Training in consulting on PPPs - refresher	
Recipients	PPP providers, Advisors, Trainers, Teachers	
Duration incl. spray appl. issues	Basic training: 3 days / 24 hours 4 hours	Refresher training: 1 day / 7 hours 1 hour
Training providers	Training Units Advisory Services	Schools/Universities Research units
Facilities & Equipment	Specified by regulations: Lecture Room with AV media	 Exercise Hall

		Exercise Field
Trainers Qualifications	Dedicated Trainers, Advisors, Researchers, Higher or secondary education in agriculture or forestry	
Training materials	Offered / available on internet: Manuals, Presentations, Videos,	Applications, PPE
Topics	Legal aspects PPP application equipment New technologies Precision plant protection Sprayer adjustment Sprayer calibration Sprayer inspection	Dose expression/calculation Drift reduction Point source contamination Diffuse source contamination Risk mitigation measures Operator's safety IPM

Mandatory training for trainers in integrated plant production.

This specialized training, delivered as postgraduate studies, is provided by authorized research institutions and universities. Completion of the program and submission of a diploma thesis entitle the holder to conduct integrated crop production training on a permanent basis.

Table 16 Mandatory training for trainers in integrated plant production		
Title of training	Training for trainers in integrated plant production	
Recipients	IP Trainers and Advisors	
Duration incl. spray appl. issues	210 hours 20 hours	
Training providers	Advisory Services Schools/Universities	Research units
Facilities & Equipment	Specified by regulations: • Lecture Room with AV media • Exercise Hall • Exercise Field	• PAE • PAE components • PAE testing equipment
Trainers Qualifications	Advisors, Researchers, Higher education, Trainers after train-the-trainer course	
Training materials	Offered / available on internet: Manuals, Presentations, Videos,	Applications, PPE
Topics	Legal aspects PPP application equipment New technologies Precision plant protection Sprayer adjustment Sprayer calibration Sprayer inspection	Dose expression/calculation Drift reduction Point source contamination Diffuse source contamination Risk mitigation measures Operator's safety IPM

Mandatory training in inspection of PAE for diagnosticians.

This training, conducted in seven authorized centers, prepares diagnosticians to inspect PAE. Centers are located within universities, research institutions, and advisory services, equipped with appropriate diagnostic and testing facilities.

Half of the total training time is devoted to practical exercises with different types of plant protection and diagnostic equipment. Upon successful completion and examination, participants receive lifetime certification to perform inspections.

Table 17 Mandatory training in inspection of PAE for diagnosticians		
Title of training	Training in inspection of terrestrial PAE Training in inspection of aviation PAE	
Recipients	PAE Diagnosticians	
Duration incl. spray appl. issues	Terrestrial PAE: 5 days / 40 hours 40 hours	Aviation PAE: 3 days / 24hours 24 hours
Training providers	Training Units, Advisory Services, Schools/Universities,	Research units, Branch organizations
Facilities & Equipment	Specified by regulations: Lecture Room with AV media, Exercise Hall, Exercise Field,	 relevant PAE PAE components PAE testing equipment
Trainers Qualifications	Dedicated Trainers, Advisors, Teachers, Researchers Higher or secondary education in agriculture or forestry	
Training materials	Offered / available on internet: Manuals, Presentations, Videos,	 Applications, PPE Tools/Small equipment
Topics	Legal aspects PPP application equipment New technologies Precision plant protection	Sprayer adjustment Sprayer calibration Sprayer inspection

Voluntary training in pesticide application issues for stakeholders.

Voluntary training courses promote safe, effective, and responsible pesticide use. They are organized through projects implemented by research institutions and industry associations, such as seminars for students and academic staff led by the Polish Crop Protection Association (PSOR) in cooperation with INHORT, continuing the European TOPPS project.

Thematic seminars on spray drift reduction and inspection of PPE for diagnostic services are conducted by INHORT as part of Ministry-funded programs.

Table 18 Voluntary training in safe use of pesticides		
Title of training	PSOR Academy – Safe use of pesticides	
Recipients	Advisors, Teachers, Students, Administration	
Duration incl. spray appl. issues	1 day / 6 hours 4 hours	
Training providers	INHORT	PSOR (association)
Facilities & Equipment	Offered: Lecture Room with AV media	
Trainers Qualifications	Researchers, Business Consultants Higher education	
Training materials	Offered / available on internet: Presentations Videos	Applications
Topics	PPP application equipment New technologies Drift reduction Point source contamination Diffuse source contamination	Risk mitigation measures Operator's safety Packaging management Risk of counterfeit PPP

Table 19 Voluntary training in drift mitigation measures		
Title of training	Drift mitigation measures	
Recipients	Advisors, Teachers, Researchers, Administration	
Duration incl. spray appl. issues	1 day / 5,5 hours 5,5 hours	
Training providers	INHORT	
Facilities & Equipment	Offered: Lecture Room with AV media Exercise Hall Exercise Field	PAE PAE components PAE testing equipment
Trainers Qualifications	Researchers Higher education	
Training materials	Offered / available on internet: Presentations Videos	Applications
Topics	PPP application equipment New technologies	Risk mitigation measures Drift reduction

Table 20 Voluntary training for personnel of Plant Protection Inspection Service (PIORiN)		
Title of training	Diagnostics of PPE	
Recipients	Employees of Plant Protection Inspection Service	
Duration incl. spray appl. issues	1 day / 5,5 hours 5,5 hours	
Training providers	INHORT	

Facilities & Equipment	Offered: Lecture Room with AV media Exercise Hall Exercise Field	 PAE PAE components PAE testing equipment
Trainers Qualifications	Researchers Higher education	
Training materials	Offered / available on internet: Presentations Videos	Applications
Topics	PPP application equipment Sprayer calibration	Sprayer adjustment Inspection of PAE

Summary for Poland

In Poland, all target groups involved in pesticide use are covered by the national training system (Figure 11). This also includes students, who, in addition to their academic curricula, gain knowledge on plant protection through voluntary seminars. The balanced distribution of training courses across recipient groups demonstrates the precise targeting of training topics, most of which are aimed at PPP users, advisors, and trainers.

All relevant topics related to the use of PPPs are covered in the Polish training system (Figure 12). However, it would be desirable to include more courses on digital agriculture, particularly those addressing new technologies, precision plant protection, and DSS.

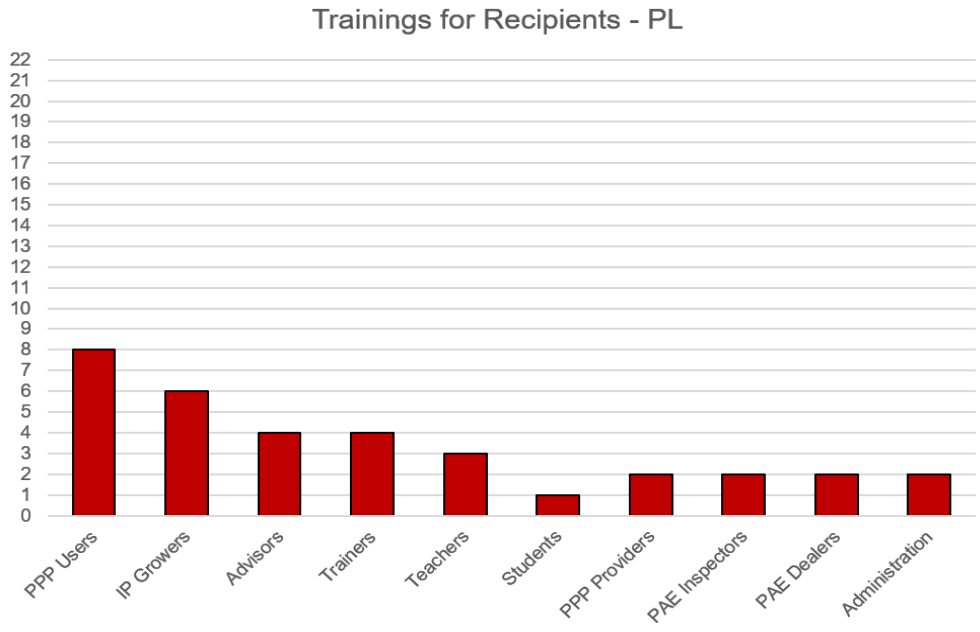


Figure 11. Number of training courses for individual recipients in Poland

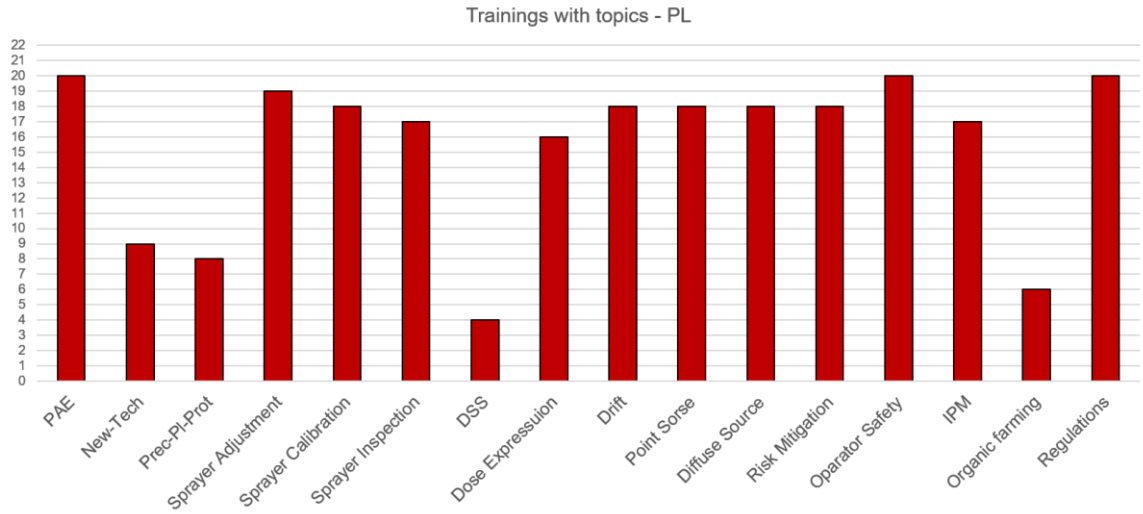


Figure 12. Number of training courses in Poland with specific topics in the program

Portugal

Mandatory training in Portugal is strictly targeted to specific groups of recipients and covers the use of PPPs, specialized forms of application, distribution and commercialization, integrated crop production, and inspection of PPE.

Training courses for specific activities are both basic and refresher formats. Most training courses are delivered as standard in-person sessions or hybrid b-learning courses. All mandatory training courses are paid. To ensure effective learning, the number of participants is usually limited to 16. Training courses grouped by subjects and recipients, also including voluntary courses, are presented in Tables 21-31.

These training courses are mandatory for obtaining the license to apply PPPs, as stipulated by Law 26/2013, which transposes the SUD Directive. They are available in basic versions with more training hours and shorter refresher versions for license renewal. The license must be renewed every 10 years. In the b-Learning format, the practical component must be completed entirely in-person, using equipment and on-site simulations in the field.

Table 21 Mandatory trainings for professional users of PPPs		
Title of training	PPPs Application PPPs Application - b-learning PPPs Application - refresher PPPs Application - b-learning – refresher PPPs Application with Manual PAE PPPs Application with Manual PAE – b-learning PPPs Application with Manual PAE - refresher PPPs Application with Manual PAE – b-learning - refresher	
Recipients	PPP users and IP Growers	
Duration incl. spray appl. issues	For training: 1 - 2 12 days / 50 hours 12 hours	For training: 3 - 8 4 days/ 25 hours 7 hours
Training providers Facilities & Equipment	Training Units and Advisory Services Specified by regulations – For training 3-4: Lecture Room with AV media, For training 1-2 and 5-8 also: Exercise Field and PAE	
Trainers Qualifications	Dedicated Trainers, Advisors Higher education, after train-the-trainer course	
Training materials	Offered / available on internet – For training 3-4: Flyers, Manuals, Presentations, Videos For training 1-2 and 5-8 also: PPE and Tools/Small Equipment	
Topics	PPP application equipment Sprayer adjustment Sprayer calibration Sprayer inspection Dose expression/calculation Drift reduction	Point source contamination Diffuse source contamination Risk mitigation measures Operator's safety IPM Organic farming

Mandatory training in Specialized Applications of PPPs includes applications in confined environments (e.g. greenhouses, storage rooms) and soil treatments. These trainings include study visits to companies offering relevant products and services.

Table 22 Mandatory training in Specialised Applications of PPPs		
Title of training	Specialized Application of PPP - Treatment Products in Confined Environment Specialized Application of PPP - Treatment Products in Confined Environment – b-learning Specialized Application of PPP - Soil Treatment Products Specialized Application of PPP - Soil Treatment Products – b-learning Update on Specialized Application of PPP - Confined Environment and Soil Treatment Products Update on Specialized Application of PPP - Confined Environment and Soil Treatment Products – b-learning	
Recipients	Specialised Users of PPP and IP Growers	
Duration incl. spray appl. issues	3 days / 21 hours; For update training: 4 days / 25 hours 0 hours	
Training providers Facilities & Equipment	Training Units and Advisory Services Specified by regulations: Lecture Room with AV media, Exercise Field, PAE	
Trainers Qualifications	Dedicated Trainers, Advisors, Teachers, Business Consultants Higher education, after train-the-trainer course	
Training materials	Offered / available on internet: Flyers, Manuals, Presentations, Videos, PPE, Tools/Small Equipment	
Topics	Application equipment Precision plant protection Dose expression/calculation Drift reduction	Point source contamination Diffuse source contamination Risk mitigation measures Operator's safety

Mandatory trainings on Distribution, Commercialization and Application of PPP prepares participants to obtain certification as the responsible technician for managing PPP retail stores, supervising companies providing pesticide application services, or acting as the technical advisor for farmers, as established by Law 26/2013. The corresponding license must be renewed every 10 years.

Table 23 Mandatory trainings on Distribution, Commercialization and Application of PPP for sale technicians, supervisors and consultants	
Title of training	Distribution, Commercialization and Application of PPP (stationary) Distribution, Commercialization and Application of PPP (b-learning) Distribution, Commercialization and Application of PPP (stationary) – refresher

	Distribution, Commercialization and Application of PPP (b-learning) - refresher	
Recipients	Advisors and Trainers	
Duration incl. spray appl. issues	Basic: 20 days / 70 hours. 10 hours;	Refresher: 5 days/ 25 hours 10 hours
Training providers Facilities & Equipment	Training Units and Advisory Services Specified by regulations: Lecture Room with AV media, For basic trainings also: Exercise Field and PAE	
Trainers Qualifications	Dedicated Trainers, Advisors Higher education, after train-the-trainer course	
Training materials	Offered / available on internet: Flyers, Manuals, Presentations, Videos For basic trainings also: PPE and Tools/Small Equipment	
Topics	PPP application equipment New technologies Precision plant protection Sprayer adjustment Sprayer calibration Sprayer inspection DSS & Tools Dose expression/calculation	Drift reduction Point source contamination Diffuse source contamination Risk mitigation measures Operator's safety IPM Organic farming

Mandatory training for trainers in Distribution, Commercialization and Application of PPP is required to obtain certification as a trainer for PPP application for farmers, operators or technicians, as mandated by Law 26/2013. The license must be renewed every 10 years.

Table 24 Mandatory trainings on Distribution, Commercialization and Application of PPP for trainers		
Title of training	Trainers in the Distribution, Commercialization and Application of PPP (stationary) Trainers in the Distribution, Commercialization and Application of PPP (b-learning)	
Recipients	Advisors and Trainers	
Duration incl. spray appl. issues	Basic: 21 days / 91 hours. 24 hours	
Training providers Facilities & Equipment	Training Units and Advisory Services Specified by regulations: Lecture Room with AV media, Exercise Field and PAE	
Trainers Qualifications	Dedicated Trainers, Advisors Higher education, after train-the-trainer course	
Training materials	Offered / available on internet: Flyers, Manuals, Presentations, Videos, PPE and Tools/Small Equipment	
Topics	PPP application equipment New technologies Precision plant protection Sprayer adjustment Sprayer calibration Sprayer inspection	Drift reduction Point source contamination Diffuse source contamination Risk mitigation measures Operator's safety

	DSS & Tools Dose expression/calculation	IPM Organic farming

Mandatory training in IP of horticultural crops includes farm visits, allowing participants to observe practical aspects of IPM or organic farming for the crop under study. These field visits provide a better understanding of techniques and strategies in action, improving applied learning outcomes.

Table 25 Mandatory trainings on IP of horticultural crops		
Title of training	Integrated Mode of Production – General Integrated Mode of Production – Vineyards Integrated Mode of Production – Olive Integrated Mode of Production – Pome Fruits Integrated Mode of Production – Stone Fruits Organic Production - General	
Recipients	IP Growers	
Duration incl. spray appl. issues	12 days / 75 hours (50 Hours for trainings 1 and 6) 1 hour	
Training providers Facilities & Equipment	Training Units and Advisory Services Specified by regulations: Lecture Room with AV media, Exercise Field	
Trainers Qualifications	Dedicated Trainers, Advisors Higher education, after train-the-trainer course	
Training materials	Offered / available on internet: Flyers, Manuals, Presentations, Videos	
Topics	PPP application equipment Precision plant protection Sprayer adjustment Sprayer calibration Dose expression/calculation Drift reduction	Point source contamination Diffuse source contamination Risk mitigation measures Operator's safety IPM Organic farming

Mandatory training in inspection of PA is required as a diagnostician, either to manage inspection centers or to act as a sprayer inspector. This certification is mandatory and must be renewed every 10 years, as stipulated by Law 26/2013.

Table 26 Mandatory trainings on inspection of PAE for diagnosticians	
Title of training	Inspection of PAE (stationary) Inspection of PAE (b-learning)
Recipients	PAE Diagnosticians
Duration incl. spray appl. issues	4 days / 28 hours 28 hours
Training providers Facilities & Equipment	Training Units and Advisory Services Specified by regulations: Lecture Room with AV media, Exercise Field, PAE testing equipment
Trainers Qualifications	Dedicated Trainers, Advisors Higher education, after train-the-trainer course

Training materials	Offered / available on internet: Flyers, Manuals, Presentations, Videos, PPE, Tools/Small equipment	
Topics	PPP application equipment New technologies	Sprayer adjustment Sprayer calibration Sprayer inspection

Specialized voluntary training provides professional qualifications confirmed by certificate and is oriented to advisors and trainers in pest management.

Table 27 Specialized voluntary and professional training for advisors and trainers in pest management				
Title of training	Trainers in Pest Management Trainers in Pest Management and Biocide Products Trainers in Pest Management and Biocide Products – b-learning Trainers in Pest Management with Specific Techniques Trainers in Pest Management with Specific Techniques – b-learning Trainers to Support the Provision of Pest Management Services Trainers to Support the Provision of Pest Management Services – b-learning			
Recipients	Advisors and Trainers			
Duration incl. spray appl. issues	Training 1 40 days / 250 h 0 hours	Training 2 and 3 16 days / 108 h 0 hours	Training 4 and 5 12 days / 82 h 0 hours	Training 6 and 7 10 days / 60 h 0 hours
Training providers Facilities & Equipment	Training Units and Advisory Services Specified by regulations: Lecture Room with AV media			
Trainers Qualifications	Dedicated Trainers, Advisors Higher education, after train-the-trainer course			
Training materials	Offered / available on internet: Flyers, Manuals, Presentations, Videos			
Topics	New technologies Precision plant protection DSS & Tools (only Training 1)	Dose expression/calculation IPM Organic farming		

Table 28 Specialized voluntary and professional training for advisors and trainers upgrading their qualifications and skills in crop protection	
Title of training	Crop Protection Complement Crop Protection Complement – b-learning
Recipients	Advisors and Trainers
Duration incl. spray appl. issues	12 days / 50 hours 0 hours
Training providers Facilities & Equipment	Training Units and Advisory Services Specified by regulations: Lecture Room with AV media
Trainers	Dedicated Trainers, Advisors

Qualifications	Higher education, after train-the-trainer course	
Training materials	Offered / available on internet: Flyers, Manuals,	Presentations, Videos
Topics	IPM	Organic Farming

Table 29 Specialized voluntary and professional training for advisors and trainers upgrading their qualifications and skills in plant protection technology		
Title of training	Training in Plant Treatment, Protection Machinery and Equipment	
Recipients	Advisors and Trainers	
Duration incl. spray appl. issues	5 days / 35 hours 35 hours	
Training providers Facilities & Equipment	Training Units and Advisory Services Specified by regulations: Lecture Room with AV media, PAE testing equipment	
Trainers Qualifications	Dedicated Trainers, Advisors Higher education, after train-the-trainer course	
Training materials	Offered / available on internet: Flyers, Manuals, Presentations, Videos, PPE, Tools/Small equipment	
Topics	PPP application equipment New technologies Precision plant protection Sprayer adjustment Sprayer calibration Sprayer inspection	DSS & Tools Dose expression/calculation Drift reduction Risk mitigation measures Operator's safety

During the training, participants take part in a field visit where they can practice with precision-agriculture tools such as drones and IoT sensors, observing how these technologies integrate into agricultural practices.

Table 30 Specialized voluntary and professional training for advisors and trainers upgrading their qualifications and skills in precision agriculture		
Title of training	Precision Agriculture (stationary) Precision Agriculture (b-learning)	
Recipients	Advisors and Trainers	
Duration incl. spray appl. issues	5 days / 35 hours 1 hour	
Training providers Facilities & Equipment	Training Units and Advisory Services Specified by regulations: Lecture Room with AV media, Exercise Field	
Trainers Qualifications	Dedicated Trainers, Advisors, Teachers, Researchers Higher education, after train-the-trainer course	
Training materials	Offered / available on internet: Flyers, Manuals, Presentations, Videos, Applications, Tools/Small equipment	
Topics	PPP application equipment New technologies	Precision plant protection

Voluntary training in IP of horticultural crops includes farm visits, allowing participants to observe practical IPM strategies. These visits enhance the effectiveness and applicability of learning.

Table 31 Specialized voluntary and professional training for advisors and trainers in IP of horticultural crops		
Title of training	Integrated Mode of Production – Actinidia Integrated Mode of Production – Almont Integrated Mode of Production – Hazelnut Integrated Mode of Production – Chestnut Integrated Mode of Production – Citrus Integrated Mode of Production – Fig Integrated Mode of Production – Walnut Integrated Mode of Production – Olive Integrated Mode of Production – Pome Fruits Integrated Mode of Production – Stone Fruits Integrated Mode of Production – Vineyards	
Recipients	Advisors and Trainers	
Duration incl. spray appl. issues	16 days / 106 hours 2 hours	
Training providers Facilities & Equipment	Training Units and Advisory Services Specified by regulations: Lecture Room with AV media, Exercise Field	
Trainers Qualifications	Dedicated Trainers, Advisors and Business Consultants Higher education, after train-the-trainer course	
Training materials	Offered / available on internet: Flyers, Manuals, Presentations, Videos	
Topics	PPP application equipment Precision plant protection Sprayer calibration Dose expression/calculation	Risk mitigation measures Operator's safety IPM Organic farming

Specialized voluntary and professional training in aerial applications of PPPs is in development in accordance with Law 26/2013. The program will be defined according to Art. 42 (2), Section III, Chapter VI of Law No. 26/2013 of 11 April.

Summary for Portugal

In Portugal, the key recipients of the training scheme are users of PPPs, including IP growers, as well as advisors and trainers (Figure 13). Mandatory training also covers PPP providers and PAE diagnosticians. However, there are no dedicated training courses for students, teachers, equipment dealers, or administrators.

The training programs cover all topics related to the safe and effective use of PPPs (Figure 14). The least represented areas are DSS, new technologies, PAE inspection, and sprayer adjustment.

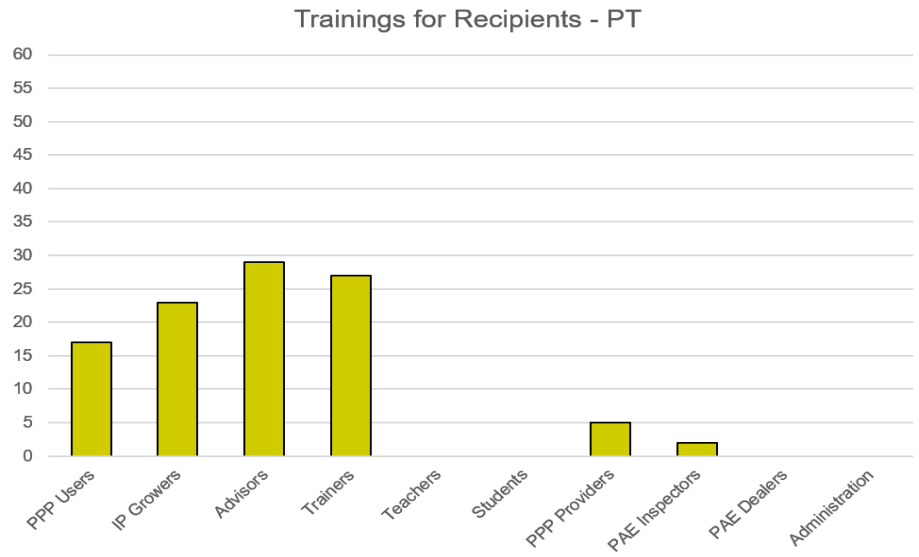


Figure 13. Number of training courses for individual recipients in Portugal

Figure 14. Number of training courses in Portugal with specific topics in the program

Spain

Mandatory training is provided for all key target groups. Pesticide users are required to complete elementary training in the sale of PPPs. Competent training in the sale of PPP is intended for a broader range of professionals, including PPP providers, advisors, trainers, diagnosticians of PAE, sprayer dealers, and official services supervising pesticide application issues.

Separate training is provided on fumigation operators, due to the specific nature of this pesticide application method.

A specific feature of the Spanish system is the training for pilots performing aerial applications.

All the above training courses have refresher versions. To ensure effective learning, the number of participants is limited to 30. Basic training courses are valid for 10 years, after which refresher training is required.

Finally, topics related to the safe use of pesticides are covered during the training Good Hygiene Practices in Primary Plant Production.

Table 32 Elementary training in sale and professional use

Title of training	Elementary training in sale of PPP Elementary training in sale of PPP - refresher	
Recipients	PPP Users, IP Growers	
Duration incl. spray appl. issues	Basic training: 5 days / 25 hours …….. hours	Basic training: 5 days / 25 hours …….. hours
Training providers	• Training Units Schools/Universities	• Branch Organizations Administration
Facilities & Equipment	Specified by regulations: Lecture Room with AV media	PAE demo components
Trainers Qualifications	Dedicated trainers, Teachers Higher education	
Training materials	Offered / available on internet: • Flyers Manuals	• Videos PPE
Topics	• Legal aspects • PPP application equipment • New technologies (R) • Sprayer adjustment (R) • Sprayer calibration Sprayer inspection	• Drift reduction • Point source contamination • Risk mitigation measures • Operator's safety (R) • First aid • IPM Organic farming

Table 33 Competent training in sale and professional use		
Title of training	Competent training in sale of PPP Competent training in sale of PPP - refresher	
Recipients	PPP Users, IP Growers, Advisors, Trainers, PPP Providers, PAE Diagnosticians, PAE Dealers, PPP Use Supervisors	
Duration incl. spray appl. issues	Basic training: 12 days / 60 hours ……. hours	Refresher training: 3 days / 12 hours ……. hours
Training providers	Training Units Schools/Universities	Branch Organizations Administration
Facilities & Equipment	Specified by regulations: Lecture Room with AV media Exercise Hall	 PAE PAE testing equipment
Trainers Qualifications	Dedicated trainers, Teachers Higher education	
Training materials	Offered / available on internet: Flyers Manuals	 Videos PPE
Topics	Legal aspects PPP application equipment New technologies (R) Precision plant protection Sprayer adjustment (R) Sprayer calibration Sprayer inspection Dose expression/calculation (R)	Drift reduction (R) Point source contamination (R) Diffuse source contamination Risk mitigation measures Operator's safety (R) IPM Organic farming First aid

Mandatory training in fumigation.

Users of gaseous products or products generating gases classified as toxic, very toxic, or lethal must be complete prior training from the elementary or competent courses.

Table 34 Training in fumigation		
Title of training	Training in Fumigation Training in Fumigation - refresher	
Recipients	PPP Users, Advisors, Trainers, PPP Use Supervisors	
Duration incl. spray appl. issues	Basic training: 12 days / 60 hours ……. hours	Refresher training: 3 days / 12 hours ……. hours
Training providers	Training Units Schools/Universities Industry	Branch Organizations Administration
Facilities & Equipment	Specified by regulations: Lecture Room with AV media Exercise Hall	 PAE PAE demo components PAE testing equipment
Trainers Qualifications	Dedicated trainers, Teachers, Industry Consultants Higher education	
Training materials	Offered / available on internet:	

	Flyers Manuals	Videos PPE
Topics	Legal aspects PPP application equipment Dose expression/calculation Risk mitigation measures	Health risk Operator's safety Organic farming (R)

Table 35 Training for applicator pilot		
Title of training	Applicator Pilot Course Applicator Pilot Course - refresher	
Recipients	PPP Users with aerial vehicle, Advisors, Trainers, Other interested	
Duration incl. spray appl. issues	Basic training: 18 days / 90 hours ..... hours	Refresher training: 5 days / 25 hours ..... hours
Training providers	Training Units Schools/Universities	Branch Organizations Administration
Facilities & Equipment	Specified by regulations: Lecture Room with AV media Exercise Field	 PAE PAE demo components PAE testing equipment
Trainers Qualifications	Dedicated trainers, Teachers, Industry Consultants Higher education	
Training materials	Offered / available on internet: Flyers Manuals	 Videos PPE
Topics	Legal aspects (R) PPP application equipment (R) New technologies (R) Precision plant protection (R) Sprayer adjustment (R) Sprayer calibration Sprayer inspection (R)	Dose expression/calculation (R) Drift reduction Risk mitigation measures (R) Health risk Operator's safety Organic farming (R)

Table 36 Training in Good Hygiene Practices		
Title of training	Good hygiene practices in primary plant production	
Recipients	PPP Users, IP Grower, Advisors, Trainers, Students, PAE Dealers	
Duration incl. spray appl. issues	Basic training: 1 days / 3 hours ..... hours	
Training providers	Training Units Advisory Services	Industry Administration
Facilities & Equipment	Specified by regulations: Lecture Room with AV media Exercise Field	PAE
Trainers Qualifications	Advisors, Teachers, Industry Consultants Higher education	

Training materials	Offered / available on internet: Presentations	Videos
Topics	Precision plant protection Drift reduction Point source contamination	Diffuse source contamination Risk mitigation measures Operator's safety

Table 37 Voluntary training in Good Practices in use of PAE		
Title of training	Good Practices in use of PAE	
Recipients	PPP Users, IP Grower, Advisors	
Duration incl. spray appl. issues	Basic training: 1 days / 4 hours 4 hours	
Training providers	Advisory Services Branch Organizations	Industry
Facilities & Equipment	Specified by regulations: Lecture Room with AV media Exercise Field	PAE
Trainers Qualifications	Advisors, Teachers, Industry Consultants Higher education	
Training materials	Offered / available on internet: Presentations	Videos
Topics	PPP application equipment New technologies Sprayer inspection Drift reduction	Point source contamination Diffuse source contamination Risk mitigation measures Operator's safety

Table 38 Voluntary training in calibration of PAE		
Title of training	Training in PAE calibration	
Recipients	PPP Users, IP Grower, Advisors	
Duration incl. spray appl. issues	Basic training: 1 days / 4 hours 4 hours	
Training providers	Advisory Services Branch Organizations	Industry
Facilities & Equipment	Specified by regulations: Lecture Room with AV media Exercise Field	PAE
Trainers Qualifications	Advisors, Teachers, Industry Consultants Higher education	
Training materials	Offered / available on internet: Presentations	Videos
Topics	New technologies Sprayer adjustment Sprayer calibration Dose expression/calculation	Drift reduction Risk mitigation measures Operator's safety

Summary for Spain

In Spain, most mandatory training courses are targeted at key groups of recipients, including PPP users, IP growers, advisors, and trainers (Figure 15). Mandatory training also covers PPP providers, as well as dealers and diagnosticians of PAE. Students benefit from the training in Good Hygiene Practices in Primary Plant Production. However, there is no dedicated training for teachers or administrators.

Among the training topics, the absence of DSS is particularly notable (Figure 16), especially considering the broad availability of DSS across Spanish producers of fruit, grape, olive and citrus. It would be beneficial to include IPM and diffuse source contamination in a greater number of training programs.

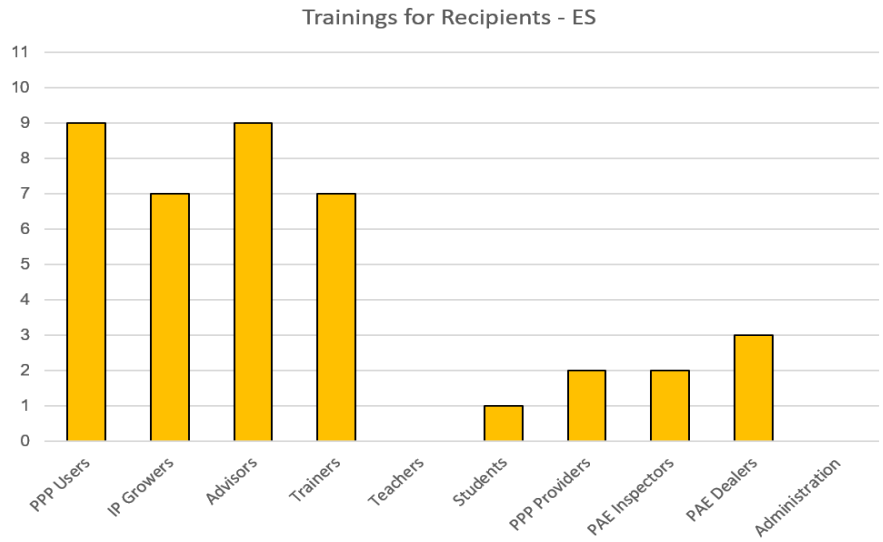


Figure 15. Number of training courses for individual recipients in Spain

Figure 16. Number of training courses in Spain with specific topics in the program

6. Final remarks

In all eight surveyed countries, mandatory training is provided to the users of PPPs and advisors on the use of these products and, except for Cyprus, also to the sellers of pesticides (Figure 17). PPP providers are key partners for PPP users, as they are at the forefront of advising on their use when purchasing products. Providing mandatory training for these three target groups meets the requirements of the SUD directive.

Most countries also provide training for PAE dealers and inspectors, as well as for administrators. Students and teachers generally draw their knowledge on PPP use from their educational programs.

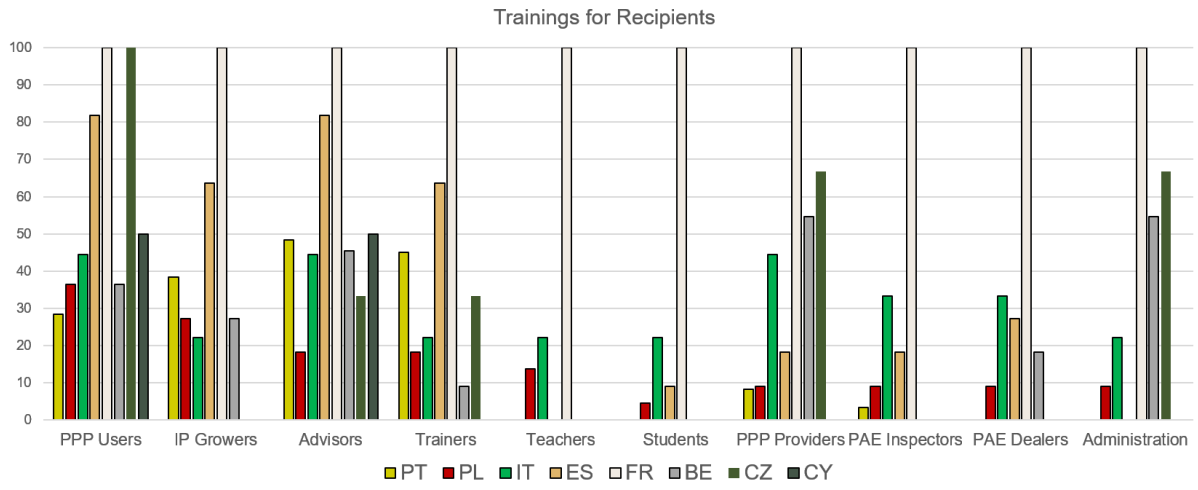


Figure 17. Percentage of training courses for individual recipients in Europe

Most topics relevant to the effectiveness and safety of PPP applications are covered in programs of training schemes existing in the surveyed countries (Figure 18). Given the importance and potential of new digital technologies to reduce the use of PPPs, we should expect more coverage of topics related to DSS, new technologies, and precision plant protection.

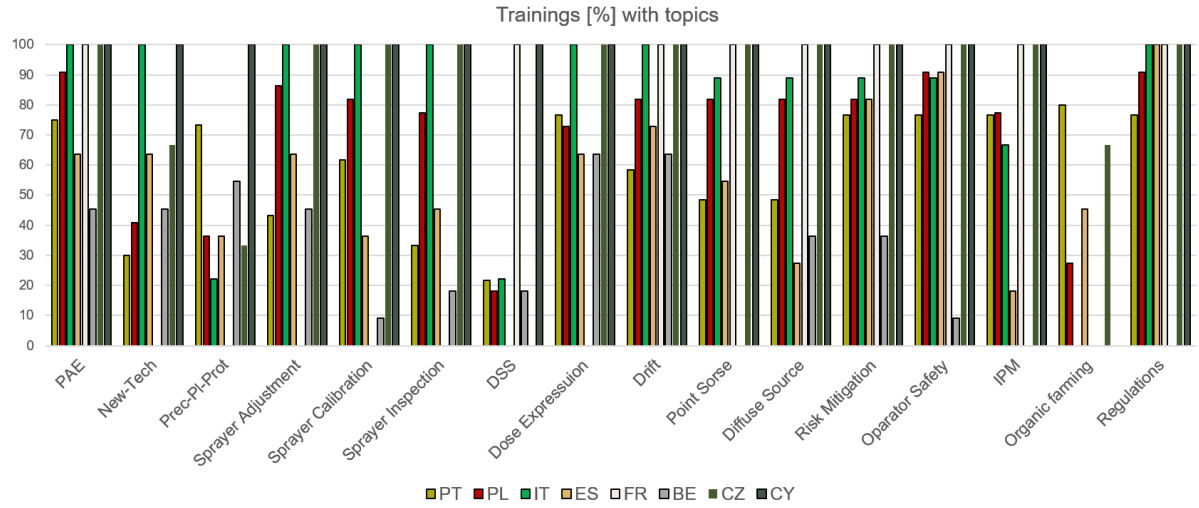


Figure 18. Percentage of training courses in Europe with specific topics in the program

Furthermore, the comparative analysis highlights a clear opportunity for greater harmonisation of training standards across MSs. While national specificities must be preserved, aligning key program elements, particularly those related to digital technologies, sprayer operation, and risk-mitigation practices, would facilitate knowledge transfer, strengthen professional competences and support EU-wide progress toward sustainable pest management.

7. Recommendations

In base of the comparative analysis of training schemes across the eight MSs, several areas of improvement have emerged that could strengthen the effectiveness, consistency, and readiness of pesticide-use training system in the EU. While national systems differ in structure and scope, the following recommendations may support further alignment with the objectives of the SUD (Directive 2009/128/EC) and ongoing developments in plant protection technologies:

I. Improving effectiveness of knowledge transfer

1. **Strengthen coordination between mandatory and complementary training schemes.**
   Linking initial, refresher, and sector-specific courses would ensure continuity of knowledge and reduce fragmentation across training pathways.
2. **Promote exchange of best practices between Member States.**
   Voluntary cross-country cooperation and benchmarking can enhance training quality while respecting national autonomy.

3. **Standardize core learning outcomes aligned with Annex I of SUD.** Defining common minimum competences would facilitate consistent knowledge transfer across different national systems.
4. **Increase the practical component of training.** Field demonstrations, calibration exercises, and real-case analysis improve retention and applicability of knowledge.

II. Increasing the attractiveness of training

1. **Adopt interactive and learner-centered teaching methods.** Workshops, case studies, and problem-solving tasks enhance engagement compared to lecture-based formats.
2. **Connect training content with real farm challenges.** Demonstrating direct benefits for productivity, compliance, and risk reduction increases perceived relevance.
3. **Offer flexible learning formats.** Hybrid and modular structures allow participants to better integrate training into their professional schedules.
4. **Introduce recognition mechanisms beyond certification.** Digital badges or micro-credentials can increase motivation and visibility of acquired competences.

III. Complementing training topics

1. **Integrate Decision Support Systems (DSS) into mandatory curricula**. Given their growing availability, DSS should become a standard element of PPP-related training.
2. **Expand coverage of precision plant protection and digital agriculture.** Topics such as drones, IoT sensors, and variable-rate application should be systematically included.
3. **Reinforce training on sprayer calibration and adjustment.** Operational aspects of PAE remain underrepresented in several countries and are critical for risk mitigation.
4. **Strengthen modules on diffuse and point source contamination**. Greater emphasis on environmental protection measures would further support SUD objectives.

IV. Use of digital training tools

1. **Integrate digital learning platforms as complementary tools**. Online modules can support refresher training and continuous professional development.

2. **Develop simulation-based digital tools for practical skills**.
   Virtual calibration exercises or risk-assessment scenarios can enhance experiential learning.
3. **Ensure accessibility through mobile-compatible solutions**.
   Digital tools should be optimized for smartphones to maximize reach among practitioners.
4. **Use digital tools to support harmonization of training standards.**
   Shared EU-level digital resources could promote consistency without limiting national flexibility.

V. Complementary role of voluntary training

1. **Position voluntary training as an innovation incubator**.
   Optional courses can introduce emerging technologies and advanced topics before formal integration into mandatory systems.
2. **Encourage voluntary programs for specialized audiences**.
   Advanced modules for advisors, trainers, and diagnosticians can deepen expertise beyond minimum legal requirements.
3. **Promote collaboration with research institutions and industry.**
   Partnership-based voluntary training strengthens knowledge exchange and technology transfer.

VI. Inclusion of underrepresented target groups

1. **Expand dedicated training for students and teachers.**
   Early integration of PPP safety and IPM principles into formal education enhances long-term competence development.
2. **Provide tailored modules for administrative staff and public officials.**
   Improved regulatory understanding supports coherent enforcement and advisory functions.
3. **Enhance outreach to non-professional users.**
   Short, safety-oriented courses can improve safe handling, storage, and disposal practices.

VII. Design of training programs

1. **Adopt a competence-based curriculum structure**.
   Training programs should be organized around clearly defined learning outcomes linked to professional roles (PPP users, PPP providers, advisors, inspectors), ensuring role-specific relevance and accountability.
2. **Differentiate content according to levels of professional responsibility**.
   A graduated structure (basic, advanced, specialized) enables progressive development of expertise and better reflects the diversity of tasks within PPP systems.

3. **Integrate theory with structured practical application**.
   Each theoretical module should be directly connected to hands-on exercises, field visits, or case-based analysis to strengthen applied competences.
4. **Embed innovation pathways within program design**.
   Curricula should include mechanisms for periodically integrating emerging technologies, regulatory updates, and research findings.
5. **Ensure transparency and coherence in certification systems.**
   Clear criteria for assessment, renewal, and recognition of qualifications enhance credibility and trust in the training system.
6. **Encourage modular and stackable learning structures**.
   Designing programs as interconnected modules allows flexibility, easier updates, and recognition of partial achievements.

VIII. Design of the RENOVATE digital training platform

1. **Align platform architecture with SUD Annex I competencies**.
   Digital modules should explicitly map to required knowledge areas, supporting both harmonization and national adaptation.
2. **Adopt a mobile-first and user-centered design**.
   The platform should prioritize intuitive navigation, accessibility, and smartphone compatibility to reflect user behavior patterns.
3. **Integrate simulation-based and scenario-driven learning tools**.
   Serious games and interactive case studies should replicate real farm decision-making contexts to enhance experiential learning.
4. **Provide adaptive learning pathways**.
   The platform should adjust content difficulty and progression based on user profile, prior knowledge, and performance.
5. **Ensure clarity, low cognitive load, and supportive feedback**.
   Given the diversity of users, the interface should remain simple, with clear instructions and constructive, transparent feedback mechanisms.
6. **Enable blended learning integration**.
   The platform should complement in-person mandatory training by offering preparatory modules, refresher content, and post-training reinforcement.
7. **Incorporate tools supporting digital and information literacy**.
   Dedicated modules should strengthen users' ability to critically assess online agricultural and regulatory information.
8. **Facilitate monitoring and evaluation of learning outcomes.**
   Built-in analytics and progress tracking can support both individual learning and system-level quality assessment.
9. **Allow national customization within a harmonized framework**.
   The platform should provide a common structural backbone while enabling Member States to adapt content to local legal and agronomic conditions.

IX. Other training aspects

1. **Maintain small group sizes for practical effectiveness**.
   Limiting participant numbers enhances interaction and hands-on learning quality.
2. **Ensure periodic updating of training content**.
   Regular revision of curricula guarantees alignment with evolving legislation and technologies.
3. **Promote gradual harmonization while preserving national flexibility**.
   Aligning key program elements at EU level can strengthen professional mobility and sustainability goals without undermining Member State autonomy.
4. **Introduce systematic evaluation of training outcomes**.
   Monitoring learning effectiveness and behavioral change would improve evidence-based policy adjustments.

Results of User Expectations Survey

Users demographic profile

Section 1: Socio-demographic information (ANNEX 1)

A total of 266 questionnaires were collected across the countries involved in the project. Figure 19 presents the distribution of responses.

Considering participants' sociodemographic characteristics, 20.8% of respondents were females and 79.2% were males and they had a mean age of 39.7 years (SD = 14.9). In terms of education, 2.3% had completed primary school, 15.8% secondary, 33.6% upper secondary, 34% held a university degree and 14.3% had attained a postgraduate qualification. Furthermore, 61.6% of respondents were farmers, while 38.4% included other stakeholders such as advisors and manufacturers (hereafter defined as advisors). All respondents have a mean of 14.5 years of work experience (SD = 12.3).

With regard to competencies related to pesticide use, the survey assessed respondents' expertise in the following areas: 61.4% of respondents reported expertise in spraying, 56.2% in planning, 39.9% in management (storage and transportation), 37.3% in cleaning, and 11.2% in other unspecified tasks (many respondents were involved in different competences).

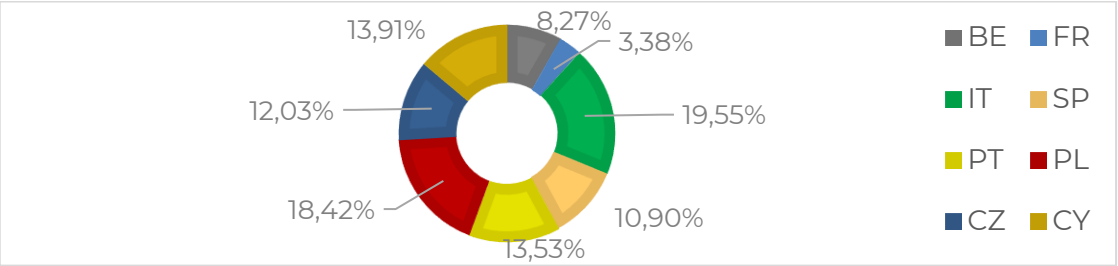


Figure 19. Geographical distribution of responses by country.

In terms of crop categories, 33.5% reported cultivating herbaceous crops, 61.4% permanent tree crops, 18% horticultural and specialized crops, while 3.8% did not specify the type of crops cultivated (Figure 20).

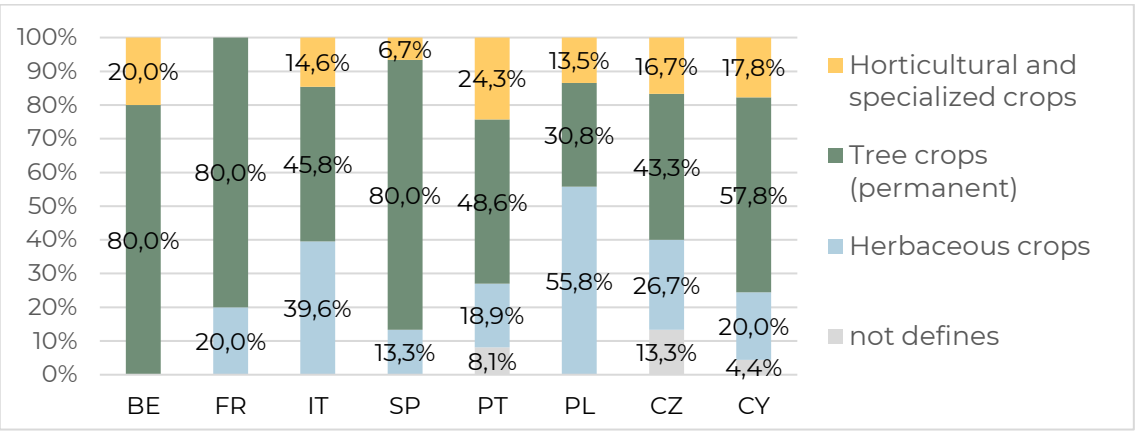


Figure 20. Geographical distribution of crop type (values).

Context of use

Section 2a: Digital device literacy (ANNEX 2)

Figure 21 indicates that participants perceive solid basic digital skills (items 1–5 and 9-10). Negatively formulated items (items 6, 7, 11) yielded relatively low mean scores, suggesting that respondents generally did not perceive major difficulties in choosing keywords for online searches, maintaining concentration when seeking information, or installing programs independently. **This finding suggests a satisfactory degree of digital autonomy among respondents.**

The only area that appears to require further development is the ability to critically assess the reliability of online information (item 8, mean = 3.62). **It suggests that a dedicated digital platform could provide valuable support in addressing this challenge among users.**

The items addressing motivation and attitudes toward digital technologies (items 12–16) achieved high values (mean ranging from 3.3 to 4.3). In conclusion, **respondents acknowledged the relevance of digital skills for their future professional activities and expressed a relatively high level of confidence in using smartphone applications**, thereby establishing a solid foundation for subsequent training initiatives.

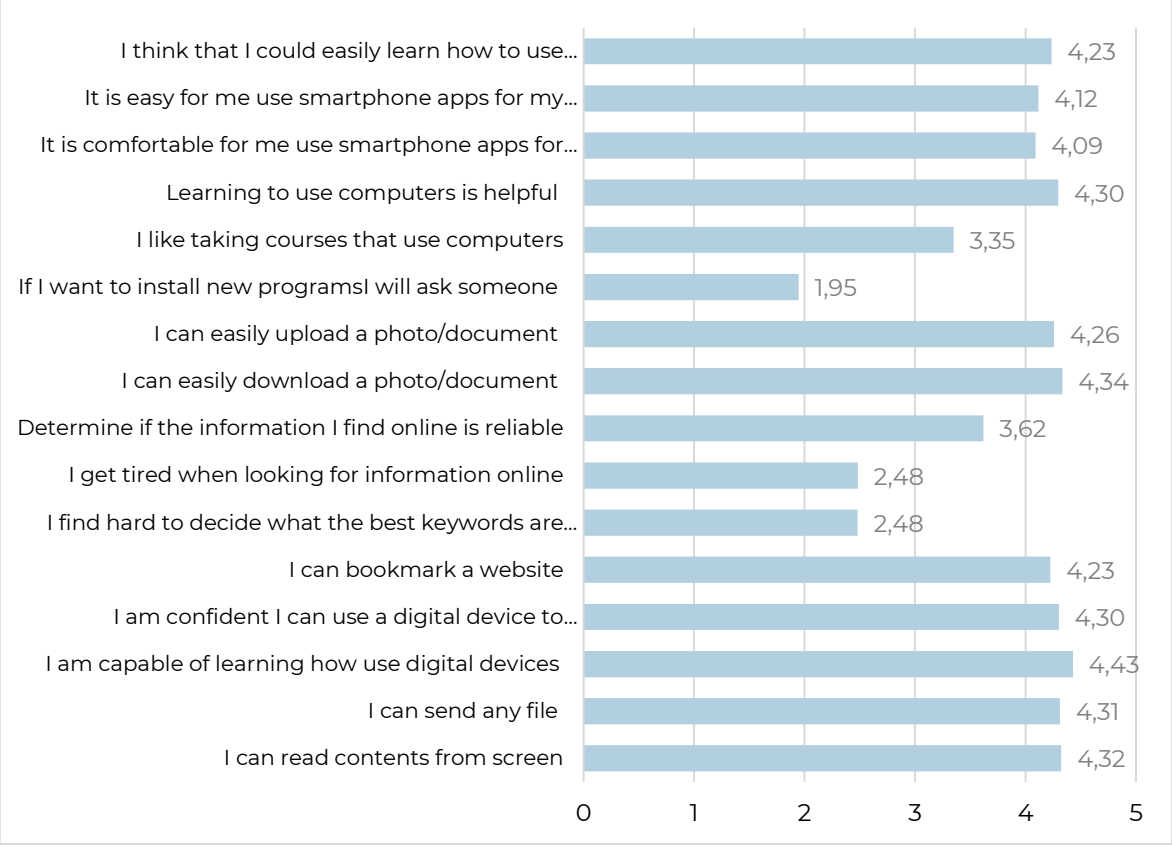


Figure 21. Mean scores related to digital device literacy.

Comparison between countries highlights slightly different levels of digital literacy. While some countries demonstrate higher overall scores, others are broadly aligned with the average, and a few displays lower mean scores (Figures 22).

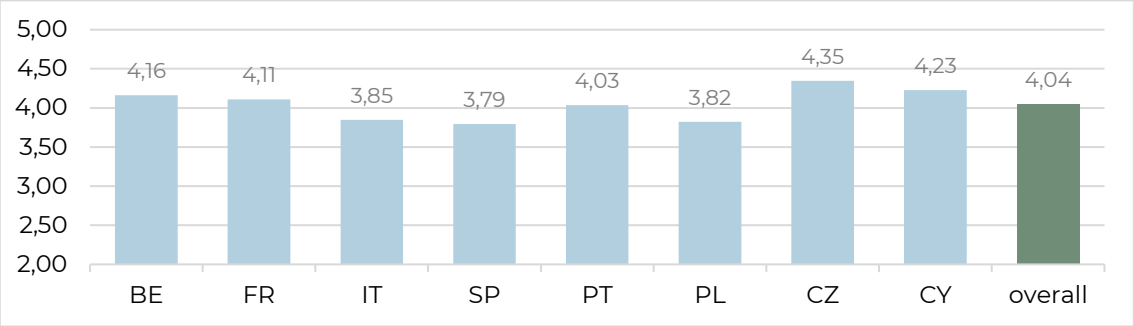


Figure 22. Overall mean score related to digital device literacy by country (mean scores). The items 6, 7, and 11 were reverse-coded in order to align their directionality with the other items and to ensure a coherent interpretation of the overall scores.

Figure 23 illustrates the mean scores across user categories and age groups. Overall, all groups report positive evaluations. Young women farmers show the highest levels, followed by advisors and young men farmers. Senior farmers reported comparatively lower values.

Figure 23. Overall mean score related to digital device literacy by user groups (mean scores).

With regard to devices available at home, the entire sample reported **widespread access to computers** (93.9%), followed by tablets (53.7%), while gaming consoles were less commonly owned (30.9%). Consistently, the daily use of digital devices is largely concentrated within the medium-to-high range (more than 3 hours per day, Figure 24).

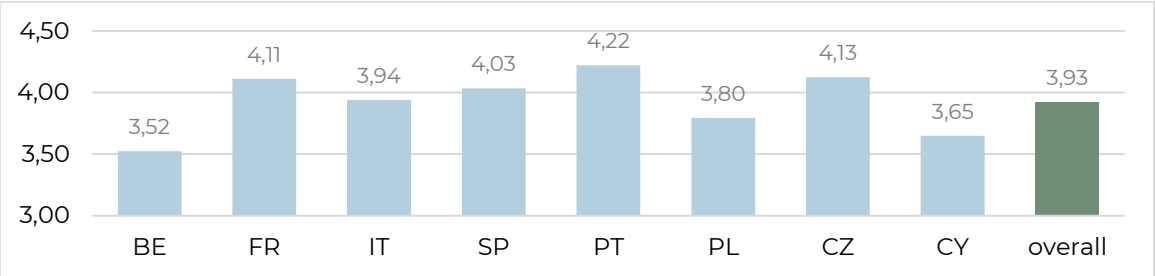


Figure 24. Daily use of digital devices, measured on a scale ranging from 1 = up to 30 minutes to 5 = more than 3 hours (mean scores).

Overall, the **use of digital devices for farming activities** is fairly widespread across the sample, though significant cross-country differences emerge (Figure 25). France stands out for the device use, while Czech and Poland lead in the intensive use of applications. By contrast, Italy shows the lower levels of digital engagement in the agricultural context.

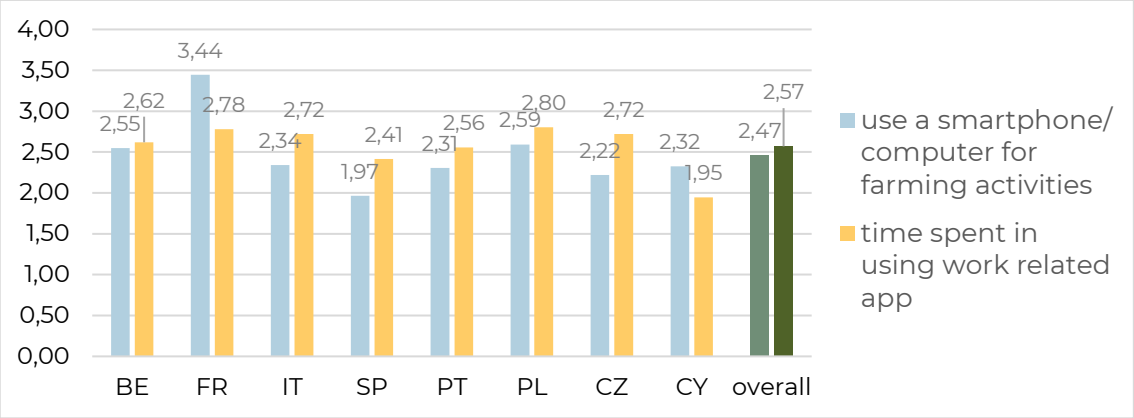


Figure 25. Use and time spent in using digital devices for farming activities (mean scores).

Figure 26 presents the comparison of digital device use patterns across user categories and age groups. Overall, younger participants tend to use digital devices more frequently than senior groups, both in their daily routines and in the context of farming-related professional activities. Advisors also show relatively high levels of digital device use. **These findings highlight a generational difference in digital adoption within the agricultural sector.**

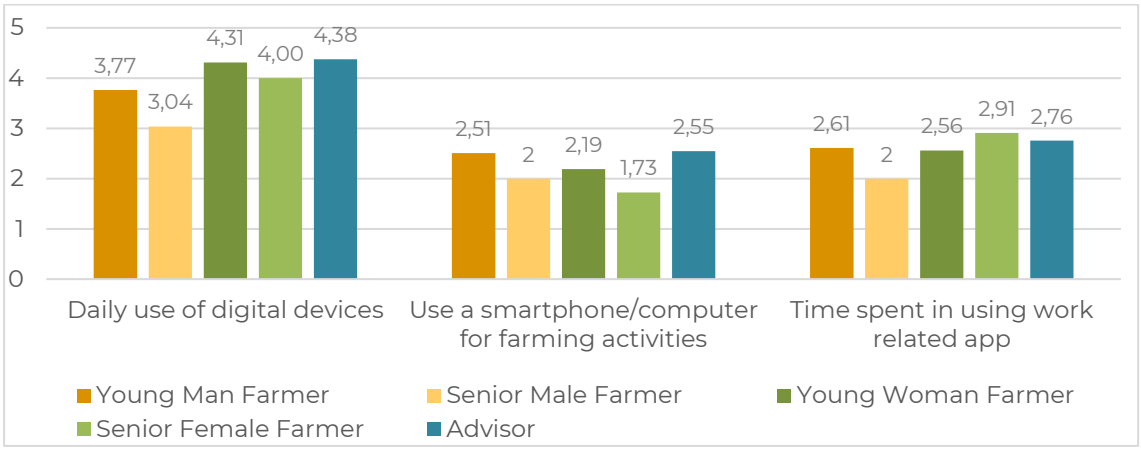


Figure 26. Comparison of digital device use patterns across user categories and age groups (mean score).

Section 2b: Gaming experience, preferences and literacy (ANNEX 3)

As displayed in Figure 27 nearly half of the sample (45%) reported having played in the past but no longer do so, while one third (34%) stated that they currently play. Only a minority (21%) declared have never engaged with digital games.

This suggests that, although active gaming is not universal, **a substantial proportion of respondents have had prior exposure to digital games, which may contribute to familiarity with interactive digital game environments.** Figure 27 illustrates the distribution of gaming experience across the identified user groups. Furthermore, among respondents who reported playing, the majority indicated engaging on a weekly basis (51.1%), followed by those playing two/ three times per week (30.4%). Smaller proportions reported daily play (14.1%) or playing multiple times per day (4.4%).

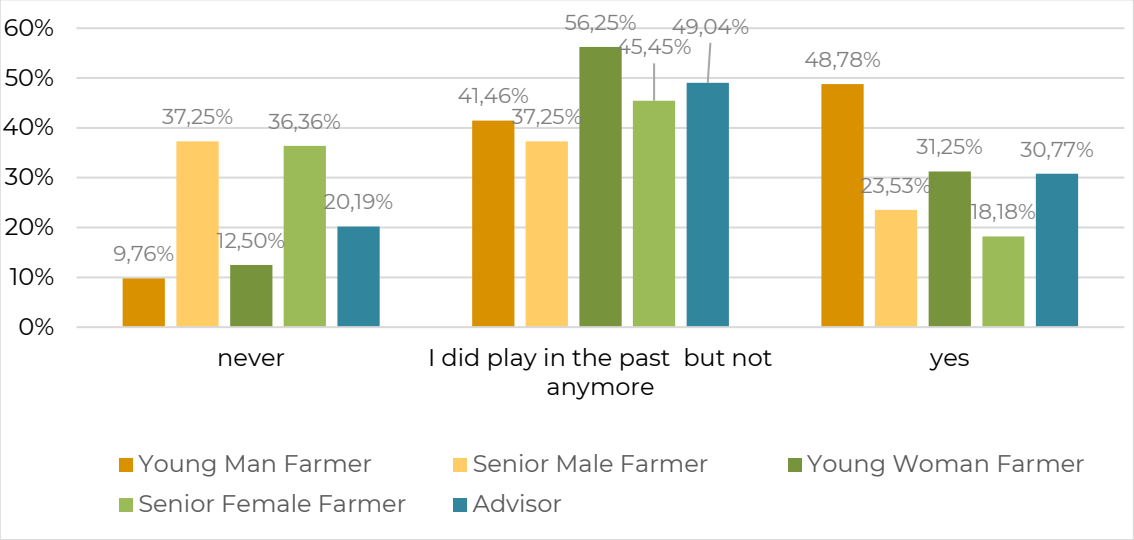


Figure 27. Respondents who have prior experience with digital games.

The data illustrated in Figure 28 showed what are the **game genres most commonly played** by respondents. Strategy (31.3%), simulation (29.4%), and action games (26.5%) emerge as the most frequently chosen genres, followed by adventure (22.3%) and puzzle games (22.3%). Moderate frequencies of play are reported for driving/racing (13.7%), quiz (13.7%), and sports games (13.2%), while lower frequencies are observed for management (10.9%), story-based games (8.5%), and party games (7.6%). Fitness games (1.9%) are almost absent from respondents' preferences. A small proportion of participants (0.9%) selected the "Other" category, mainly specifying card games. A group-level analysis (Figure 29) highlights clearer generational and gender patterns: younger users show stronger engagement with simulation and action-oriented genres, whereas young women farmers stand out for their preference for quiz and puzzle formats.

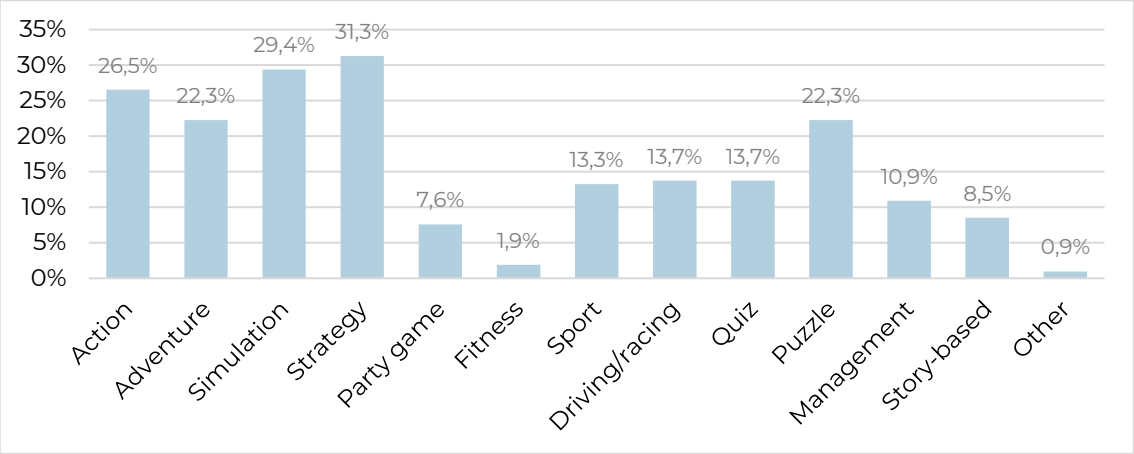


Figure 28. Game genre preferred and traditionally played by respondents.

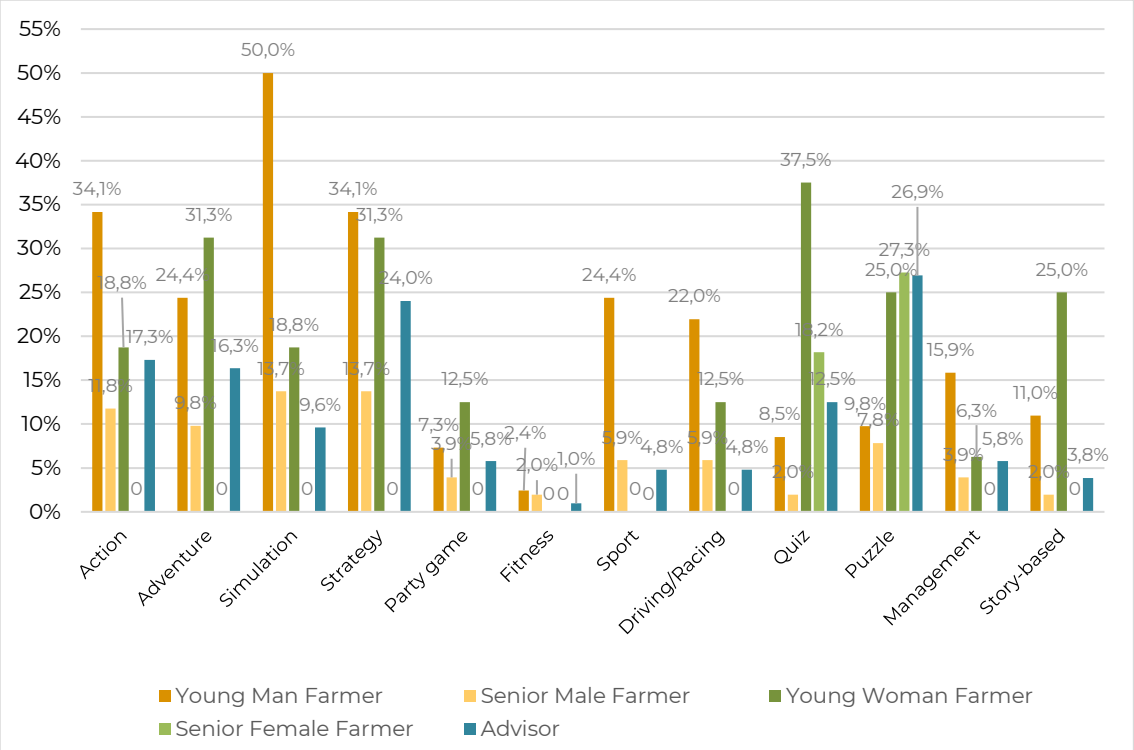


Figure 29. Game genre preferred and traditionally played by respondents across user categories (young and senior farmers, and advisors).

The data on the **devices most commonly used for playing** show that the majority of respondents engage with games on smartphones (55.4%), followed closely by computers (46.5%). A considerable proportion also reported playing on consoles (34.1%). In contrast, tablets were only rarely used for gaming (8.1%). **These findings highlight the centrality of mobile and computer-based platforms for gaming**, with consoles still maintaining a relevant role. Group-level analysis confirms smartphones as the primary gaming device across all users, with higher console engagement among younger farmers and lower overall device use among senior male farmers (Figure 30).

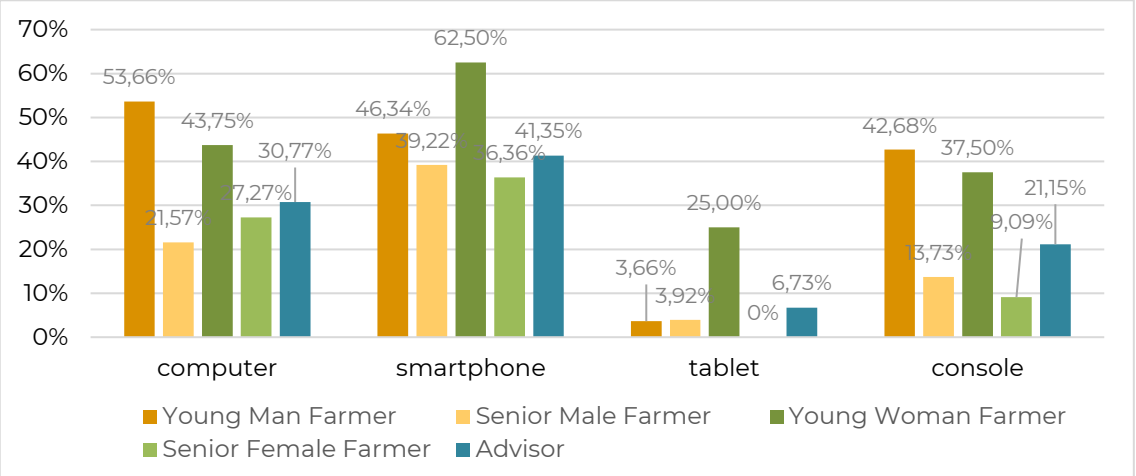


Figure 30. Devices most commonly used for playing digital games, by user category.

The findings also reveal that the average daily time spent on gaming is relatively limited (Figure 31). More specifically, most respondents reported playing for no more than one hour per day, while only a limited number of respondents indicated one to two hours, and instances of more intensive use were marginal (Figure 32). Comparing these data with those on the general use of digital devices (Figure 24 and 25), **it becomes evident that gaming represents only a minor part of daily digital practices, with most digital engagement oriented toward work-related and informational purposes**.

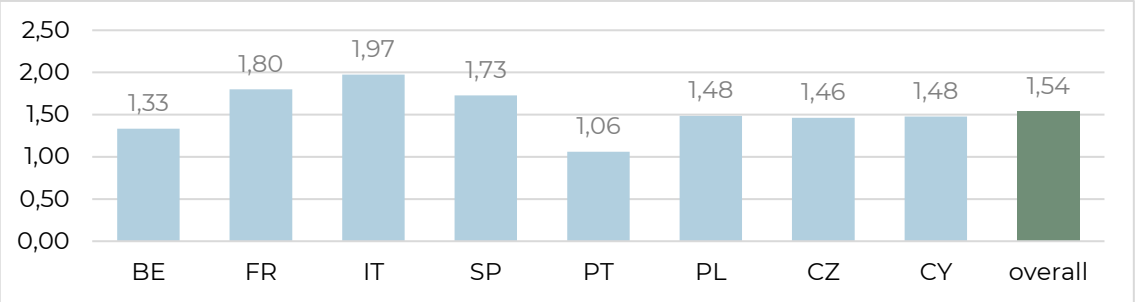


Figure 31. Time spent playing, measured on a scale from 1 to 5 (1= 1–30 minutes, 2 = 30 minutes–1 hour, 3 = 1–2 hours, 4 = 2–3 hours, to 5 = more than 3 hours, mean scores).

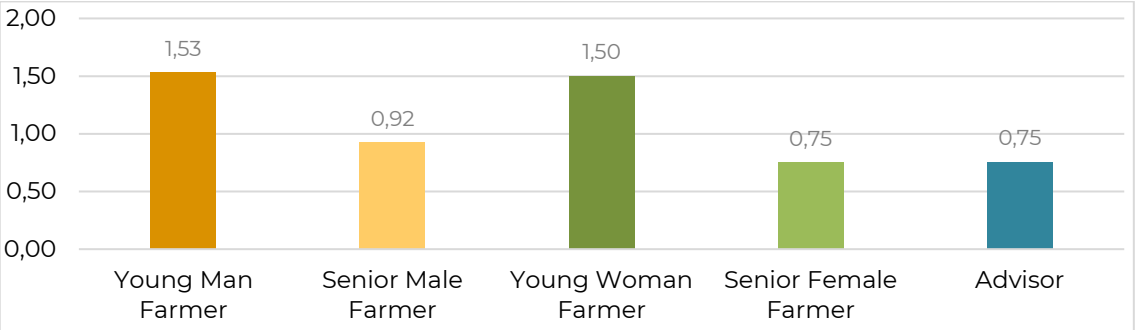


Figure 32. Time spent playing by user groups, measured on a scale from 1 to 5 (1= 1–30 minutes, 2 = 30 minutes–1 hour, 3 = 1–2 hours, 4 = 2–3 hours, to 5 = more than 3 hours, mean scores).

The results show that most respondents usually play at a **moderate level of difficulty** (59.2%). A smaller share reported playing at an easy level (20.2%), while a comparable proportion preferred a difficult level (20.6%). Minor differences can be identified across user groups (Figure 33).

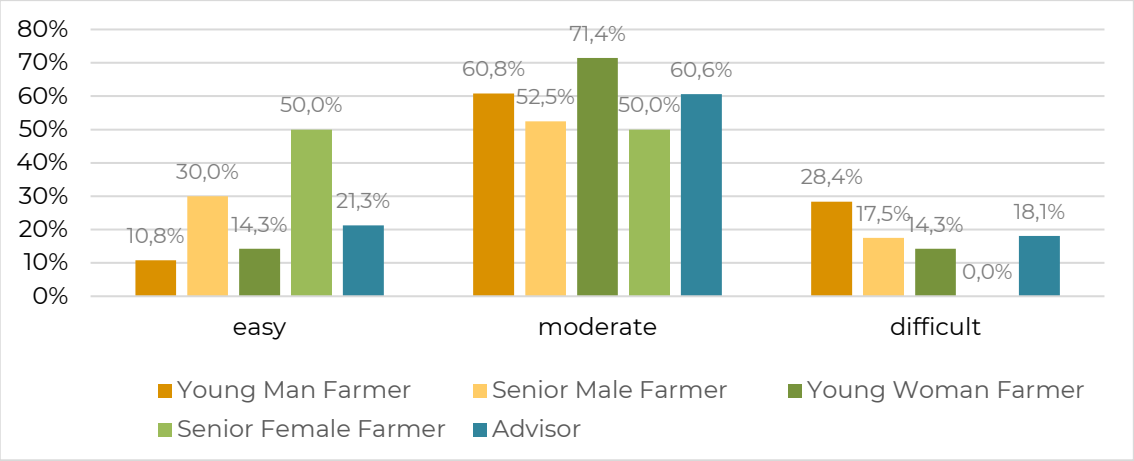


Figure 33. Preferred level of game difficulty across user categories.

The responses to the section of the questionnaire addressing familiarity with common game elements and mechanics reveal a generally positive but heterogeneous pattern, with an overall mean score of 3.50 (Figure 34). The highest score was observed for basic operational confidence (item 2, mean = 4.08), followed by ease of playing mobile games (item 3, mean = 3.94). This suggests that respondents feel confident in managing several in-game functions. Lower scores were associated with use of avatars and personalization features (item 4, mean = 2.67), indicating limited interest in customizing gaming experiences. Moderate/Neutral scores emerged for items related to the use of games as a learning tool, the ability to assess feedback quality, the motivational role of points and rankings and interest in solving missions or quests for learning purposes (items 5-8, respectively). Consistently, familiarity with basic game elements is higher among younger users, particularly young women farmers, while senior male farmers report consistently lower levels. However, confidence in basic game operations and mobile play is relatively strong across groups (Figure 35).

The overall mean was generally consistent across countries (Figure 36). In addition, the results suggest that while basic familiarity with game mechanics is present across categories, generational differences remain evident, with younger users showing greater confidence in interacting with game-based features (Figure 37).

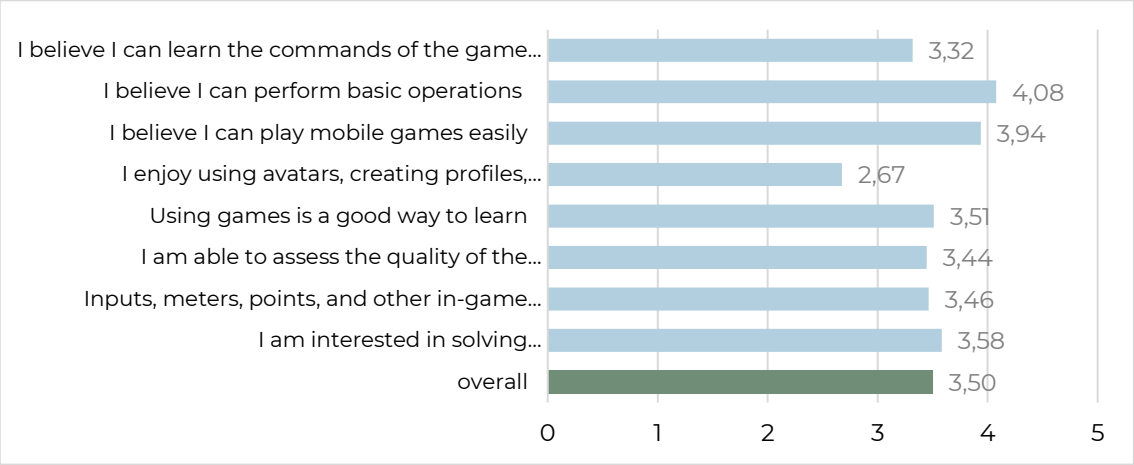


Figure 34. Perception and familiarity with game elements (mean scores).

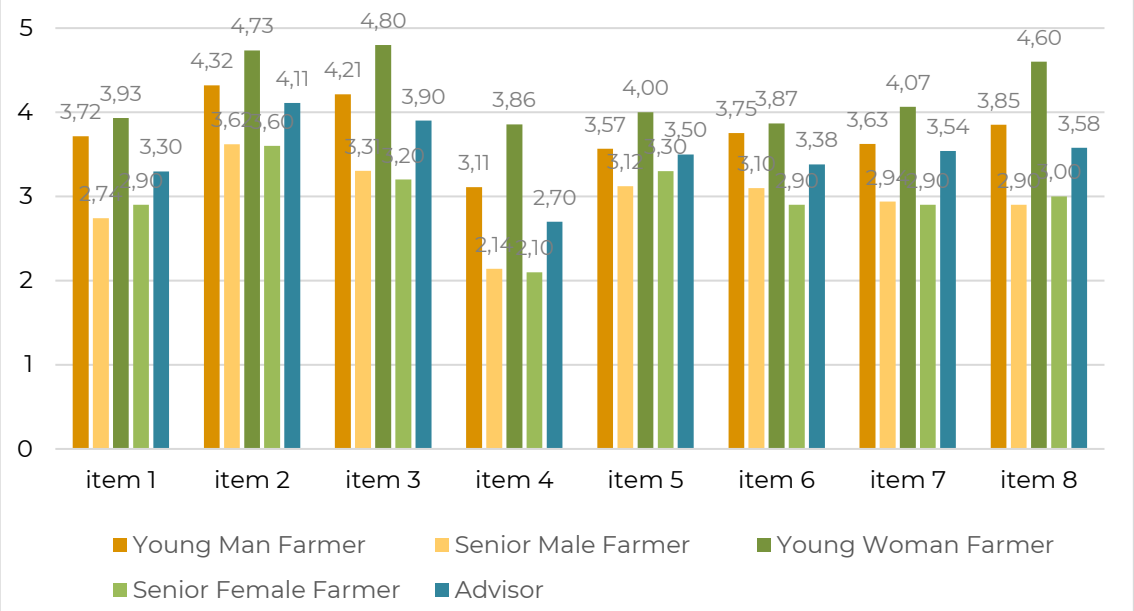


Figure 35. Perception and familiarity with game elements (mean scores).

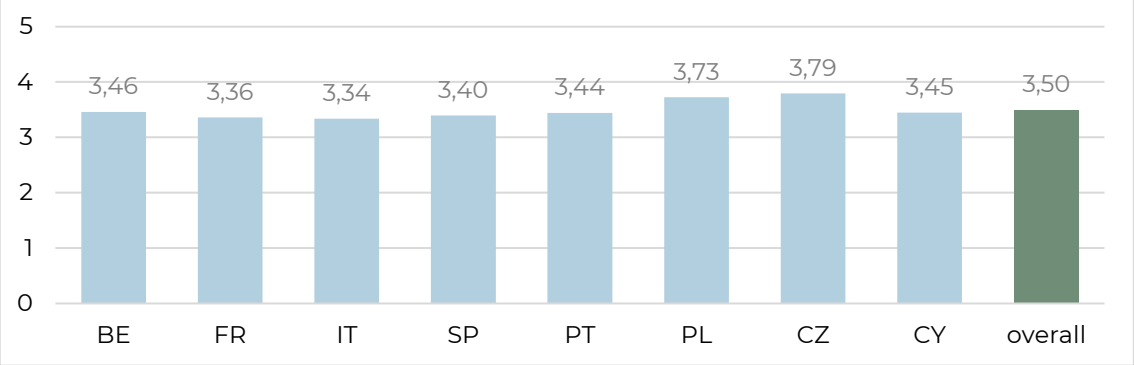


Figure 36. Perception and familiarity with common game elements and mechanics, overall mean scores across countries.

Figure 37. Perception and familiarity with common game elements and mechanics, overall mean scores across user groups.

User motivational profile

Section 3: Expectation and Learning Preferences (ANNEX 4)

The responses to the section of the questionnaire addressing **expectations** toward the Renovate platform reveal overall positive attitudes, with an average score close to 4.0 across all items (overall mean = 3.94). The highest values were recorded for expectations of acquiring knowledge of PPP regulations (item 3) and of understanding challenges, obstacles, and opportunities related to the optimal use of PPPs (item 4). These findings indicate **strong interest in the platform's potential to enhance both regulatory and practical knowledge**.

Items addressing the perceived usefulness of a digital platform for agricultural activities (items 5–7) yielded slightly lower but still really positive scores, ranging from 3.77 to 3.92. However, respondents acknowledged that such a platform could be useful, support faster task execution, and potentially enhance farm productivity (Figure 38).

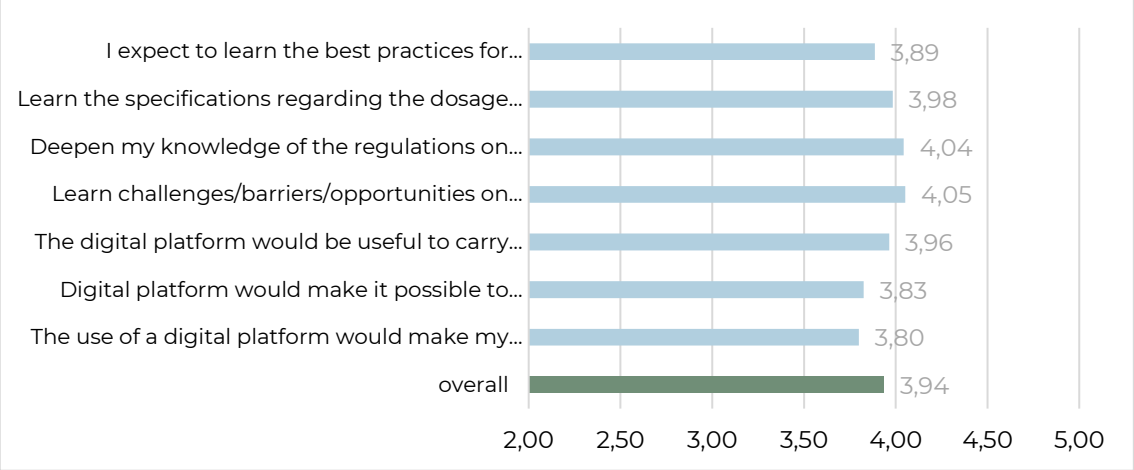


Figure 38. Expectations toward RENOVATE platform (mean scores).

Expectations regarding the RENOVATE platform were generally positive across countries. The Czech Republic, Cyprus, and Portugal expressed the highest mean values, while Belgium, Spain, Italy, and Poland showed comparatively more moderate scores (Figure 39).

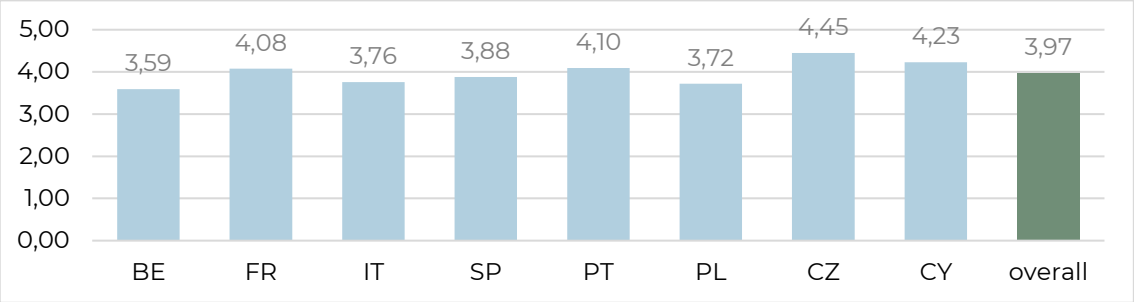


Figure 39. Expectations, overall mean scores across countries.

The results related on current training **perception and knowledge regarding PPPs** indicate a generally good perception. Respondents positively valued the importance of training and considered the knowledge acquired as meaningful, highlighting potential areas for improvement to further enhance their knowledge. Indeed, **self-perceived competence and access to resources were rated moderately, while the need for more engaging and interactive resources was clearly expressed** (Figure 40). Overall, perceptions appeared largely similar across countries, with limited differences emerging (Figure 41).

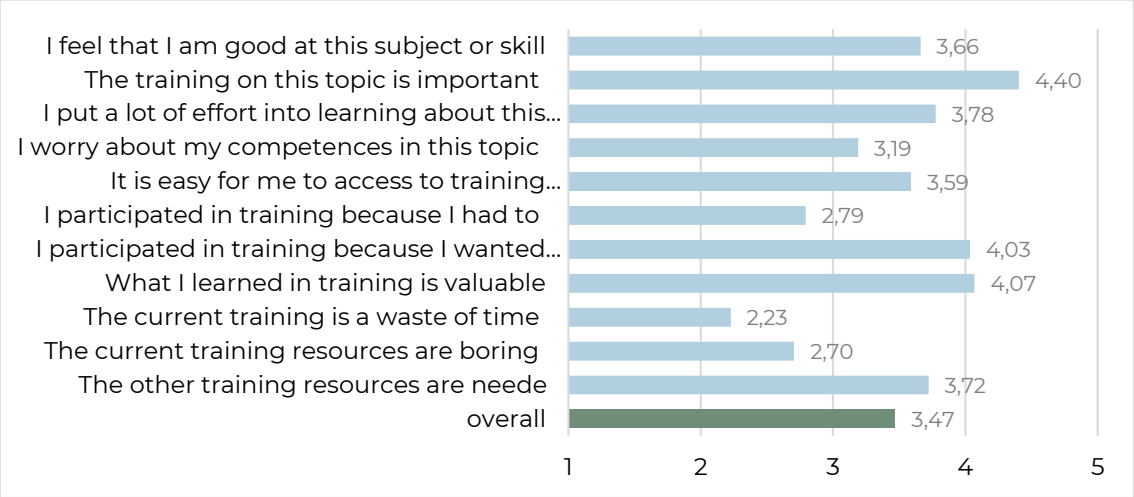


Figure 40. Mean scores of items related to perceptions of training on PPPs.

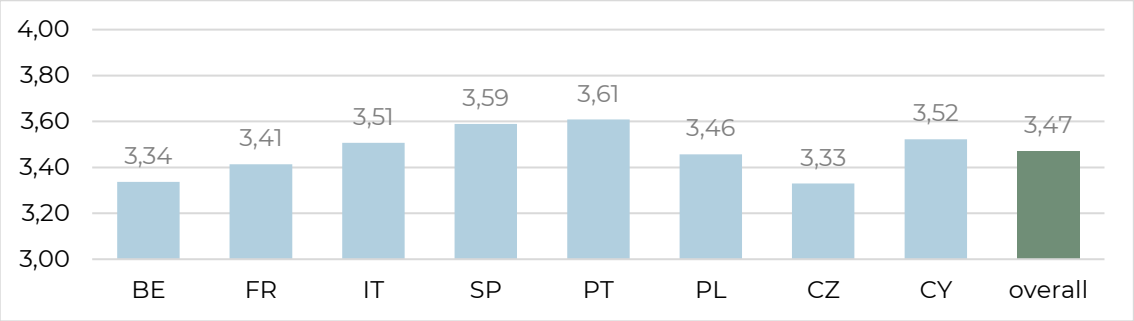


Figure 41. Cross-country comparison of mean perception scores.

The differences across user groups for this section are presented in Figure 42. Expectations toward the RENOVATE platform appear consistently positive across all categories, with young women farmers reporting the highest levels. Self-perceived knowledge remains moderate across groups, with limited variation, suggesting a relatively homogeneous perception of existing competences among user categories.

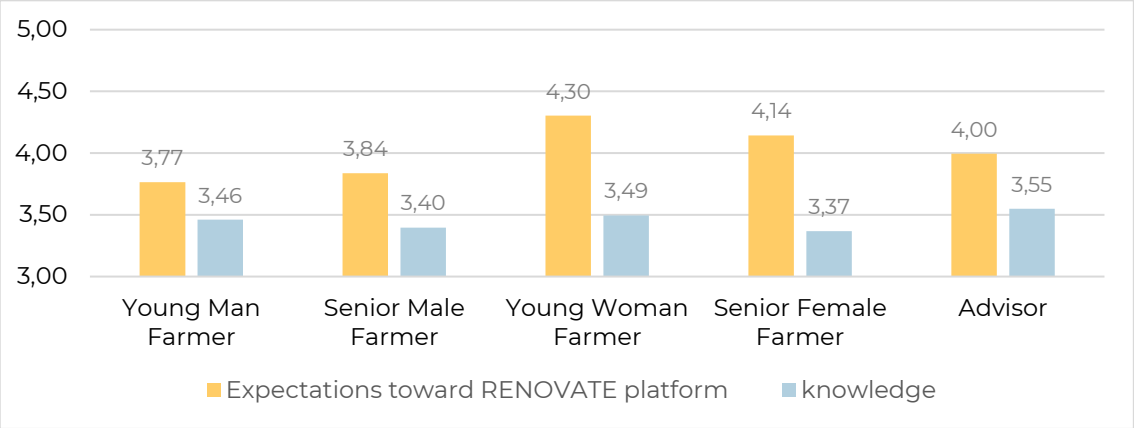


Figure 42. Cross-country comparison of mean perception scores

Section 4: Personality traits (ANNEX 5)

Descriptive statistics were computed for each item. In addition, for each of the **five personality traits (openness to experience, consciousness, extraversion, agreeableness and emotional stability**, Figures 43 and 44) a score was calculated as the mean of two corresponding items (see Annex 5). The highest mean scores were observed for Conscientiousness and Openness to Experience, suggesting that participants generally perceive themselves as reliable, disciplined, and receptive to new ideas and approaches. **These dimensions can be also associated with respondents effective perception on learning and adaptability and openness to new training platform.**

By contrast, the lowest score emerged for Emotional Stability, highlighting a tendency toward lower stress tolerance and greater emotional reactivity. This result may suggest that, while respondents demonstrate openness and conscientiousness, they might simultaneously experience difficulties in coping with the pressures typically associated with agricultural work and the

increasing regulatory demands on pesticide use. Such challenges could influence both their learning processes and their capacity to adapt effectively to evolving professional requirements.

Overall, the personality profile emerging from the data suggests that users are generally reliable, disciplined and open to new experiences, characteristics that may facilitate the adoption of innovative and gamified training solutions. However, the comparatively lower levels of emotional stability indicate that training approaches should remain clear, supportive and not overly complex, in order to avoid cognitive overload and sustain user confidence.

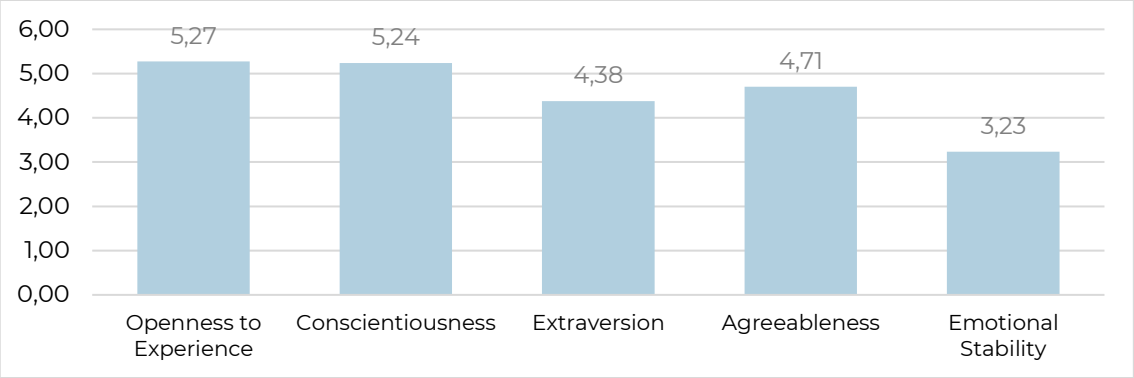


Figure 43. Mean scores for the five personality traits.

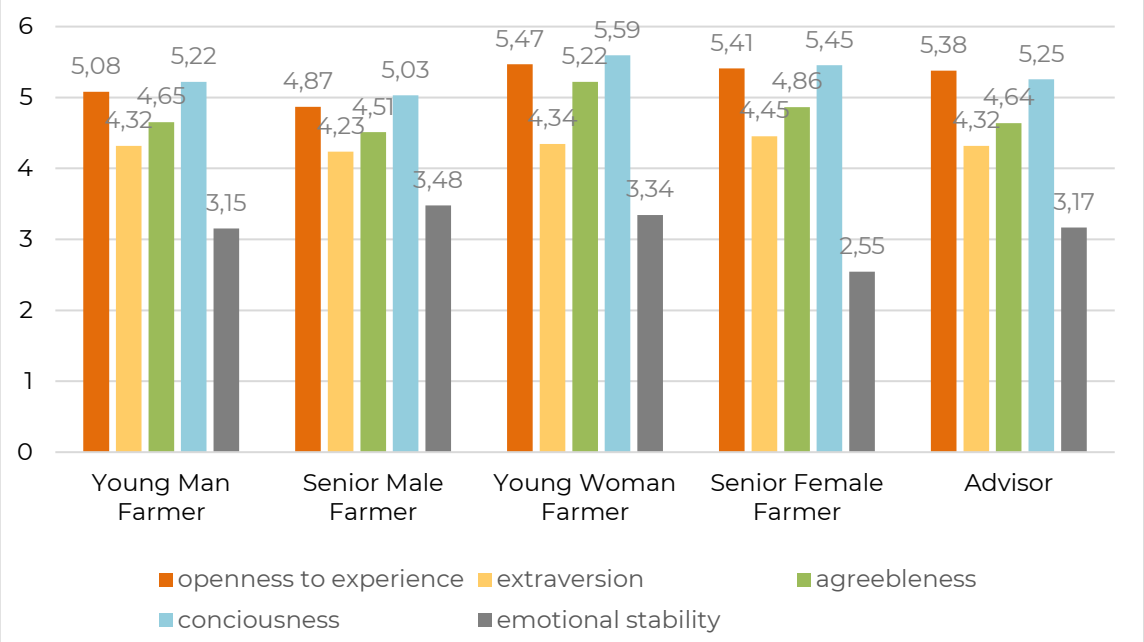


Figure 44. Mean scores for the five personality traits across user groups.

Recommendations

The conducted survey research deepens the understanding of the digital skill levels of potential users of the RENOVATE platform, providing a solid empirical foundation for tailoring platform functionalities and gamification mechanisms to users' actual capabilities and expectations. Context-specific insights into users' digital competences were used to formulate recommendations for the design of the RENOVATE digital training platform.

1. **Base design decisions on users' digital literacy profile.**
   Platform features and gamification mechanics should be calibrated to the demonstrated digital autonomy of users, while addressing weaker areas such as critical evaluation of online information.
2. **Prioritize practical regulatory and operational content.**
   Training tools should focus strongly on PPP regulations and real-life farm application scenarios, aligning with users' highest knowledge expectations.
3. **Adopt a mobile-first but cross-device compatible approach.**
   While smartphones should be the primary design reference, seamless functionality on computers must be ensured to maximize accessibility across user groups.
4. **Implement diverse and flexible gamification formats.**
   Considering generational and gender differences in gaming familiarity and preferences, the platform should include flexible game formats by combining simulation-based, strategy-oriented, quiz-based, and mission-driven mechanics.
5. **Emphasize realistic simulations and decision-based scenarios.**
   Interactive farm cases, planning exercises, and consequence-based tasks should replace passive content delivery to enhance engagement and applied learning.
6. **Maintain moderate difficulty with adaptive progression.**
   Challenges should start at a medium level and dynamically adjust according to user profile and progress, ensuring both inclusiveness and sustained motivation.
7. **Structure learning as progressive competence development.**
   Content should follow a clear advancement pathway that gradually builds mastery, reinforcing confidence among users with moderate self-perceived knowledge.
8. **Design short, modular, and goal-oriented sessions.**
   Learning units should be concise (e.g., 15–30 minutes), allowing effective engagement within limited time windows and supporting regular, weekly use.
9. **Provide clear, transparent, and constructive feedback.**
   The system should deliver explicit explanations of decisions, errors, and correct solutions to strengthen users' confidence in evaluating feedback quality.
10. **Support generational differences with optional guidance tools.**
    Tutorials, hints, and simplified navigation should be available for senior or less digitally confident users without constraining more experienced participants.
11. **Ensure interface clarity and low cognitive load.**
    The design should remain intuitive, visually clear, and free from unnecessary complexity to avoid overload and sustain user confidence.
12. **Avoid overemphasis on complex customization features.**
    Given limited interest in avatars and personalization, development efforts should prioritize core learning functionality over aesthetic customization.

13. **Integrate critical information literacy training.**
    Specific exercises should help users assess the reliability of PPP-related information sources, addressing a documented competence gap.
14. **Clearly link learning outcomes to farm productivity and compliance benefits.**
    Scenarios and feedback should explicitly demonstrate how acquired knowledge improves efficiency, regulatory compliance, and overall farm performance.
15. **Encourage sustained but non-intensive engagement.**
    The platform should promote periodic challenges, updates, or milestones that foster regular use without requiring high daily time commitment.

Literature

Ziegenfuss, Jeanette Y., Casey A. Easterday, Jennifer M. Dinh, Meghan M. JaKa, Thomas E. Kottke, and Marna Canterbury. 2021. “Impact of Demographic Survey Questions on Response Rate and Measurement: A Randomized Experiment.” Survey Practice 14 (1).

Gosling, S. D., Rentfrow, P. J., & Swann, W. B., Jr. (2003). A Very Brief Measure of the Big Five Personality Domains. Journal of Research in Personality, 37, 504-528

REGULATION (EU) 2021/2115 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 2 December 2021 establishing rules on support for strategic plans to be drawn up by Member States under the common agricultural policy (CAP Strategic Plans) and financed by the European Agricultural Guarantee Fund (EAGF) and by the European Agricultural Fund for Rural Development (EAFRD) and repealing Regulations (EU) No 1305/2013 and (EU) No 1307/2013. 6.12.2021, Official Journal of the European Union, L 435/1.

ANNEXES

ANNEX 1: Digital device literacy

Please, indicate the extent to which the following statements are true for you (1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree)

Communication
- 1. I can easily read online contents from screen
- 2. I can send any file to a contact using a smartphone

Confidence
- 3. I am capable of learning how use digital devices (computers/smartphone/tablet) without difficulty
- 4. I am confident I can use a digital device to manage my daily matters
- 5. I can bookmark a website I like so I can view it later

Informational skills
- 6. I find hard to decide what the best keywords are for online searching
- 7. I get tired when looking for information online
- 8. Determine if the information I find online is reliable

Technological skills
- 9. I can easily download a photo/document I found online
- 10. I can easily upload a photo/document I found online
- 11. If I want to install new programs on my smartphone, I will ask someone to do it for me because I don't know

Learning
- 12. I like taking courses that use computers/smartphone
- 13. Learning to use computers is helpful to my future work

Technological skills at work
- 14. It is comfortable for me use smartphone apps for my work activities
- 15. It is easy for me use smartphone apps for my work activities
- 16. I think that I could easily learn how to use smartphone apps for my work activities

What devices do you have at home? (Check all that apply) (coded as YES or NO)
- Computer
- Phone
- Tablet
- Game console
- Other

Daily use duration: (coded from 1 to 5)
- 1 to 30 minutes
- 30 min. - 1 hour
- 1 - 2 hours
- 2 - 3 hours
- more than 3 hours

Do you use a smartphone/computer for farming activities at work? (coded from 0 to 4)
- never
- rarely
- sometimes
- very often
- always

Indicate the time spent in using work related app (coded from 0 to 4)
- Never used
- Less than once a week
- Once a week
- Daily
- More times per day

ANNEX 2: Video games use and perception

Do you play video-games (any kind)? (coded from 0 to 5)
- Never
- I did play in the past but not any more
- Yes, weekly
- yes, 2-3 days per week
- yes, daily
- yes, more times per day

If YES, what types of games do you play? (Check all that apply) (coded as YES or NO)
- Action
- Adventure
- Simulation
- Strategy
- Party game
- Fitness
- Sport
- Driving/racing
- Quiz
- Strategy/puzzle
- Management
- Story-based
- other

On which device do you usually play? (Check all that apply) (coded as YES or NO)
- Computer
- Phone
- Tablet
- Game console
- Other

Indicate the daily mobile phone use duration for play games (coded from 1 to 5)
- 1 to 30 minutes
- 30 min. - 1 hour
- 1 - 2 hours
- 2 - 3 hours
- more than 3 hours

Preferred game difficulty:
- easy
- moderate
- difficult

Indicate the extent to which the following statements are true for you thinking about games to provide attractive training resources (1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree)
- 1. I believe I can learn the commands of the game immediately, without reading the instructions
- 2. I believe I can perform basic operations such as saving and loading
- 3. I believe I can play mobile games easily
- 4. I enjoy using avatars, creating profiles, customizing characters, or otherwise
- 5. Using games is a good way to learn
- 6. I am able to assess the quality of the information and feedback I receive from games
- 7. Inputs, meters, points, and other in-game sources of information that games present are useful features to increase motivation to play
- 8. I am interested in solving quests/questions/missions in games with the aim to learn

ANNEX 3: User expectation and motivational profile

Indicate the extent to which the following statements are true for you when you think about the RENOVATE platform (1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree)

Expectancy for skills growth

- 1. Playing the Renovate games, I expect to learn the best practices for applying PPP
- 2. I expect to learn the specifications regarding the dosage on labels
- 3. I expect to deepen my knowledge of the regulations on the application of PPP
- 4. I expect to learn challenges/barriers/opportunities on PPP optimal use
- 5. The digital platform would be useful to carry out my farm tasks
- 6. Using a digital platform would make it possible to carry out farm tasks faster than before
- 7. The use of a digital platform would make my farm more productive

Indicate the extent to which the following statements are true for you when you think about the RENOVATE platform (1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree)

Perceived Competence

- 1. I feel that I am good at this subject or skill

Importance

- 2. I think that training on this topic is important (0-totally disagree- 5 totally agree)
- 3. I put a lot of effort into learning about this topic

Pressure

- 4. I worry about my competences in this topic

Accessibility /usefulness

- 5. I think that it is easy for me to access to training resources
- 6. I participated in training because I had to
- 7. I participated in training because I wanted to
- 8. I believe what I learned in training is valuable
- 9. I think that current training is a waste of time
- 10. I think that current training resources are boring
- 11. I think that other training resources are needed

Others (open question)

- What topic/skill are you the most interested in training ….

ANNEX 4: User personality traits

Please rate how much you agree or disagree with the following statements on a scale from 1 (Strongly Disagree) to 7 (Strongly Agree). (1=Disagree strongly, 2=Disagree moderately, 3=Disagree a little, 4=Neither agree nor disagree, 5=Agree a little, 6=Agree moderately, 7=Agree strongly)

Openness to experience	I see myself as **open to new experiences, complex.**
	I see myself as **conventional, uncreative.** (*Reversed*)
Conscientiousness	I see myself as **dependable, self-disciplined.**
	I see myself as **disorganized, careless.** (*Reversed)*
Extraversion	I see myself as **extraverted, enthusiastic.**
	I see myself as **reserved, quiet.** (*Reversed*)
Agreeableness	I see myself as **sympathetic, warm.**
	I see myself as **critical, quarrelsome.** (*Reversed*)
Emotional stability	I see myself as **anxious, easily upset.**
	I see myself as **calm, emotionally stable.** (*Reversed*)

ANNEX 5: SOCIO-Demographic profile

- **work country**
- **gender**
- **age**
- **level of studies:**
  - primary
  - secondary
  - high school
  - university
  - post-degree
- **type of crop** (olive, vineyards…)
- **Profession:** contracted, proprietary, farmers,
- **years of experience**
- **job description in relation to pesticides spraying**
  - planning
  - managing (storage, transportation)
  - spraying
  - cleaning
  - other