



Deliverable 3.7: Report on identified policy gaps and policy briefs

**Accelerating Innovative practices for
Spraying Equipment, Training and
Advising in European agriculture.**



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Abstract

This deliverable proposes Policy Gaps and related Solutions drawn by INNOSETA Thematic Network as a result of more than 3 years of project implementation. Different project deliverables and outcomes have been integrated to produce this report that complements and completes the results of the Policy Recommendations, as presented in deliverable D3.6. The knowledge thereby generated has been integrated with the information gathered through the project Hubs and real Testimonials. As a result, the policy gaps and policy briefs are structured following a thematic approach that aims at covering the most relevant areas for policy development for the adoption and uptake of innovative spraying equipment by end users, particularly farmers. The main recommendations are also summed up in the Policy Briefs, highlighting the most important information to be used for dissemination purposes.

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1 Introduction:

INNOSETA is a Thematic Network funded by the European Commission in the frame of the Horizon 2020 program for Research and Innovation. The main objective of INNOSETA is to set up an Innovative self-sustainable Thematic Network on Spraying Equipment, Training and Advising to contribute in closing the gap between the available novel high-end crop protection solutions -either commercial or from applicable research results- with the everyday European agricultural practices.

Running for 42 months, INNOSETA is fostering the effective exchange between research, industry, extension and the farming community so that direct applicable research and commercial solutions are widely disseminated and grassroots level needs and innovative ideas thoroughly captured.

INNOSETA follows the EIP-AGRI “multi-actor approach”, implementing an interactive innovation model, for engaging with different stakeholders within and outside the project at regional, national and European level. Through its different activities, the project has gathered insights on the barriers and incentives for the adoption and better uptake of Innovative Spraying Equipment, Training and Advising (SETAs) as well as on the needs from end-users and other stakeholders in the value chain, such as researchers, industry and advisors. These findings have allowed the INNOSETA consortium to produce a set of recommendations for closing the research and innovation divide in the field of SETAs in Europe, which are presented in this Deliverable. Being one of the central outcomes of INNOSETA, the recommendations have also been drafted in the form of fact-sheets, policy briefs, easily readable documents for wide dissemination among end users and stakeholders.

The Deliverable is divided into six Chapters:

Chapter 1 – Introduction: Basic information on project has been provided in this chapter together with the project aim and objective.

Chapter 2 - The methodology used to prepare this report, implementing an interactive innovation model, for engaging with different stakeholders within and outside the project. The methodology, carried out for preparing the Policy Gaps and Briefs, is complementary to the one used to draft the Policy Recommendations and is thereby built on the outcomes of the project’s different activities and tasks. The knowledge already collected and analyzed during the project lifetime has been integrated with the information gathered through the INNOSETA Hubs and real Testimonials, included in this deliverable.

Chapter 3 – This chapter summarizes the outcomes of the regional and transnational workshops realized during the project lifetime that have been used to identify several policy gaps on Hub and EU level, which should be addressed by the future Common Agricultural Policy, Sustainable Use Directive, existing NLF legislation like the Machinery Product Regulation and upcoming legal initiatives in relation to establishing a digital Europe. Solutions to these gaps have been proposed through support to access innovative spraying solutions or supporting farmers’ investment in new technologies through the CAP Second Pillar. Together with lifelong learning, research and innovation as support strategies for boosting agricultural innovation stressing out the importance of advisers, continuous education and training, the important role of demonstration in the farmers learning processes.

Chapter 4 – Policy overview and identified policy issues on the INNOSETA Hubs level: This chapter summarizes the results of the data collection on INNOSETA Hubs level in order to determine the policy barriers on EU, National and Regional Level that prevents better uptake of the innovative spraying equipment by end users.

Chapter 5 - Summary with main conclusions and recommendations in relation to European policies: This chapter summarizes the results of this study highlighting at the same time identified policy gaps and recommendations for policy makers.

Chapter 6 – Policy briefs: The set of policies are described in this deliverable. The briefs sum up policies with dissemination purposes. All in all, you will find 7 policy briefs in this chapter.

2 Methodology:

2.1 Integration of the project's results

INNOSETA follows the EIP-AGRI “multi-actor approach”, implementing an interactive innovation model, for engaging with different stakeholders within and outside the project. The latter has implemented a bottom-up approach, integrating information gathered through surveys and workshops at the grassroots level in the project's seven Regional Innovation Hubs. The methodology carried out for preparing the Policy Gaps and Briefs is complementary to the one used to draft the Policy Recommendations (INNOSETA deliverable 3.6, October 2021) and is thereby built on the outcomes of the project's different activities and tasks, particularly outcomes of the Regional and Transnational workshops (D3.3 and 3.4.).

Different project outcomes have been integrated for the production of both recommendations and the policy briefs. Regarding production of the Policy Gaps and Briefs presented in this report, the knowledge already collected and analyzed during the project lifetime has been integrated with the information gathered from the INNOSETA Hubs and other partners.

2.2 The INNOSETA Hubs policy data and testimonials collection

During the online meeting with project Partners held in October 2020, policy data collection was presented. This template for existing POLICY collection and identification of policy gaps on EU and Hubs Level served as an initial data collection action comprising overview of the existing policies on EU, national and regional level per INNOSETA relevant topic (results of the exercise per Hubs contribution summarized under section 4.2. – 4.11.). Hubs Leaders were additionally asked to link existing policies listed in the data collection template with the identified policy gap(s). Such template has been developed in agreement with the project partner ECPA (task co-leader), the project partner IFV (Work Package leader) and the project coordinator, UPC.

Additionally, partners were asked to provide info on more specific aspects when it comes to practice and barriers that technology users are facing while implementing innovative spraying technologies and practices. The main idea behind the testimonials is as follows and the outcomes of this action have been presented in Annex of this document:

a) Objectives

This initiative aimed at contributing to **Deliverable: Report on identified policy gaps and policy briefs** (Responsible CEMA, M36): A review report for the identification of the policy gaps to be used as input to policy briefs. A series of 7 policy briefs will be developed containing two or three key messages which can be easily and quickly grasped by the target group in each case.

Policies were reviewed in terms of their **encouragement – or discouragement – of innovation and use of SETAs and the actual uptake of these innovations in practice**. Based on the findings, the project partners will seek to identify potential gaps and produce dedicated policy briefs with specific suggestions.

b) Target group:

This template targets **Project Partners** and, in particular, **Hubs' leaders**.

Each Hub Leader was asked to collect at least one (and maximum three) example(s) of policy testimonial (one policy testimonial per template) and return this form filled to CEMA.

The template was structured to have some short discussions/ interviews with external experts and stakeholders (policy makers, policy implementation body, and beneficiaries of the measures, such as in particular farmers) that have/ had a role in the planning/ implementation/ evaluation of the selected policy measure(s). Partners were encouraged to provide examples according to their own experience. They were meant to focus either on successful stories (concrete examples of one/ more of such policy measures that have effectively addressed the challenges while supporting innovative spraying equipment adoption) or failure ones (policy measures that have failed addressing the challenges and/ or supporting innovative spraying equipment adoption), explaining the factors featuring “success” or “failure”.

Partners, were also encouraged to involve external stakeholders in the survey in order to gather more and valuable information on the existing policy measures that have been supporting (or not) innovative SETA adoption.

c) Testimonials template:

Testimonials template	
<p>In this template, we kindly ask you to provide more information about the selected policy gaps already highlighted in the initial excel file sent by each Hub. The idea behind this exercise is to provide more detailed insight on how the identified policy gap(s) is affecting present practices of SETA and better adoption of innovative spraying technologies. Each Hub Leader, from your position as research institute, farmer association or academia, is kindly asked to provide one to maximum three of these testimonials.</p>	
1. Basic information	<i>Name of the Partner</i>
2. Policy	<i>Please provide more information on the policy measure outlined here (info from the excel file, insert link if available)</i>
3. Policy issue(s) experienced NOTE: Please indicate details such as crop type and thematic already identified on the INNOSETA level	<i>Please specify problem and/or challenge occurred in practice and implementation of the existing policy and back it up with some concrete examples. What was the effect of the identified policy gap(s) in terms of practical application and potentially environmental impact?</i>
4. Who are the actors involved?	<i>Please specify the group that faced this problem (e.g. farmers, advisors, researchers, agricultural contractors etc.)</i>
5. Recommendation(s) for policy makers	<i>Please specify the recommendation(s) that would help overcome existing policy barrier(s) when it comes to more efficient uptake of innovative SETAs and implementation of advanced technologies.</i>
6. Any additional comments or support information (factsheets, videos, pictures, presentations, news, etc.)	

7. Sources	<i>Please indicate eventual sources (online, publications, etc.) and/ or contacts you have involved to fill this template.</i>
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2.2.1. Objectives of the INNOSETA Hubs Testimonials

Information gathered through the template aimed at contributing to D3.7. Report on identified policy gaps and policy briefs: a review report for the identification of the policy gaps to be used as input to policy briefs. In particular, policies were reviewed in terms of their encouragement – or discouragement – of innovation and use of innovative spraying technology and the actual uptake of these innovations in practice. Based on the findings, the report seeks to identify potential gaps (chapters 3 and 4) and produce dedicated policy briefs (chapter 6) with specific suggestions and expected impact.

3 Overview of the policy gaps and suggested recommendations as result of INNOSETA Regional and Transnational workshops

The following section summarizes the main policy aspects collected during the Regional Workshops (D3.3) and highlighted during the Transnational workshops (D3.4) needs to be further addressed.

3.1 Priorities for future European policies and calls for projects based on the outcomes of Regional workshops (RWs)

In the framework INNOSETA thematic network 17 workshops were organized across Europe on issues related to the appropriation of spraying innovations by farmers. The objective of these workshops, which gathered a total of 850 people, was to foster exchanges between the various stakeholders (sprayer manufacturers, PPP companies, authorities, advisors, farmers' representatives, researchers, etc.) in a multi-actor approach, address issues related to the dissemination of innovation and to identify ways to improve farmers' uptake of innovative spraying technologies. Each workshop was organized as a technical day combining demonstrations of innovations with interactive discussions (details on the organization of the RWs can be found in INNOSETA D3.3). Sections 3.1.1. – 3.1.4 of this report highlight the main issues discussed and raised during the Regional Workshops (RW), organized on the Hub level covering Italy, Spain, Greece, Sweden, Belgium/Netherlands, France and Poland, focusing different crop types (field crops, greenhouses, vineyards and orchards).

The purpose of RWs was to bring together the relevant stakeholders and to take advantage of the multiplicity of their expertise to identify which innovations are the most relevant to meet the challenges of the sector. The objectives were also to:

- Identify the ways to promote the development of these innovations and their dissemination,
- Identify needs not covered by current available SETAs solutions,
- Identify policy gaps and produce recommendations and policy briefs for EU policy-makers.

3.1.1. Regional Workshops about spraying in Greenhouses

1. **Overcome the economic barrier for the purchase of new spraying technologies:**
Additional funds from national projects that will lead to lower costs for the acquisition of new technologies. Establishing national programs and subsidies to finance the purchase of expensive precision spraying machinery will help farmers to invest in new spraying technologies.
2. **Provide more trainings to the agricultural community:**

Trainings should be provided to all types of agricultural stakeholders: farmers, advisors, students, sprayer manufacturers and PPP distributors. For instance, seminars, workshops and demonstrations about spraying technologies and about PPE are important to promote.

Additional highlights also mentioned other priorities for European policies and calls for projects during the workshops:

- Conduct research and development for more comfortable and ergonomic PPE;
- Encourage research and development processes of new SETAs in collaboration with farmers, so the equipment developed will meet their needs. In other words, develop new technologies based on the farmer's needs;
- Develop software that will inform farmers for upcoming plant diseases or already detected diseases in neighbouring areas at an early stage;
- Combine calibration processes with mobile applications (add the functionality of calibration at the existing applications);
- Fund projects for the development of public facilities that allow farmers to safely prepare the PPP mixing and the remnants management to reduce point source pollution, when applicable.

3.1.2. Regional Workshops about spraying in Vineyards

At the level of public policy priorities, participants underlined the need to **encourage and promote the renewal of the sprayer fleet** towards more efficient machines and to support this transition with **purchase subsidies**. **Older equipment that generates drift and have a low spraying quality should be improved with more environmentally friendly retrofitting technologies when possible or removed from the market.**

It is important to help and inform winegrowers when they buy a new spraying equipment (e.g. provide a decision support tool), so they can have all the essential information before making a choice. **The orientation of subsidies** and the evolution of the **sprayer fleet** should be **based on their general environmental performance, considering both point sources and diffuse source contamination aspects.**

An example in terms of spray quality and diffuse sources evaluation is the one proposed in France by PERFORMANCE PULVÉ® (<http://www.performancepulve.fr/>).

The sprayer ratings given by the PERFORMANCE PULVÉ® labelling system is based on the results of sprayer tests carried out on the EvaSprayViti test bench, an artificial vine that ensures the standardization of spray tests. The quality of spraying is assessed by measuring the quantity of product deposits on the vine and their distribution within the vegetation. A classification of sprayers that would integrate additionally the performance in terms of drift reduction potential remains to be developed to (i) provide growers with comprehensive information on the performance of the sprayer they buy and /or use (ii) to direct subsidies to the most efficient sprayers.

In addition, national plans and European Rural Development Plans should also include economic incentives to facilitate and encourage the purchase of useful tools such as induction hoppers that could be retrofitted to the PAE in use in several case.

It is also necessary to give growers the possibility to control the quality of spraying by the monitoring of application parameters in real time during application. Most sprayers used in vineyards and orchards are in many case still just fitted with one single sensor which is a conventional manometer fitted on the sprayer in a position not always easy readable from the cab. The knowledge of the operating pressure value is instead of priority importance as of those of the other relevant parameters for controlling the accuracy of spray application which are: (i) the volume rate (l/ha), (ii) the flow rate of the nozzles on the different sections of the sprayer (l/min), (iii) the forward speed (km/h) (iv) the air fan flow rate and speed. **A control systems** that allow to display **and trace** the

relevant spraying parameters should become mandatory on each sprayer in Europe **in order to improve and monitor the** spraying operations.

Another point that was highlighted during the discussions is to set up a "**mandatory and periodic advice and control**" at farm level about good PPP management practices and ways to limit point sources pollution (filling, mixing, rinsing, remnants treatment, etc.). This measure could be coupled to a **certain number of trainings courses** that each farmer would have to follow, for a fixed period of time, about the environmental importance of the point sources pollution and the possible technologies and solutions to prevent it. However, a financial support to farmers would be needed to attend these training sessions.

The **subject of drift and the impact of PPP on the environment and population** is actually particularly sensitive in several European countries. There is a growing tension that can be observed between farmers and local residents. Consequently, there is a need to **increase communication**, based on a variety of tools: neighborhood charter, information meeting with local residents, alerts to inform population when neighboring winegrowers spray their vineyards, etc. Participants also mentioned the following solutions to reduce drift and ease the tensions between stakeholders:

- Encourage use of high-performance sprayers and devices to reduce drift near sensitive areas (rivers, homes);
- Raise awareness among farmers with periodic trainings about the importance of the consequences of the drift phenomenon on human health, environment, etc. Make practical demonstrations of technologies/practices that can reduce drift (e.g. anti-drift nozzles);
- Promote resistant varieties of vine, as drift is related to the need of numerous treatments in vineyard;
- Set minimal drift reduction requirements for all new sprayers produced.

Finally, participants mentioned several times the need to **harmonise technical requirements, minimum criteria and practices at the European level**:

- Promote the exchange of information about the training of agricultural technicians throughout Europe in order to compare and, above all, to improve and harmonize the training courses provided;
- Improve standardize regulations regarding PPP application and sprayers requirements between all European countries;
- Harmonize drift reduction classification schemes mandatory size at European level;

Promote the exchange of information related to good practices that reduce drift (regulation, practices and technologies) from one European country to another to implement these measures in countries where they are lacking.

3.1.3. Regional Workshops about spraying in Orchards

At the level of public policy priorities, the theme of **training courses** was raised again. According to the participants, it would be necessary to provide support for training at all levels: farmers, advisors, distribution networks, higher education (university), etc. Moreover, good practices for drift reduction should be included in the training courses on a mandatory basis. adjustment

In addition, an element previously identified as a challenge was mentioned again: the need to improve the **harmonisation of European requirements** in order to facilitate the adoption of appropriate technologies by the farmers. A priority is an harmonized classification of drift-reduction at EU level. A first step for encourage farmers to reduce drift would be to promote the use of air induction nozzles as mandatory at EU level.

Another action at European level should be implemented: establish a reference framework in terms of training about spraying. Again, on the theme of training, it would be appropriate to create a

platform as the INNOSETA one to exchange knowledge about good practices at EU level that would serve as a repertory of existing training materials. Indeed, a lack has been identified concerning access to good practice guides, as several are drawn up by chambers of agriculture, technical institutes, manufacturers, firms, etc., and difficulty to find.

Concerning the **mandatory periodic inspection of sprayers**, has been underlined that it is limited to check a certain number of parameters related to the functioning of the equipment (absence of leaks, balance of flow rates on the spray sides of the equipment, functionality of pressure gauges, etc.) but generally it does not take into account the equipment settings (choice of type and number of active nozzles, their orientation, air fan settings, etc.). It would be great to link the mandatory inspection with the **PAE adjustment** to the field conditions encountered by farmers. However, the problem identified is the lack of adviser qualified in this specific topic. A **technical reference framework about the correct sprayers adjustment** established in a concerted manner between the various stakeholders also appears necessary.

As for the viticulture area, the need to fit sprayers with control units was identified as a priority in 4 of the 6 countries Partners. Attendants stressed that spraying would gain in precision with the possibility of verifying the quality of spraying in real time during application by the monitoring of the application parameters. As mentioned for viticulture, most sprayers are insufficiently equipped (a single manometer) and do not make it possible to ensure the precision of the application. A real time monitoring systems (control panel displaying the different parameters) should become mandatory on each sprayer in Europe to facilitate spraying operations.

Finally, an important element that emerged from the discussions was the need to **reconnect society with the agricultural community** and to explain the important role of the agricultural service. For instance, some events could be organized according to the school program: a day of discovery of agricultural world, internships in agricultural environments, etc.

3.1.4. Regional Workshops about spraying in Field crops/Vegetables

The priorities for the future European policies stated by the participants were mostly about two main points.

1. **Overcome the economic barrier for the purchase of new/innovative spraying technologies:**
It is important to provide financial support to small farms and this could be based on the “environmental risk situation of the farm”. For instance, the risk of direct PPP contamination is higher if a farm is located close to vulnerable areas like watercourses, residential areas, high biodiversity area, etc. Financial support should also be focused on PAE filling and cleaning.
2. **Provide more trainings to the agricultural community:**
It is essential to provide more trainings to farmers, agricultural technicians, sprayer controllers, sprayer manufacturers on proper sprayer adjustment, ways to reduce drift, precision spraying, etc. It was also mentioned several times that there is a need to better train agricultural trainers on the specific technical aspects of spraying. It would also be necessary to improve the content of training courses in relation to spraying aspects as it is almost absent today; The importance of communication and harmonization of agricultural education was stated several times. Moreover, it will be desired when a farmer buys a sprayer, he receives **training on the correct use and adjustment of his machine, but clearly distinguishing sprayer inspection from training.**

Four other public policy priorities were collected from participants:

- **Harmonize test methodologies and classification** for all European countries, as already mentioned. This harmonization would contribute to the dissemination of appropriate spraying technologies and good practices. For instance, it would be useful to harmonize the classification of drift reducing equipment across Europe because farmers and

advisors like to visit fairs and shows abroad to get good ideas. However, what they find is not always valid in all European countries;

- Launch a **communication campaign** among farmers, media and citizen where to present good spraying practices, such as the use of air injection nozzles. This communication campaign would also help to promote social acceptability of spraying practices;
- Improve buffer zone regulation with long term perspectives for the farmers, which also include new technologies in the **regulation**. In this way, farmers will not be afraid to invest innovations that would not meet legislation requirements in a few years. Participants are in favour for stricter enforcement of the legislation and a clearer communication about changes in legislation to the farmers. Some attendees also proposed to promote policing of use of drift reducing technologies. Technicians and farmers suggested to make mandatory the utilization of SETAs with significant impact on environment protection and on the operators' safety. In short, there is a need for more **control on the correct implementation of the present legislation**, as it is relevant to restate that are still sold or in use sprayers that do not completely fulfill the legislation requirements;
- Attendants, regardless to their profile (farmers, technicians etc.) considered relevant the opportunity to promote **international events** for the exchange of **good practices** between stakeholders from different European countries.

3.2 Priorities for future European policies and calls for projects summarized during the Transnational workshops

During the transnational workshop, the outcomes from 17 regional workshops, carried out at national level, were presented, and work was focused on the following 3 topics:

- Thematic 1 - Optimization of spray quality and application precision;
- Thematic 2 - Spray drift reduction;
- Thematic 3 - Prevention of point sources pollution – Environmental safety and operator health.

Sections 3.2.1 – 3.2.3 highlight the main priorities and issues, as well as promotion and policies for the EU presented during the Transnational workshop, while more information is available in project deliverable D3.4: Report from the transnational workshops.

3.2.1. Topic 1: Optimization of spray quality and application precision

FIELD CROPS: Priorities issues and challenges

- The cost of innovations: depending on the type of farm, some innovations are economically not feasible, which considerably hinders their adoption. Depending on the size and type of farm, packages of innovative tools and practices that do render the necessary cost-benefit, could be identified and promoted;
- Insufficient communication to the global society about farmers' work. Their work relative to the use of PPP is often miscommunicated to the general public and the communication is quite often negative. Part of this miscommunication is also due to the lack of reliable data and the availability of data on national but certainly on EU level.

FIELD CROPS: Promotion and policies for EU

- The need to provide more training to farmers on how to adjust and use their spraying equipment:
 - Such training courses should be coupled with demonstrations of SETAs such that farmers get in contact with novel technologies and practices;

- Special attention should focus on SETAs that allow further increase in the precision, efficacy and environmental risk control and monitoring aspects.
- Initiatives that optimize the use efficiency of such innovations through co-operatives or other forms of cooperation should be promoted;
- Training and good practice sharing/demonstration provide the necessary intelligence to farmers/contractors to make a well-balanced purchase, in addition to webtools like STEP-water;
- It is expected that with digitization, with cross-domain integration of stakeholders, 'proof by data' will gain in importance. It fits within the partnership 'Agriculture of Data' where data should help farmers to make better use, better decision based on monitoring of the application process. In parallel the resulting data can also be used to proof good practice. Initiatives that promote data sharing could provide solutions.

ORCHARD: Priorities issues and challenges

- The lack of information and practical training about how to adjust the sprayer (e.g. working modes regarding volume application rates, droplet sizes, etc.);
- Lack of dissemination of information about new existing technologies and the way they can be properly used;
- In terms of R&D: necessity to have devices that can be easily adjusted, either automatically or manually, to target the spraying on the plant as effectively as possible;
- The need to reconnect society with the agricultural community and to explain the important notion of agricultural service.

ORCHARD: Promotion and policies for EU

- In terms of public policy priorities, the importance of promoting training courses for farmers and advisers was raised: BMPs for spraying, drift reduction etc. should be included in the mandatory training courses;
- To ensure the development of canopy sensors for precision spraying based on Variable Rate Application, it is necessary to translate the information collected by the sensors into relevant dose modulation maps. Even though there was a consensus among the participants on the interest of having such tools in the long term, they also remark that the agronomic advantage is complex to evaluate, since the link with "agronomy" is missing. Consequently, R&D needs to be dedicated on the development of these prescription maps, which will become the basis for precision spraying in the future. Sensors to identify and characterize the canopy in canopy maps exist already. However more research to develop agronomic insight is needed to convert those canopy maps onto prescription maps and, as such, the amount of PPP to be applied;
- To reconnect society with the agricultural community and to explain the important notion of agricultural service, Organize events at school level: a day of discovery of agricultural world, internships in agricultural environments, etc;
- Establish a common charter at European or zonal level that would deal with guidelines for spraying practices, such as sprayer's calibration according to the type of crop, in order to have a common technical reference base;
- A technical reference framework on the correct sprayers adjustment agreed between the different stakeholders is needed at national and EU level.

VITICULTURE: Priorities issues and challenges

- Difficulty for operators to verify the quality of spraying with most of the sprayers currently used in vineyards (they are just fitted with a pressure gauge);
- Raise awareness of the importance of a proper sprayer adjustment and train operators (advisors, farmers, sprayer distributors, etc.) on sprayer calibration; It is crucial to raise

awareness among farmers about the fact that an appropriate spray distribution profile optimizes the PPP application in vineyards;

- Development of SETAs that increase the precision of PPP application so that it can be used by farmers with limited skill and training:
 - disease and canopy automatic detection;
 - prescription maps generation;
 - “smart” spraying systems that automatically adjust PPP dose and sprayer settings according to the canopy main characteristics without the operator's involvement.

VITICULTURE: Promotion and policies for EU

- Promote training courses covering very practical aspects under real field conditions to provide better information of the importance of adopting correct sprayer adjustment to maximize the effectiveness of crop protection and lower the risks of environmental contamination;
- Encourage winegrowers to acquire easy-to-use on-farm tools that would allow them to understand and visualize the spray distribution in the field;
- Field demonstrations organized by manufacturers are needed to make end-users aware of the SETAs sold on the market;
- Subsidies for the purchase of efficient sprayers based on their precision and their environmental performance should be offered to farmers;
- It is also necessary to give producers the possibility to control spraying quality in real time during treatment by the monitoring of spraying application parameters;
- Indeed, most sprayers used in viticulture are still fitted with only one sensor, which is a simple manometer located on the sprayer, far from the cab. A monitoring systems that display relevant spraying parameters in real time (Vol/ha, flowrate for each section, pressure, forward speed) should become mandatory on each sprayer in Europe to improve spraying operations.

GREENHOUSE: Priorities issues and challenges

- Lack of information and training about the correct use of spraying equipment and innovative technologies emerging on the market. Fill the knowledge gap by training about how to correctly adjust a sprayer because most of the operators do not calibrate their sprayer appropriately;
- Problem of the high cost of innovative technologies for farmers;
- Develop support tools for the calibration of sprayers;
- Develop robots performing automated operations. In an “ideal future greenhouse”, the entire process of scouting and pest control should be automatic.

GREENHOUSE: Promotion and policies for EU

- Provide more trainings to the agricultural community. All stakeholders need to be included: farmers, advisors, students, sprayer manufacturers and dealers, PPP distributors as well as policy makers and local authority;
- Agricultural advisors and universities should collaborate to develop training programs and seminars about sprayer calibration and pest and disease control at regional level;
- Importance of having tools to assess spraying quality and distribution before spraying – to be coupled with farmers training for a correct use;
- Offer more training courses to show operators how to correctly use SETAs;
- Research institutes, sprayer manufacturers and farmers should collaborate for carrying tests and experimentation of SETAs in commercial greenhouses under real conditions, which would help to convince users with objective data;

- Provide subsidies/funding /economic incentives to cover the acquisition cost of the most efficient SETAs would be an efficient way to promote innovation dissemination;
- Subsidies for the purchase of new spraying technologies;
- Sprayer manufacturers, research institutes/universities and national and regional authorities could also collaborate to develop the best calibration methodologies and technologies.

3.2.2. Topic 2: Spray drift reduction

FIELD CROPS: Priorities issues and challenges

- All participants agreed that drift reduction is a challenge of high priority to support environmental protection;
- Need to demonstrate and communicate to farmers, advisors, etc. that drift reducing technologies are effective in reducing drift without penalizing the quality of the application and bio-efficiency:
 - Promote nozzles or technologies, including combinations, with drift reduction of min. 75% and document the maximum bio-efficiency and what is practically achievable when using common spray volumes;
 - Need for and acceptance of alternative drift reducing techniques in addition to drift reducing nozzles which are 1. affordable (w/wo subsidies), 2. reliable, 3. user-friendly/fully automatic, 4. suitable for various crops and problems;
- Importance of clear communication about drift and drift reduction not only to farmers, but to all stakeholders and the general public.

FIELD CROPS: Promotion and policies for EU

- EU harmonize drift reduction classifications which nowadays differ between countries;
- Drift reduction (regulation & means for drift mitigation) issues should be included in the mandatory training courses that are followed by all professional users, advisors, trainers, etc.;
- Launch a communication campaign to farmers and the general public:
 - Present the spraying technologies that are currently in use and that will be adopted in the near future;
 - Good spraying practices, such as the use of air injection nozzles, should be explained;
 - This communication campaign would also help to promote social acceptability of PPP spraying.

ORCHARD and VINEYARDS: Priorities issues and challenges

- Differences in drift and buffer zone requirements between EU countries resulting in a lack of harmonization of technology classification and practices at EU level; In any case the requirements on buffer zones and drift will remain on national level but the classification of technologies used should be harmonized;
- Big variety of orchard and vineyard sprayers in use including a lot of sprayers not equipped with drift reducing equipment;
- Difficulties to adopt/apply drift regulations in the field;
- Lack of training courses for farmers & operators about spray drift, drift reducing technologies and practices and how to properly adjust a sprayer to reduce drift risk;
- Increase the social acceptability of PPP spraying.

ORCHARD and VINEYARDS: Promotion and policies for EU

- Adopt/plan a scrappage program for old sprayers, including on the disposal of contaminated materials, and promote (e.g. with purchase subsidies) the step-by-step renewal of the sprayer fleet towards more efficient machines;

- Harmonize EU drift classifications to facilitate the adoption of drift reducing technologies by farmers (e.g. harmonized classification of sprayers in terms of drift reduction potential, buffer zones, etc.);
- Include good practices for drift reduction in the EU mandatory training courses;
- Launch clear communication campaign towards society/neighborhood to improve social acceptability of PPP spraying (information meeting with residents, alerts to inform neighborhood before spraying);
- Improve the accessibility to EU training materials, good practice guides, e.g. ([INNOSETA platform](#), [TOPPS PROWADIS](#), [STEP-water](#)).

3.2.3. Topic 3: Prevention of point sources pollution - Environmental safety and operator health

FIELD CROPS: Priorities issues and challenges

- Improve training and dissemination of technologies useful to prevent point source also through television/internet.

FIELD CROPS: Promotion and policies for EU

- Promotion of closed transfer systems/induction hoppers.

ORCHARD: Priorities issues and challenges

- Use of personal protective equipment (PPE): Most of the operators do not use PPE because they find it uncomfortable. To expand their use, it is necessary to consider the needs of users. Research projects should take into account not only the ergonomic and technical aspect, but also the sociological aspect of PPE and their social acceptability (e.g. the colour of the PPE). It is therefore necessary to develop R&D on textiles, among other things to improve comfort, including the warmth felt when wearing equipment in summer;
- A decision support tool, to select the right PPE according to the spraying situation and the product used, could be developed by CROPLIFE Europe (European Crop Protection Association) and national associations such as UIPP in France (Union of Plant Protection Industries) or AGROFARMA in Italy.

ORCHARD: Promotion and policies for EU

- Promote or make mandatory the use of induction hoppers and or Closed Transfer System (CTS) – CTS ready sprayers for incorporation of liquid formulation of PPPs in to orchard sprayers as will be done in Denmark and in Netherlands in 2024;
- It would be interesting to better test and then promote the use of specific complexes able to neutralize the active ingredients that remain into the tank bottoms after a spray treatment;
- Develop micro-injection system (for apple, walnut, peach, etc.) in order to avoid the management of spray waste and make the operators safer.

VITICULTURE: Priorities issues and challenges

- Improve sprayers building conception in order to facilitate their cleaning and filling;
- Develop solutions for an easy and safe filling also with PPP powdery formulation;
- Develop solutions allowing precise measurement of the volume of water filled in the sprayer;
- Make induction hopper (PPP mixers) mandatory on sprayers;
Promote that PPP manufacturers make the PPP-containers CTS ready.

VITICULTURE: Promotion and policies for EU

- National Plans and European Rural Development Plans should also include economic incentives to facilitate and encourage the purchase of useful tools to prevent point sources contamination;

- Make a mandatory and periodic control at farm level of the correct PPP management practices including ways to limit point source pollution;
- Need to improve training on these specific aspects.

GREENHOUSE: Priorities issues and challenges

- Need to raise awareness on the protection of operators during their management of PPP and to develop new PPE (Personal Protective Equipment) that better suit the environmental conditions in greenhouses and are more ergonomic;
- The volumes of PPP packaging may be considerably smaller, the packaging units are too large especially when are used Low Volume Mist equipment that require dosage amount really low and therefore the user might spill liquid when filling;

4 Policy overview and identified policy issues on the INNOSETA Hubs level

An initial data collection exercise has been conducted among project partners in order to detect all relevant legislative on EU, national, regional and local level that have direct and/or indirect impact on the existing spraying technologies and practices, including policy gaps that needs to be addressed. Several topics of interest have been identified by project partners and addressed in chapters 4.1 – 4.11.

4.1 EU level legal framework and requirements for sprayers

There are two EU Directives with applies to application technology (AT). The first one is Machinery Directive 2006/42/EC amended by 2009/127/EC which sets the legal framework for new sprayers for placement on the EU market. How to fulfil the requirements of this directive are detailed in harmonised standards which are more less legally binding for every AT manufacturer (higher presumption of conformity). Following standard series are harmonised with the Machinery Directive: EN ISO [16119](#), EN ISO [16122](#), EN ISO [4254](#), EN ISO [19932](#) and EN ISO [28139](#).

The second one is Sustainable Use of Pesticide Directive (SUD) which aim to achieve a sustainable use of pesticides in the EU by reducing the risks and impacts of pesticide use on human health and the environment and promoting the use of Integrated Pest Management (IPM) and of alternative approaches or techniques, such as non-chemical alternatives to pesticides.

4.1.1. Directive on Sustainable Use of Pesticides (SUD) - Directive 2009/128/EC

The Sustainable Use Directive (SUD) focuses on the **use phase** of Plant Protection Products (PPP) and lists the following actions that Member States must undertake:

- Set up National Action Plans (NAPs) containing objectives and timetables to reduce risks and impacts of pesticide use;
 - The NAP also defines e.g. the National Drift Reduction Schemes (incl. drift reduction technology classification and buffer zones)
- Training: Professional pesticide users, distributors and advisors must receive proper training on the safe use and handling of Plant protection products (PPP);
- Establish competent authorities and certification systems for trainings;
- Minimize or prohibit PPP use where necessary in certain critical areas for environmental or health reasons;
- Inspecting application equipment in use: All PPP application equipment should have been inspected at least once by 2016 (except handheld equipment) and subsequently at ongoing intervals (3 years as of 2020).

The main actions relate to training of users, advisors and distributors of plant protective product (PPP), inspection of PPP application equipment, the prohibition of aerial spraying, limitation of pesticide use in sensitive areas, and information and awareness raising about pesticide risks.

Identified Policy gaps:

- a) Training of users are established in most member states. Formats of trainings vary between 3 h and several days. Reports suggest that training on application techniques (sprayer adjustment – especially for orchard and viticulture, Best management Practices for drift and point sources mitigation) and correct handling of PPP are very poorly developed and often absent from the programs.
- b) Trainings about correct use of PPP are mainly addressed to provide farmers with licenses for purchasing PPP but there is a lack of trainings about how to apply them in the field. **A specific license for PPP applicators established at EU level would be very useful to improve spraying techniques and to adopt good spraying practices.**
- c) Time for the first sprayer inspection varies strongly between 6 months (DE) and 3 years (EU mandatory) after first use among member states. Inspection methods vary and a more severe quality control should be established. Register of sprayers in use is only available in few countries while should become mandatory.
- d) Due the fact that not-harmonized National Action Plans (required by SUD) sets the conditions under which the PPP can be applied incl. the definition of drift reduction classes and conditions of the national certification procedure for these technologies **are not harmonized** across EU.

If an harmonization will be achieved it will contribute to faster uptake of new technologies due to lower administration burden for MS and manufacturers (one test, one certificate & **mutual recognition**). The harmonization of DR classes will achieve easier understanding of the classification scheme for farmers and control authorities.

- e) Need to harmonize mandatory inspection of sprayers in use in Europe: according 128/2009/EC Directive, all the sprayers in EU should be inspected at least once by December 2016. However, five years over deadline only very few EU MS have been able to reach the targets. In most of the EU countries the number of sprayers already inspected is too low and far from the objective.

4.1.2. Machinery Directive (Directive 2006/42/EC amd. by 2009/127/EC) and its Harmonized Standards

One of the main legislations governing the harmonization of essential health and safety requirements for machinery at EU level is the [Machinery Directive 2006/42/EC](#). The directive:

- promotes the **free movement of machinery within the single market;**
- guarantees a **high level of protection for EU workers and citizens.**

Sprayer manufacturers selling sprayers in the EU market are requested to provide a risk assessment for the sprayer covering operator and environmental risks based on the Machinery Directive and using the harmonized standard if so desired and which provides them a higher presumption of conformity. Sprayer manufacturers are responsible for certifying (by means of self-certification) that the machinery complies with the relevant requirements, and may then apply the official CE label to the sprayer. It must be stressed that the Machinery Directive also mandates the necessary quality assurance testing, to ensure that the product performance remains intact under all phases of its useful life, which includes production, transport and assembly. It is the manufacturer's responsibility

to ensure proper alignment with the legal requirements and harmonized standards and proper functioning at entry into service.

The manufacturer of machinery for pesticide application must ensure that an **assessment is carried out of the risks of unintended exposure of the environment to pesticides**. Machinery for pesticide application should be designed and constructed taking into account the results of the risk assessment, so that the machinery can be operated, adjusted and maintained without unintended exposure of the environment to pesticides. Leakage must be prevented at all times.

The Machinery Directive amendment defines specific requirements for crop protection machinery concerning the **protection of the environment**. Machinery for pesticide application must be designed and constructed such that the machinery can be operated, adjusted and maintained without unintended exposure of the environment to pesticides, and the following relevant requirements are laid down in the Directive. Each area mentioned is potentially an area for innovations.

Essential Requirements Applied by the Machinery Directive to Application Equipment

a) *Controls and Monitoring*

It must be possible to easily and accurately control, monitor and immediately stop the pesticide application from the operating positions.

b) *Filling and Emptying*

The machinery must be designed to facilitate precise filling with the necessary quantity of pesticide and to ensure easy and complete emptying.

c) *Application rate*

The machinery must be fitted with means of adjusting the application rate easily, accurately and reliably.

d) *Distribution, deposition and drift of pesticide*

The machinery must be fitted with means of easily adjusting the application rate; be designed to ensure that pesticide is deposited on target areas, to minimize losses to other areas and to prevent drift of pesticide to the environment. Where appropriate, an even distribution and homogeneous deposition must be ensured. The machinery must be designed to prevent losses/ drips while the pesticide application function is stopped.

e) *Maintenance of the Equipment*

The machinery must be designed to allow easy and thorough cleaning, and to facilitate servicing and changing of worn parts without contamination of the environment.

f) *Inspections of the Plant protection equipment (PPE)*

It must be possible to easily connect the necessary measuring instruments to the machinery to check correct functioning.

g) *Marking of nozzles, strainers and filters*

Nozzles, strainers and filters must be marked so that their type and size can be clearly identified (color code).

h) Indication of pesticide in use

Where appropriate, the machinery must be fitted with a specific mounting on which the operator can place the name of the pesticide in use.

i) Tests

In order to verify that the relevant parts of the machinery comply with the requirements set out in sections “Application of pesticides and distribution”, **the manufacturer or his authorized representative must, for each type of machinery concerned, perform appropriate tests, or have such tests performed.**

Identified Policy gaps:

- The harmonized standards with inspection test methodologies for new technologies (e.g. electronic devices) for products to be placed on the EU market might be related to the Machinery Directive. Latter specifies requirements related to the protection of the environment and for which the necessary harmonized standards exist. question remains whether legal base of the Machinery Directive is sufficiently wide to capture as well the performance testing of new technologies for products to be placed on the EU market;
- Some of the harmonized standards may not reflect the state-of-the-art. CEN stakeholders are responsible for adequate revision when necessary;
- MD could specify the harmonized classification schemes for drift reduction nozzles/technologies instead of being specified by National Action Plans (see also SUD gaps);
- **Market surveillance** is variable across the EU and must be improved in many Member States. This includes the build-up of expertise and knowledge and using the existing EU platforms to share good practice and market surveillance actions more often and more thoroughly; The training and staffing of market surveillance authorities should be higher on the political agenda.

4.2 Agricultural machinery for PPP application

4.2.1. Requirements for agricultural machinery

Italy

The compliance of sprayers with EN ISO 16119 standard is under self-certification by the manufacturers, it is not mandatory to have it certified by a third party. PAE inspection workshop in Italy have noticed sprayers that may not be fully compliant with the EN ISO 16119. The general impression is that there is not an efficient market surveillance. It could also be that especially small companies are often not sufficiently aware of the standards requirements and due to the importance to fulfil them, training and information sessions addressed to them would be very crucial. The inspection according of sprayers in use acc. EN ISO 16122 serves to ensure that the performance **remains adequate** over time it shall not replace the market surveillance, which is the only legitimate tool to check if the sprayers are compliant with the applicable EU legislation.

Spain

Need for a classification of sprayers according to the fitting of features that can reduce risks and/or use of PPPs in certain application and particular crops. Questions was raised whether such

classification can be developed at EU level. ISO CEN test methodologies on efficiency potential could help avoid certain national testing schemes to infringe free market access.

Belgium

- Standardization and coordination between agricultural machines / manufacturers. No standard data format for communication and task cards yet;
- Unclear EU regulations and no long-term perspective. It is quite often unclear to the farmers and manufacturers what are the exact requirements for new sprayers and sprayers in use;
- In Belgium, a regulation about the mandatory use of drift reducing technologies is in place but farmers still have questions about the practical feasibility (bio efficacy) and new innovative technologies are not always considered (e.g. reduced boom height in combination with 25 cm nozzle distance);
- There is a need to renew the sprayer fleet as the average age of a sprayer in Belgium increases year after year e.g. through purchase subsidies;
- Lagging regulations are causing machine builders to stall in their development. The latest techniques are sometimes impossible to apply because of the current regulations.

Sweden

- Most equipment is imported as there are no domestic sprayer manufacturer of boom- or orchard sprayers, one for glass house sprayers/robots and two for seed treatment equipment. It is known that non-conforming sprayers are imported. Market surveillance is not active concerning plant protection equipment. The responsible authority don't have resources. Contacts have been made with sprayer inspector that they should report sprayers that are not conforming with Machinery Directive. This will be done 3 years after the machine was taken in use;
- Drift reducing technology (DRT) was introduced in 2003 as a tool to calculate and apply different sizes of buffer zones. Approved DRT according to JKI, Germany, approval. There is a lack of harmonization to other countries DRT-approvals;

France

- There is a need to encourage and to promote the renewal of the fleet of sprayers towards more efficient machines and support this transition through purchase subsidies. It is important to give an objective and independent information to growers on efficiency when they buy a new spraying equipment. National plans and European Rural Development Plans should also include economic incentives to facilitate and encourage the purchase of efficient according to their efficiency (deposition on the crop, potential for drift reduction);
- EU Machinery Directive (**Directive 2009/127/EC**) (<https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32009L0127>) define prerequisites for the construction and sale of machines on the European territory : *"The machinery must be designed and constructed to ensure that pesticide is deposited on target areas, to minimise losses to other areas and to prevent drift of pesticide to the environment. Where appropriate, an even distribution and homogeneous deposition must be ensured."* [...] *"In order to verify that the relevant parts of the machinery comply with the requirements set out in sections 2.4.5.1 and 2.4.5.2 the manufacturer or his authorised representative must, for each type of machinery concerned, perform appropriate tests, or have such tests performed."* Although the objectives are well identified, **the means, test protocols and thresholds to ensure compliance with these obligations are not defined.** We suggest that compliance with these obligations be based for each cropping system on agronomic and environmental performance indicators developed for instance in the framework of the PerformancePulvé label;

- In perennial crops (orchard and Vineyard), oldest equipment that generates drift and has a low spraying quality should be removed from the market;
- Make equipment that record application parameters during spraying (traceability) mandatory. Traceability of geo-referenced spraying parameters during spraying operations is important because: 1) it helps farmers to optimize practices 2) It can help farmers to prove that the applications have been done with compliance of the rules (wind conditions during spraying, interval between 2 applications, respect of buffer zones closed to sensitive areas etc.). This fits within the Commission' concept of proof by data as outlined in the new to be setup partnership on 'Agriculture of Data'.

Greece

- Create databases for the European certified crop spraying machinery;
- Create channels with informative purposes for farmers through farmers' associations and cooperatives;
- Promote the modernization of old spraying equipment by introducing subsidies for innovative machinery, thus decreasing the cost.

Poland

- Need to update the operating rules of the Sprayer Control Station and authorized diagnosticians;
- Need to update the rules for registering sprayers;
- Update of the methodology of conducted research in the field of confirming the technical efficiency of plant protection equipment;
- Unifying the price for the technical efficiency test of the equipment;
- Extension of the approval period for testing sprayers by measuring the outflow until new requirements are developed, in line with the current state of scientific knowledge and practical experience collected during the 20-year history of sprayer research in Poland.

4.2.2. Inspection of pesticide application equipment

Italy

At present, the mandatory inspection of all the PAE in use it is not reached (around 60% of the estimated PAE in use has been inspected).

- It is necessary to update the reference national guidelines for sprayers inspections to EN ISO 16122. (at present the old EN 1380 it is still in use as reference);
- There is a need to clearly identify which types of machines for PPP application are to be inspected at regular intervals, but with a different time interval with respect to field crop and air-assisted sprayers;
- Test methodologies for some pesticide application equipment (e.g. dusters, micro granulators etc.) are still not available, though related EN ISO Standards are being prepared;
- To be able to guarantee to fulfil the SUD Directive requirements it is necessary to have a national register of the Pesticide application equipment (PAE) in use.

Spain

- Spain requires more frequent testing of pesticide application equipment belonging to contractors, as this equipment is likely to be used more frequently, and over a wider area;
- Mandatory registration process of all sprayers in use has been implemented prior the organization of the mandatory inspection program. This database allowed to organize in a

proper way the mandatory inspection process among all the territory, with clear definition of required number of inspectors and inspection units;

- The publication of the official Manual for inspection of sprayers in use by Universitat Politècnica de Catalunya in collaboration with the Spanish Ministry of Agriculture (<https://uma.deab.upc.edu/es/publicaciones-y-prensa/archivos/manual-de-inspeccion-de-equipos-de-aplicacion-copia2.pdf>) following ISO 16122 has been considered by the European Commission (see official audit of implementation of SUD) as a positive aspect;
- Based on official figures, around 65% of sprayers in use have been inspected in Spain.
- An official software for inspection of sprayers in use has been developed by Universidad de Zaragoza (<https://eps.unizar.es/priteaf>) and officially supported and implemented by Ministry of Agriculture;
- A common official and mandatory training program (40 hours) have been designed by Univesitat Politècnica de Catalunya and implemented by al the official responsible at the 17 local authorities.

Belgium

- Belgium has a well-established compulsory inspection of sprayers in use since 1995. Today, the inspection concerns field crop sprayers, greenhouse sprayers, vineyards and orchard sprayers, soil disinfection machinery and spray trains. The inspection is on a three-yearly basis. The inspections are performed by official and mobile teams from the regional authorities;
- There is a need for EN/ISO standards for less used PPP technologies e.g. Seed treatment equipment, Granule applicators, Foggers, etc. Belgium is now developing its own inspection protocols e.g. for Foggers with the involvement of companies specialised in this type of equipment;
- There is a need to establish criteria for exemption of pesticide application equipment types on the basis of a risk analysis in line with the criteria of Directive 2009/128 (Article 8(3)) which states that ALL professional equipment used for applying PPPs is checked at regular intervals or exempted under the criteria duly established.

Sweden

- Inspections have been going on since 1988 on voluntary basis and as mandatory in quality assurance systems. Since Nov 2016 all sprayers shall have been inspected and approved. The numbers in statistics indicate that not all sprayers are inspected;
- Supervision of inspection is done by Swedish Board of Agriculture, but limited to bureaucratic aspects in protocol. Lack of quality assurance or quality control of the preformed inspections or test equipment;
- There is no official statistics on number of sprayers or their age.

Poland

- Make new technologies available to all farmers by increasing financial support and/or decreasing their cost.

4.3 Environmental & health impacts & risk mitigation measures

4.3.1. Risk mitigation measures to protect water and aquatic organisms

EU level

Harmonize requirements between countries is advisable and in particular specific and achievable R&D action like on Drift Reducing Technologies (DRT).

France

Since 2006, buffer zone closed to water sensitive areas (“Zones Non Traitées” or ZNT) are mandatory. Their width depends on the product with a minimum of 5 meters. Since 2019, buffer zone (“Distance de Sécurité Riverain” or DSR) closed to residential areas have been introduced. They also depend on the product and can be reduced when using DRT. Until now, in vineyard and orchard, one official classification of spraying equipment according to drift risk has been drawn up under expert guidance. The proposal is that before selling a sprayer, manufacturers should perform test of their sprayer (by independent institute) in order to have a classification of their machines according to drift mitigation potential. The possibility of reducing buffer zone should be based on the results of the drift reduction potential of the machines.

Italy

- At present there is still not any official definition of buffer zones width according to the crop context in Italy, but only a generic indication regarding the minimum buffer zone width that in any case should be at least 5 meters. A detailed guideline document enabling to calculate the buffer zone distance to respect from water bodies and sensitive areas concerning spray drift and runoff was prepared by a group of experts under the umbrella of Ministry of Public Health. To date it has still to be officially included in the new National Action Plan that will be released in the next months;
- Nowadays farmers are confused as they can only read some prescriptions about buffer zone widths on the PPP labels, but often the latter are provided with different schemes from product to product and the indications about possible reductions of buffer zones widths are linked to the capability of PAE used to reduce by 25%, 50%, 75% or 90% the amount of spray drift. However, no official classification of spraying equipment according to drift risk is currently available in Italy. DiSAFA – University of Torino has promoted a test methodology to assess potential spray drift from field crop sprayers (ISO 22401) and from air-assisted sprayers (UNI 11797 Standard has recently been published) so to be able to build such classification, but an official recognition from the Ministries of Agriculture, Environment and Public Health should be released. Moreover, it is not clear who can make controls in the fields about the respect of buffer zones. The local communities’ laws further complicate the situation;
- A simplification of the procedure to define buffer zones width would help in making farmers more available to adopt them. Economic incentives should be foreseen to boost their implementation on wide scale and to upgrade PAE with drift reducing devices (not only air induction nozzles, but also shields, air sleeves on boom sprayers, system to close the air flow on one side of the air-assisted sprayers, etc.);
- It is needed an official recognition of the allowed systems to manage PPP contaminated water (residues of spray mixtures, washings of sprayer and of PPP containers) at farm level. Incentives to equip farms with adequate sprayer filling/cleaning areas enabling to collect contaminated water would help in the adoption of virtuous practices.

Spain

- Spanish law establishes minimum requirements concerning the size of mandatory buffer zones when the spray application is made close to water sources. In this case, and according RD 1311/2012 concerning the sustainable use of pesticides, article 31 established a minimum distance of 5 m. Additionally, similar measures already entered in force to avoid point source contamination and reduction of risk of specific zones;
- Even if in some cases, spray application recommendations of certain pesticides included the mandatory use of certain drift reduction technology, this classification and this information

is not available in Spain. This fact, as it happens also in Italy, cause difficulties for farmers and advisors, who request for a harmonized process and classification all around Europe;

- In collaboration with DiSAFA – University of Torino, the research group of UMA at UPC (partner of the project) was directly involved in the development, field trials and publication of the alternative methodology for drift measurements for boom sprayers (ISO 22401).
- UPC also published a reference drift curve for olive plantations, as a complementary tool to be used for drift classification purposes;
- In general, Spanish's manufacturers represented by ANSEMAT claiming for a certain support in the accomplishment of ISO 16119. Official collaboration with UPCV, Ministry of Agriculture and ANSEMAT derived in the publication of a Manual for sprayer's manufacturers, increasing the level of adoption of mandatory measures, and creating awareness about the need of safe and environmentally positive sprayers.

Greece

- Create software that will inform farmers for upcoming plant diseases or already detected diseases in neighbouring areas at an early stage. All mobile applications should have a map that will show the spray application path;
- Raise awareness on environmental and operator's safety and health impact of agricultural applications;
- Organize seminars regarding the proper use of equipment and promote alternative access to such material by online applications for younger producers;
- Promote with economic benefits, the development of buffer zones and application of PPP with minimum impact on the environment (i.e. biopesticides).

Belgium

- In Belgium, different buffer zone regulations are in place (nitrates, pesticides, cross compliance, ecological focus areas (EFA), etc.) which might also vary between regions. There is a need to simplify and harmonising as far as possible the rules of different buffer zones.
- Set up a list of 'accepted' bio remediation systems for residuals at farm level (e.g. biobed, phytobac, etc.);
- Regulations are often unclear without a long-term perspective. It is often unclear to the farmers what they can and cannot do;
- There is a need for alternative drift reducing techniques in addition to drift reducing nozzles that are : (i) affordable (w/wo subsidies), (ii) reliable, (iii) user-friendly/fully automatic, (iv) Suitable for various crops and problems. Examples: air support, shielded spray boom, formulation, boom height, adjuvants?, etc. The legal framework is becoming stricter, so the question arises if there are still sufficient techniques available?;
- The efficiency of 'new' techniques (magnetic spraying, CDA etc.) is insufficiently known and not included in the regulations;
- Incentives and guidelines to promote the installation of adequate sprayer filling and cleaning areas;
- A stricter enforcement of the rules is needed in the field
 - Federal buffer zones (almost) never inspected;
 - Variable zones difficult to inspect.

Sweden

- Sweden has law-system for fixed buffer zones to water;
- Drift risks is mandatory to consider at all times since 1997. System for boom sprayers and mist blowers in orchards with tables to apply different size of buffer zones to different objects in wind direction depending on technology, boom height, temperature, wind speed

and applied dose compared to maximum dose. System with DRT is in place and used related to Rautmann Basic Drift Values at approval of plant protection products. Ca 30 products have requirements of use only with DRT in specified classes;

Lack of harmonised DRT classification cause problems for sprayer manufacturers, Plant protection industry, farmers and authorities that control farms. Farmers find that sprayers they want to buy may have approval from country that has other system. Need for DRT-system to harmonise/compare between countries;

- Chemical Inspectorate sets condition for use when approving plant protection products regarding operator safety. Some products require higher safety due to e.g. risk for eyes when filling sprayer. Requirement for “induction hopper or similar giving the same level of protection” for all use. Lack of requirement for safety level on old equipment compared to newer induction hoppers;
- Closed transfer systems are not yet considered in Sweden;
- Some plant protection products require “closed tractor cabin with carbon filter”. Lack of harmonised system for tractor cabins and replacement of filters. To be noted that the necessary amendments in ISO have been done and are published. See also the [CEMA position paper](#).

Poland

Periodic checks by national authorities during the period of application of fertilizers and plant protection products if they are properly applied are required.

4.3.2. Residents (neighbourhoods, houses, living areas)

Italy

It is necessary to define common national criteria for the protection of bystanders, leaving to the local communities the final decisions about size of buffer zones which shall take into account the specific local context. Respect of these local prescriptions should be checked by local authorities. More research and field test data are needed to define both the risk of bystanders/residents and the necessary mitigation measures.

Belgium

- In Belgium, different buffer zone regulations are in place which might also vary between regions. There is a need to simplify and harmonising as far as possible the rules of different buffer zones Regulations are sometimes unclear without a long-term perspective. It is quite often unclear to the farmers what they can and cannot do;
- There is a general need for more control on the correct implementation of the legislation: This gives breathing space to the ones who are acting correctly and hopefully prevents further punishing legislation that is put in place due to the few farmers/contractors who are not following the law;
- Those who don't follow the rules must get out. The number of complaints from society is increasing and by getting the rotten apples out, hopefully the perception of the general public will improve.

France

Idem as for Subtopic 4.3.1.

Spain

- In Spain there is no a specific legislation concerning the residents or living areas and its relationship with the spray application. All the official requirements established at RD 1311/2012 are equally applied;
- It is identified, in consequence, a specific regulation to be implemented for very particular zones where the minimum requirements of 5m buffer zone is impossible to apply.

Sweden

- System for spray drift and drift reduction concerns schools, nursery, private ground for residence, green houses and objects sensitive for the plant protection in use in wind direction. These are all “fixed objects”;
- Lack of system to consider persons that are in those areas as well as bystanders, persons or animals passing next to the sprayed field.

Poland

Additional clarification of the conditions for the use of plant protection products in production.

4.4 Training

4.4.1. Training topics

EU Level

- PPP applicators need to be highly competent professionals with mandatory official training in safely applying PPPs, and must carry out regular checks on their crop protection equipment;
- Farm’s employees are also advised to follow the same strict rules in order to respect health and safety in the workplace;
- Experience show that training with farmers is most productive in a combination of theory and practice. Providing efficient training means also teachers which are able to demonstrate correct handling and operations (very few available). Key training topics: Correct use of the sprayer (e.g. adjustment, cleaning, filling). Operator safety and Environmental safety. Certain training topic need more focus on practice some more on theory. e.g. Calibration of sprayers should be done practically;
- Offer trainings both in theory and practice: Offer trainings and demonstrations how to correctly use sprayers in practice. Such trainings need to be adapted to crop contexts: arable, bush & tree crops, horticulture (greenhouses).

Area for Innovations:

- Nozzle demonstration (Demostand)
- Develop easy to transport demonstration equipment (for a car trailer/ Demosprayer)
- Protective clothing
- Adjustment tools
- Remnant management tools
- Drift measurements
- Develop systems for quality control
- Train the trainers

- **Address whole PPP process**

Develop training schemes which focus on Best Management Practices and address the whole Plant Protection Process. This remains to be setup at regional/local level depending on the crops. EU harmonized sets rather to encourage that such schemes are setup with more exchange of good practices. This should cover the correct behavior of the operator, the spray equipment (theory and practice) and the infrastructure. All these elements are important aspects to realize mitigation measures.

- Interact personally
 - Indirect interaction (Media, online audits, planning tools)
 - Integrate training schemes in licensing process
- **Develop a standard curriculum** (addressing the specific regional needs) on aspects to be discussed in obligatory trainings and AG schools. It could be a basis for certifications of trainers. It should include operation of the sprayer, protection.

Italy

- The mandatory training course that the farmers have to follow in order to be allowed to use the PPP and take the license in Italy is mainly manage by farmers associations and do not consider the PPP application aspects and the appropriate use and adjustment of the PAE.
- Instead in the training courses to get PPP licenses for farmers and advisers should be mandatory to foresee a practical part dedicated to correct sprayer use and adjustment. This would support the improvement of spray application methods and get positive impacts on savings PPPs and in terms of less environmental contamination.

France

- There is a mandatory training course in France for the use of plant protection products, called Certiphyto. However, this training course does not cover spraying, sprayer's setting, etc. This mandatory training should include a practical part dedicated to the correct use of the sprayer and its adjustment;
- There is a lack of training offered to the various stakeholders implicated in spraying (farmers, agricultural advisers, sprayers distribution/sales networks, sprayer controllers, sprayer manufacturers, academic trainings, etc.) about how to reduce spray drift; how to correctly set a sprayer; what are the good spraying practices to reduce impacts on environment, on local residents and on operators;
- There is a need to train Trainers and advisers in application technology and sprayers.
- Establish a common national training standard for crop spraying, one for each cropping system. This standard training materials could be distributed to agricultural education teachers, advisers, manufacturers, people in charge of the mandatory training course in France for the use of plant protection products, called [Certiphyto](#).

Greece

- Provide training support to all stakeholder types: farmers, advisers, students, crop sprayer and agrochemical distributors;
- Provide training and advising seminars and workshops for the importance of personal protection;
- Provide training and advising activities (e.g. seminars, workshops, demonstrations) of these technologies;

- Establish a common European training standard for crop spraying, including the use of personal protective measures;
- Promote the development of online repositories with training material linked with the PPPs that are locally available as commercial products in national level.

Belgium

- There is a mandatory training course in Belgium for the professional use of plant protection products i.e. Phytolicence. However, this training course does not always cover spray application technology details;
- Mutual recognition of national certification systems for professional users of PPPs must be set up, at least with neighbouring countries. To this end, specific memoranda will be developed by Belgium with the Netherlands, France, Germany and Luxembourg;
- Provide training and information to all farmers and also to the society and general public. Both farmers and general public are not always aware about the innovations available and used in the field. As a result there is little entry into practice and a poor perception of the general public.

Sweden

- Sweden has a system with mandatory training since 1990 of all professional users of plant protection products. Basic course four days and a one day refresher course every 5 year. Approval in written exam necessary. In basic course there is a section on application technology including a practical on calibration, filling and cleaning of sprayers ca 4 hours;
- There is a need to train Trainers and advisors in application technology and sprayers. There is no training in ag university except for horticulturists that get 4 hrs practical, same as professional users. It is very limited the number and type of staff that may attend BTSF courses. No training in sprayers or spraying in vocational education for agriculture, horticulture or forestry;
- The same situation for training on environmental or health risks or risk mitigation.

Spain

- As of November 26, 2015, professional users and sellers of phytosanitary products must be in possession of a card that certifies appropriate knowledge to carry out their activity, according to the training levels established in article 18 and the subjects specified for each level;
- Spain establishes four different training levels: a) Basic, for the auxiliary personnel of ground and aerial treatments, including non-agricultural ones, and the farmers who perform them on the farm itself without employing auxiliary personnel and using phytosanitary products that are not or generate toxic, very toxic or deadly gases. They will also be issued for auxiliary distribution personnel who handle phytosanitary products; b) Qualified, for professional users responsible for terrestrial treatments, including non-agricultural ones, and for farmers who carry out treatments using auxiliary personnel. They will also be issued for personnel who are directly involved in the sale of phytosanitary products for professional use, training them to provide adequate information on their use, their risks to health and the environment, and instructions to mitigate said risks; c) Fumigator, for applicators that carry out treatments with phytosanitary products that are gases classified as toxic, very toxic, or deadly, or that generate gases of this nature; and d) Pilot, for personnel who carry out phytosanitary treatments from or by aircraft, without prejudice to compliance with the specific regulations that regulate the granting of licenses in the field of air navigation;
- Concerning the capability for accessing the mandatory training, this responsibility is delegated to the local governments. In here, the competent body of the autonomous community will adopt the necessary measures so that, no later than November 26, 2013,

professional users can have access to adequate training to acquire the respective type of training required by this royal decree, as well as for periodic updating.

4.4.2. Dissemination of the information

EU Level

Dissemination is critical. Basically, we have methods of indirect interactions with farmers (media, digital tools etc.) and direct personal interaction. Personal interaction is most effective: Agriculture is still a people business. A EU programme of exchange of training courses about correct spraying practices and available technologies to optimise application efficiency and reduce environmental contamination to support the goals of risk and/or use reduction, specifically addressed to farm advisers include sprayers dealers, should be established, with the aim to enable an adequate number of them to disseminate the information learned to the farmers. A register of recognised trainers should be created, and the number of trained farmers should be tracked as well.

Maybe special attention could come within the EU skills program (TBC) for financial support.

Italy

The challenge is to reach all professional farmers and field technicians with these info campaigns on sustainable PPP use, they should be promoted and become mandatory to be recognised as a professional farmer.

Belgium

There is a continuous need to disseminate good agricultural practices related with PPP use to farmers, advisors, students, etc. Mandatory training courses and information campaigns can help.

France

Concerning Personal Protective Equipment (PPE), there is a need to promote the dissemination and the use of PPE that are currently under-used on farms. The challenge is therefore to raise awareness about wearing PPE and about good practices related to PPE use;

Greece

- Provide training and advising seminars and workshops for the importance of personal protection, as well as the proper use of personal protection material;
- Provide training and advising activities (e.g. seminars, workshops, demonstrations) of these technologies;
- Economically motivate producers to stay updated on possible changes and implementation of regulations and directives;

Sweden

- Since 1997 there is a system to disseminate information on safe use in plant protection. Managed by Farmers Association and work actively together with involved authority and distributors of plant protection products. The information is distributed but as usual reach those who are most active and updated. Those with most need are often not reached. There is very limited available expertise to produce training material;
- For application technology, sprayers and spraying the information available specific for Sweden is limited. Very limited available technical expertise, trainers and advisor.

Spain

- Increase internet connection in rural areas is crucial. In Spain, more than 70 % of these areas lack a good connection. This reduces the efficiency of innovative technologies for agriculture. Providing internet services to rural areas not only benefits the agricultural sector but also provides better living conditions for the rural areas, promoting what people can live there;
- Promotion of partnerships between small farmers and other stakeholders of the agricultural chain so that they can use the innovative technology and get their investment back within a maximum time frame of three years.
- RD 1311/2012 in Spain regulates most of the mandatory actions to accomplish a sustainable use of pesticides. Concerning the information and the need of its dissemination, article 26 is focused on information and sensibilization of the general public. It states that the competent bodies will adopt, each one in its territorial or competence scope, in coordination with each other and with the Ministry of Agriculture, Food and Environment, and within the framework of the Committee, measures to inform the general public, promote and facilitate programs of information and awareness, and the provision of accurate and balanced information in relation to phytosanitary products. This information will make special reference to the risks resulting from its use and possible acute and chronic effects for human health, non-target organisms and the environment, as well as on the use of non-chemical alternatives.

4.5 Plant protection products and active substances on the market

4.5.1. Approved substances

EU level

- PPPs will remain an essential element in Crop Protection systems (e.g. IPM). Low-risk substances and biopesticides will complement or substitute toxic substances;
- Regarding the production of specialty crops, a limited or non-existent supply of options for weed, pest and disease control as it is the case nowadays can cause serious economic losses for these sectors. We must keep looking for alternatives tailored to the needs of this kind of production;
- The risk assessment of active ingredients on the EU level shall take into account state-of-the-art of the application techniques and equipment e.g. variable rate technologies or drift reduction technologies during the PPP approval procedure. Such an approach will contribute to ensure that EU farmers will be able to use PPPs in a sustainable way in IPM programmes. Biopesticides may require higher standards of application than conventional PPPs to express their specific effectivity.
- The EU and MS PPP regulators, particularly Risk assessors, shall be trained about new technology and techniques which are currently available on the market to gain better awareness about their risk reduction potential and efficiency.

Italy

It would be useful to harmonise PPP packages in order to make easier the use of Closed Transfer Systems (CTS) for filling sprayers and to optimise the design of cleaning systems for empty PPP containers. It is a point regarding the shape of the containers and the screw thread size for caps. If harmonised for all PPP companies, they would enable an easier manufacturing and use of CTS.

Belgium

Need for simple, universal PPP packaging materials, without a seal. Would make filling much easier (eventually with a Closed Transfer system) and reduce the risk of point contamination.

Spain

Article 42 of RD 1311/2012 established the official requirements to be accomplished for the approved substances in Spain.

Sweden

- The attitude to risk mitigation measures to get pesticides approved are positive. Farmers, advisors and dealers have understood that it is a way to get more pesticides approved and a way for Swedish farmers to be competitive;
- However, many stakeholders complain about number of available substances or products;
- Recommendations on application technology from plant protection industry varies a lot and is generally low. Lack of information on how to apply when drift reduction technology is used, which lead to some mis-trust among users;
- For biological and physically acting products information on how to apply is almost non existing.

4.5.2. Setting data requirements for actives substances

EU level

PPPs' active substances must be treated like any other substance that may affect health and the environment, but always on a clear, science-based, transparent assessment. Clear, transparent and swift procedures for the evaluation of new active substances, must be always guaranteed.

Greece

- Create databases for the appropriate mixing order of every PPP;
- Create databases for the compatibility of different PPPs.

4.5.3. Labelling of Plant Protection Products

EU level

Encourage to move to electronic databases and information that can be updated quickly and can contain more information.

Italy

The PPP label should always report the indications on how to apply the product in the field in order to reduce the risks of environmental impact and to narrow the buffer zones width. These indications should refer to a classification of PAE according to drift risk which should be officially recognised at national level.

Belgium

Add clear information about how to apply the product in the field, including spray volume range, buffer zone regulation, etc.

Greece

Create databases for the appropriate mixing order of every PPP.

Spain

- Everything related to pesticide label requirements in Spain is collected in RD 285/2021. In most cases, the dose expression, especially for specialty crops, is unclear as is based in both

concentration and amount per unit of area. This fact leads to advisors and farmers to a serious difficulty to understand and to follow the recommendations;

- Another aspect to be mentioned is concerning the generalised volume rate to be applied in specialty crops. In most of the cases, pesticide label recommends 1000 L/ha as a basic point to calculate the amount of pesticide. Several research have already demonstrated the wrong recommendation. However, still appears in many cases.

Poland

Create databases for the appropriate mixing order of every PPP.

4.6 Monitoring data on the risks for health and the environment related to pesticide use

4.6.1. Statistics on the use of pesticides for decision making

EU level

- In order to improve the existing 2009 regulation, it is necessary a feasible and practical approach to the collection of pesticide statistics and the preparation of guidelines for Member States, as the latter should also be updated periodically, as already defined in the SUD;
- As the current framework may lead to difficulties for data collection in some Member States, the Commission should look at successful Plant Protection Products (PPPs) data collection as a possible means of improving processing.

Besides, data collection itself should not place additional administrative burden on farmers.

Sweden

- Surface water is systematically monitored by competence centre for chemical pesticides at University for Agricultural Sciences on several places over the country;
- Monitoring leads to finding of substances in surface water that has led to questioning of approval for some substances. Information campaigns on safe use together with other stakeholders;
- Lack harmonised method to consider surface run off.

Greece

- All mobile applications should have a map that will show the spray application path;
- Monitoring data platforms may have as an additional output the use of the proper pesticide category based on local geostatistical data related to possible pathogen resistance.

Italy

- Surface and ground water is monitored at regional level with more data available in north central Italy regions (in total around 1550 and 3000 monitor sites respectively for surface and groundwater);
- An evaluation scheme based on the single substance is not adequate (up to 55 substances in a single sample has been found);
- For an evaluation of the impact of PAE on health and environmental could be useful to have also statistic data about the improvement of the PAE technology (age of fleet- use of mitigation technologies) as of about the functioning defects encountered during the mandatory PAE inspections (how much are they reducing).

Spain

Concerning the data acquisition, in Spain became mandatory for all farmers to record the basic parameters during the spray application process. This fact had the main objective to generate an objective and useful database to know exactly the amount of PPP used. However, due to the lack of training, absence of educational actions and relatively low interest from the local authorities, this system does not work properly. Data recording is made in most of the cases trying to accomplish the administrative process without any interest and accuracy.

Poland

In the context of agriculture of high-value crops, policies and projects that promote transferring of available technology to the market are needed. Funding, incentives, and targeted plans are needed to ensure that the most updated technology such as artificial intelligence, big data as well as other platforms can get to the market, generating the maximum value to this type of agriculture in the most efficient and harmonised way within the whole EU.

4.7 Research

EU level

- The main limiting factor of the new technology uptake it is the risk of yield losses (particularly in high value crops), and the cost of learning how to properly use innovative risk/dose reducing systems and their possible practical limitations. If there is not sufficient advice/support (including both agronomic and regulatory support) that puts farmers off acquiring innovative technologies. To conduct research (long-term field studies) are critical to gain data on the cost benefits of risk/use reducing equipment over time. These data will justify the investment by farmers. The use of EU Horizon 2021-2027 budget shall be considered to found this extensive and costly studies.
- The exchange of information between stakeholders within the food chain through thematic networks and other digital platforms must be encouraged, while also ensuring data protection (e.g. personal data of farmers, researchers, workers, etc.). The farmers must be sure that they will get a return in terms of the value created and can access their data collected by the public administration;
- The involvement of farmers in decision-making processes may help to bridge the gap between *researchers* and farmers and to find widely shared solutions that would ultimately be perceived as feasible new opportunities to improve productivity. An increased investment on research and innovation at EU level may allow EU farmers to go further on environmental sustainability of their production and should be always encouraged.

Italy

- The communication of research results is often limited to the academy and to few representatives of the stakeholders (e.g. PPP producers, sprayers manufacturers, field advisers, farmers, public authorities). There is a lack of a serious debate in the society about PPP use, possible ways to reduce their consumption, evolution of plant protection towards more sustainable strategies. In public opinion farmers are often addressed as responsible of environmental pollution because they use PPP, independent of the strategies and technologies adopted (e.g. IPM, organic farming, use of advanced sprayers, etc.). Too low efforts are made to clearly identify the technologies and PPP application practices that can play a distinctive role in reducing PPP consumption and risks for public health, operators, and the environment.

Greece

- National projects that will lead to lower costs for the acquisition of new technologies;

- Research and development for more comfortable and ergonomic personal protection equipment;
- Projects for the development of safe crop spray mixing facilities to better control PPPs waste and reduce pollution.

Belgium

More research is needed related to the following topics:

- Uncertainties related to the Cost-benefit analysis of new techniques. Unclear what the added value of precise spraying is compared to profitability;
- Lack of sufficient research and communication of relevant results to the entire society. Farmers feel that their work (esp. related to the use of PPP) is miscommunicated to the general public. Quite often the communication is fragmented and quite often negative;
- Nozzles with high drift reduction with maximum bio-efficiency and practically achievable spray volumes (quote: 90% drift reduction, 100% efficiency). Bigger droplets can cause problems with weed control, resulting in a need to spray more which could eventually lead to resistance of the weed/pest to PPP. Additionally, high drift reduction classes usually correspond to higher spray volumes. Furthermore it was reported that within the 50% drift reduction class, there is also a lot of difference in efficiency;
- Efficiency of 'new' techniques (magnetic spraying, CDA ect.) is insufficiently known and not included in the regulations.

Spain

- In the context of agriculture of high-value crops, policies and projects that promotes transferring available technology to the market are needed. Funding, incentives, and targeted plans are needed to ensure that the most updated technology such as artificial intelligence, big data as well as other platforms can get to the market, generating the maximum value to this type of agriculture in the most efficient and harmonised manner within the EU. Example of the Smart Agri Hubs (<https://www.smartagrihubs.eu/hubs>) that are support organisations that aim to make businesses more competitive by speeding up the development and uptake of digital innovations.
- Operational Groups (OG) has been an important challenge programmed by Ministry of Agriculture. Theoretically, those kinds of activities mixing research and private producers seems to be interesting and there are a lot of good examples as the recently implemented OG GOPHYTOVID (www.gophytovid.es). However, the bureaucratic and extremely difficult procedure seems a negative characteristic of this interesting initiative.
- Additionally, research in agriculture has not considered, historically, as the same level as other research topics. This act implies that it results difficult to find public funds to continue improving research in agriculture.

Sweden

- Very little research on application of plant protection products. The last 10 years funding has been possible only for application with biological or physically acting products in limited amount of crops;
- Lack of research of influence of risk mitigation measures;
- Lack of research on technology and precision farming.

4.8 Financial support

EU level

For the EU farming community, it is crucial that investments keep going into in this area to bring to the market affordable, effective and safe products which may be adapted to the EU agricultural system and circumstances. We must keep insisting on research into and the development of these alternatives for their application through Integrated Pest Management (IPM) schemes, based on existing scientific literature and the wealth of knowledge collected by EC research projects like INNOSETA.

Italy

Subsidies could be tuned according to the environmental friendliness level of the machines (e.g. category of spray drift reducing equipment according to ISO 22369-1, availability of efficient systems for internal and external cleaning, presence of devices for allowing direct filling of PPP in the sprayer without risks of operator and environment contamination, etc.). The important thing is to have consolidated and harmonised test schemes in order to provide transparent proofs by data.

France

There is a need to encourage and to promote the renewal of the fleet of sprayers towards more efficient machines and support this transition through purchase subsidies. Subsidies could be tuned according to the environmental friendliness level of the machines (e.g. according to the category of spray drift reducing equipment according to ISO 22369-1, availability of efficient systems for internal and external cleaning, presence of devices for allowing direct filling of PPP in the sprayer without risks of operator and environment contamination, etc.).

Greece

- Provide funds from national projects that will lead to lower costs for the acquisition of new technologies;
- Establish national programs and subsidies for the finance of farmers (to buy expensive precision spraying machinery) All mobile applications should have a map that will show the spray application path;
- Provide associations and cooperatives with subsidies that will enable them to buy equipment that will be used by the members. In this way, producers that may lack the possibility to access such machinery, will be able to access it.

Belgium

- Governmental (Vlif subsidies) support and fair compensation for products. Innovations cost a lot of money. Costs must be able to be passed on to the food sector, which sets high standards;
- Keep on promoting innovative drift reducing spraying techniques through subsidization;
- Opening up subsidies for contractors (now only farmers can apply);
- Also allow subsidies (Vlif support) for adjustments to 2nd hand machines and not only for new machines.

Spain

- Promotion of partnerships between small farmers and other stakeholders of the agricultural chain so that they can use the innovative technology and get their investment backs with a max time frame of three years;

- Ministry of Agriculture in Spain already started a financing campaign to support investment to adopt precision farming. This action has been established based on presented projects, where objectives have to be aligned with Farm to Fork strategy.

Sweden

- No investment support directed for sprayers or precision farming with sprayers;
- Not yet in national plans.

Poland

- Provide funds from national projects that will lead to lower costs for the acquisition of new technologies;
- Establish national programs and subsidies for the financial support of farmers.

4.9 Consumer information

EU level

- All policy measures must recognize the wider services that farmers and cooperatives, as suppliers of quality and healthy food, feed and non-food agricultural products, provide to society. It is therefore important to boost communication with consumers on the good practices that farmers carry out on a daily basis in order to provide them with high-quality, safe and nutritious food;
- European agriculture and the use of chemical PPPs are currently facing a lot of criticism from the general public, as a result of food safety concerns about its possible effects on environmental, human and animal health. European citizens do not seem to be able to find enough clear, reliable and transparent answers to allay these concerns. It is therefore the task of the agricultural sector to be transparent about the way food is being produced, but it is also the duty of EU institutions to help delivering these transparent messages to the final consumers, always supported by trustworthy data;
- The high-quality production standards present nowadays in the EU agricultural production are not always evident for EU consumers. Although some of them are willing to pay a premium for higher production standards. This is only possible when farmers being paid more for additional work and less yield.

Italy

- Food information shall also pass through the information on how the PPP has been applied;
- In that sense traceability of the PAE operative parameters could be essential;
- A more strict connection between the PAE manufacturers and the GDO shall be established (e.g through contact with GLOBAG.A.P).

Spain

Agriculture needs to be perceived by the whole population as a strategic sector that can bring many benefits to countries, specially to their rural areas.

4.10 Sustainable food systems

EU level

We all must continue to endorse and stimulate the availability and use of Integrated Pest Management (IPM) tools (Directive 2009/128 on Sustainable Use of Pesticides), in which the use of chemicals is the last resort in agriculture. These tools are already used in other parts of the world, not just in the EU. By applying IPM, farmers are already avoiding an excessive use of chemical

pesticides and they are increasingly moving towards low-risk substances and selective crop protection techniques. They combine various agricultural practices to reduce the impact of agriculture on the environment: crop rotation, implementation of resistant cultivars, soil management, seed protection, etc. Farmers must be given available, safe, effective and affordable tools, sourced as much as possible from the EU crop protection industry (physical/mechanical, genetic, biological, natural, etc.) in order to treat our crops when necessary and be able to provide high-value and quality food and horticultural products (flowers, herbs) with EU origin.

4.11 Good Agricultural Practices

4.11.1. Drift reduction/water contamination/ bystanders' contamination/others

EU level

Dissemination of the webtool [STEP-water](#), the online platform realized by CEMA and CLE that guides crop protection users in the selection of the best spraying technology with a focus on water protection.

Italy

It would be useful to officially refer to TOPPS Best Management Practices (www.topps-life.org), agreed among European experts, for drift reduction and prevention of PPP point sources. This would help in harmonising at EU level the reference good agricultural practices about use of Pesticide Application Equipment.

France

- There is a lack of assistance and training for the appropriate setting of sprayers;
- There is a lack of training offered to the various stakeholders implicated in spraying (farmers, agricultural advisers, sprayers distribution/sales networks, sprayer controllers, sprayer manufacturers, academic trainings, etc.) about how to reduce spray drift; how to correctly set a sprayer; what are the good spraying practices to reduce impacts on environment, on local residents and on operators;
- There is a lack of knowledge and/or a lack of existing tools that allow to follow and record the traceability of application parameters during spraying (recording of data during spraying). Traceability is important because it helps optimize farmers' practices;
- There is a need to promote the dissemination and the use of personal protective equipment (PPE), as it is currently under-used on farms. The challenge is therefore to raise awareness about wearing PPE and about good practices related to PPE.

Spain

- A part of the official training program, there are few other initiatives. Concerning the official training programs, important defaults have been detected especially at the basic level. Contents and time distribution should be reviewed as it seems more a first aid manual than a basic training for sprayer's operators. Additionally, it should be considered the big differences among the 17 local authorities, which are responsible of the organization and development of the mandatory training programmes;
- Private initiatives as the one started by UPC in collaboration with private companies (e.g. Syngenta, Bayer, BASF or Belchim) have been greatly received. In the last years more than 10.000 technicians, farmers, advisors and local authorities have been trained on the basic principles of a proper use of pesticides and a proper spray application process.

Greece

- Digital solutions that will inform farmers for upcoming plant diseases or already detected diseases in neighbouring areas at an early stage, for preventive and minimal action on time and on the spot;
- Combine sensor calibration processes with applications in mobile machinery (add the functionality of calibration at the existing applications).

Belgium

- Nozzles with high drift reduction with maximum bio-efficiency and practically achievable spray volumes (quote: 90% drift reduction, 100% efficiency). Bigger droplets can cause problems with weed control, resulting in a need to spray more which could eventually lead to resistance of the weed/pest to PPP. Additionally, high drift reduction classes usually correspond to higher spray volumes. Furthermore, it was reported that within the 50% reduction class, there is also a lot of difference in efficiency;
- A need for alternative drift reducing techniques in addition to drift reducing nozzles that are: (i) affordable (w/wo subsidies), (ii) reliable, (iii) user-friendly/fully automatic, (iv) Suitable for various crops and problems. Examples: air support, shielded spray boom, formulation, boom height, adjuvants? etc. The legal framework is becoming stricter, so the question arises if there are still sufficient techniques available?

Sweden

- Even with information system considering safe use of plant protection about calibration, dosage, drift, buffer zones etc there is no agreed system on Best Management Practices.

Poland

- Software that will inform farmers for upcoming plant diseases or already detected diseases in neighbouring areas at an early stage (EDWIN https://zodr.pl/index.php?site=technolog_radzi&dzial=25)
- All mobile applications should have a map that will show the spray application path;
- Combine calibration processes with mobile applications (add the functionality of calibration at the existing applications).

5 Summary with main conclusions and recommendations in relation to European policies

Within this section an attempt is made to look at those overall recommendations, as extracted from the regional and transnational workshops, that are considered key for the consortium, and an attempt is made to indicate in which legislations they should be addressed.

Overall the three topics identified for the transnational workshop show the main trends: Optimization of spray quality and application precision / Spray drift reduction / Prevention of point sources pollution - Environmental and operator safety in the context of improvements in spray technology.

In all three topics and for all specific fields of application the issue of **lack of (appropriate) training** is the main identified bottleneck. Within the SUD the requirements on training should be more elaborated on both requirements for users, like mandatory training on proper calibration of sprayers; Best Management Practices for risk impact mitigation; new innovative technologies and practices, but also for governments/MS to support the organisation of such training sessions for reasons of affordability and low threshold for participation. Mandatory elements within training sessions should

be worked out, as the harmonised minimum for the EU, with requirements for MS with support to identify the technologies/practices they like to promote and insert them into the training programs.

A second aspect is the necessary **financial support and/or organisation support** to facilitate the purchase or overall the use of new innovative technologies, whether data tools for more informed decision making related to pest control, or spot specific and variable rate technologies, more economic feasible and bearable. A possible way is to specifically look at MS National Strategic Plans under the CAP in relation to the Eco scheme 'precision farming' that target pest control and in particular the reduction of pesticide use.

An important element for an enhanced EU market for innovative technologies, certainly taking into account the low sales volumes, is the harmonisation of performance test methodologies and classification, in support of MS efforts to draft list of technologies up for financial contribution and in support of farmers to make more informed choice of purchase. This could be initiated by a clear mandate under the SUD or the Machinery Directive depending on where the performance of technologies (efficiency + efficacy) should be handled, to start the development and the enforcement of the appropriate CEN or ISO EN standards.

A clear point of attention is **drift reduction**. One element is the choice of drift reduction technologies for sensitive areas and the necessary training for users to understand the tools at their disposal and the need and obligation to reduce drift. But overall it is the lack of a European harmonised classification of drift that burdens the discussion overall and in particular on what technologies to promote like the nozzles with high drift reduction potential but also the development of alternative solutions on a European scale. A clear signal is needed from the EU political level that forces the development of such harmonised classification and this could be handled under the SUD.

Concerning **prevention of point sources pollution** and also **the environmental safety and operator health**, it must be emphasised there is a continued need for follow-up and training. Even if the pesticide reduction targets are achieved within the coming ten years, this will remain an important point of attention. The European Commission could support to bring key experts and MS representatives together to discuss and finetune the necessary practices and technologies on a European level.

An important topic to keep high on the agenda are calls for more stringency for placing PAE on the market. But awareness is growing, also with European institutes, that the necessary data is simply missing to make the right call in this problematic. With digitisation, there is hope that farmers can be provided with tools to monitor more closely the health situation of their crops and act in a preventive and minimalistic way, but also with the tools to transmit the necessary intelligence/information to the PAE for machine settings and steps to be followed in handling the products for mixing, filling and application. In addition, with a continued data stream throughout the process from PPP label to administrative forms, farmers can continue improve their practices and use the information to proof compliance. The provided information will allow MS and European institutes to better monitor and steer the process and legal instruments. Like DG AGRI and DG CNECT are closely collaborating on new research call programs to work both on the in-depth development of digital solutions and practical implementation and demonstration, DG SANTE could get involved to place higher focus on dedicated calls for pesticide application that deliver the necessary open source solutions for input management with strong cross domain integration.

By taking on board these recommendations to enhance the uptake of innovative spraying technologies, European policies should be better positioned to support farmers in reaching the ambitious targets set in the European Green Deal, the Farm to Fork strategy and the Biodiversity strategy. In particular, changes to the SUD should feed into the comprehensive impact assessment of these strategies.

6 Policy briefs:

Who?

INNOSETA is a Thematic Network funded by the European Commission in the frame of the Horizon 2020 program for Research and Innovation. The main objective of INNOSETA is to set up an Innovative self-sustainable Thematic Network on Spraying Equipment, Training and Advising to contribute in closing the gap between the available novel high-end crop protection solutions -either commercial or from applicable research results- with the everyday European agricultural practices.

This has allowed us to pool together a wealth of information and insights, leading to a number of recommendations for increasing the adoption and uptake of SETAs.

What?

INNOSETA has conducted an assessment of current EU policies impacting on SETAs adoption, including this Policy Review. The outcome of the regional and transnational innovation workshops have also been used to identify Policy Gaps which should be addressed by the future Common Agricultural Policy, Sustainable Use Directive, existing New legislative framework legislation like the Machinery Product Regulation and upcoming legal initiatives in relation to establishing a digital Europe, such as:

- Lack of and need for appropriate training;
- Financial and/or organizational support by stimulating innovations uptake;
- Lack of common risk mitigation measures on European level;
- Environmental safety and operator health;
- Choice of drift reduction technologies for sensitive areas and the necessary training for technology users.

INNOSETA also proposes Policy Solutions, summarized in form of 7 Policy briefs in this deliverable, and more detailed in D3.6, to overcome these gaps by providing examples of good practices already available at European level More details will be presented in D3.6. The Policy solutions include, the following:

- Supporting farmers investment in SETAs;
- Harmonization of legislation at EU level in order to support better technology uptake;
- Improve farmer's capabilities through lifelong learning, education and training together with on farm and in-field demonstrations;
- Research and innovation as support strategies for boosting agricultural innovation, emphasizing the importance of advisers.

Why?

The INNOSETA vision is to turn the policy into an opportunity to make EU agriculture smarter and greener, thereby contributing to a more sustainable and competitive EU agriculture. In this sense, EU policy makers are called to promote and realize a holistic approach aiming at:

- Promoting innovative spraying solutions that are farmers-centred and that reward farmers;
- Simplifying and improving the aid programmes management;
- Harmonization at EU level of drift and buffer zone regulation and common risk mitigation measures;
- Intensive communication and training campaign including applied research with field trials

With 7 Policy Briefs with selected topics, listed below, this document sums up the main challenges, accompanying recommendations and expected impact of the proposed measures, as overall accepted by the consortium.

6.1 PB1: Demonstrate and Share the Knowledge

What is the challenge?
<p>Agricultural community needs regular training organized on regional and national, but also on the EU level with respect to new, and existing, risk and/or use reducing application techniques/equipment. All stakeholders need to be included in such actions: regulators, particularly risk assessors, advisers, farmers, students, sprayer and PPP dealers, and local authorities.</p> <p>There is a general opinion that there is a lack of training courses for farmers and machine operators about spray technologies and practices and how to properly set a sprayer. Trainings are important to all types of agricultural stakeholders: regulators, advisors, farmers, students, sprayer and PPP dealers, and local authorities. For instance, seminars, workshops and demonstrations about spraying technologies and about PPE are important to be promoted and organized on regular basis. Additional, constant awareness raising among technology users about the importance of the consequences of not following the requirements and good practices on health, environment, etc. is crucial.</p> <p>Moreover, good practices should be included in the training courses on a mandatory basis if possible. It would also be important to establish a common charter at European level that would deal with guidelines for spraying practices, such as sprayer's calibration according to the type of crop, in order to have a common technical reference base.</p>
Policy Recommendations
<ul style="list-style-type: none"> • Develop harmonized R&D and cost/benefit methodologies that provide representative findings on the performance of SETAs, thus helping farmers to take their decision on using spraying equipment, particularly concerning yield performance and the use of inputs; • Promote demonstration activities at the farm level aimed at showing the farmers in their own region/country how new smart technology or machinery perform; Demonstration farms are key examples of support strategies facilitating the adoption and uptake of Innovative spraying equipment; • Promote tools that allow farmer experiences to be shared, as well as the exchange of information about training courses and materials used throughout Europe in order to compare and, above all, to improve and harmonize the training courses provided; • Develop the content of training courses in relation to spraying implemented on regional, national and EU level; Integrate the thematic of diffuse and point source pollution and health of operators into training curricula; • Strengthen training and information for farmers, but also for all the actors involved in plant protection (advisers, PPP dealer, sprayers distributors and others). In the mandatory training courses to get PPP licenses for farmers and advisers (Article 5 from the Directive SUD 2009/128/EC), it should be mandatory to foresee a practical part dedicated to "correct sprayer use and adjustment".
Expected impact
<ul style="list-style-type: none"> • More empirical based evidence from R&D and farmer field trial about the economic benefits and environmental impacts of using SETAs that will encourage farmers to invest in new, innovative equipment

- Training and good practice sharing/demonstration will provide the necessary intelligence to farmers/contractors to make a well-balanced purchase in addition to the use of web based tools such as TOPPS and STEP-Water. It is expected that with digitization, with cross-domain integration of stakeholders, 'proof by data' from R&D and practical experience will gain in importance. It fits within the partnership 'Agriculture of Data' where data should help farmers to make better use, better decision based on monitoring of the application process. In parallel the resulting data can also be used to prove good practice;
- Demonstration activities at farm level are a crucial part of the agricultural knowledge exchange for innovation, with the benefit of having the possibility of testing the SETA directly on the field;
- Farmer-to-farmer learning is a crucial example of knowledge exchange in agriculture that can help in the uptake of new spraying technologies or practices;
- Engaging with stakeholders need to be included: regulators, advisors, farmers, students, sprayer and PPP dealers as well as and local authorities.

6.2 PB2: Lack of Common risk Mitigation Measures

What is the challenge?

There is a need to properly consider and assess all potential risks arising from application of PPPs, to human health (of operators and bystanders/residents) and the environment (from point source and diffuse sources) and ensure they are dealt with appropriately and in context e.g. in terms of spray drift protection importance will vary depending on presence, of people/sensitive areas, and distance from the application. Common harmonized risk mitigation measures are necessary at the EU level to facilitate uptake/adoption.

From the regional and transnational workshops, the general opinion was raised that **drift reduction** is a **high priority** to support environmental protection. There is a lack of harmonization in drift reducing measures and requirements between European member states. For example, the measures in terms of non-sprayed buffer zones differ between countries and can even differ per region in some countries. This results in a lack of standardization of drift reducing spraying equipment and practices at EU level. That is why there is a need to **establish common risk mitigation measures**.

Overall, it is **the lack of a European harmonised drift** requirements (including a harmonised classification of drift reducing technologies and buffer zone width measures) that is restricting progress regarding what technologies to promote like nozzles with high drift reduction potential, but also the development of alternative drift reduction technologies on a European scale. The efficiency of 'new' techniques (including but not limited to Controlled Droplet Application, Pulse Width Modulation (PWM), electrostatic and magnetic spray deposition aids...) is insufficiently known and not included in the regulations.

Policy Recommendations

- **Harmonize** EU drift requirements and the Drift reduction technology (DRT) classification to facilitate the adoption of drift reducing technologies by farmers;
- **Set common measures for buffer zones at EU level** (definitions of buffer zones are set by national authorities considering their specific situations);
- There is a need for harmonized measures and practically achievable buffer zone widths that could potentially be reduced through the use of DRTs (giving a direct economic incentive to farmers to adopt DRTs);

- Importance of **clear communication** about drift and drift reduction not only to farmers but to all stakeholders and the general public;
- **Promotion of** innovative drift reducing spraying technologies through harmonized regulation supported by subsidization;
- Inspection in use' schemes vary and good quality control should be ensured. A complete register of sprayers is only available in few countries. Inspection in use should also be extended to "minor" use equipment (e.g., micro granulators, dusters, seed treatment, etc.);
- There is a need for better understanding of the allowed systems/practices to manage PPP contaminated water after PPP application (residues of spray mixtures, washings of sprayer and of PPP containers) at farm level. Incentives to equip farms with adequate sprayer filling/cleaning areas enabling to collect contaminated water would help in their adoption as would a list of 'accepted' bio remediation systems for residuals at farm level (e.g. biobed, phytobac, heliosec, etc.);
- There is a general call for more control on the correct implementation of the legislation: This potentially rewards those who are acting correctly and hopefully prevents further punishing legislation that is put in place due to the few farmers/contractors who are not following requirements.
- Reconsider current requirements set by EN ISO Standards used for crop protection equipment to minimize risks of point source pollution (e.g. Closed Transfer System, induction hoppers, sprayer cleaning systems, etc.).

Expected impact

- Harmonized EU drift requirements supported by harmonized classification of DRTs will make it easier and clearer for farmers to adopt and use drift reducing technologies. If this is combined with adequate subsidization, these (classified) drift reducing technologies will be used more and better;
- By communicating better about drift to farmers and the general public, drift reduction will increase. The INNOSETA platform and other web resources such as TOPPS and STEP-Water can help with this;
- Recognition of allowed systems to manage waste water containing PPPs would give farmers the possibility to process their wastewater optimally. If correct management of wastewater is rewarded, many more farmers will potentially use these allowed systems;
- Reaching the targets on sprayer inspections in Europe will help maintain the quality of the European spray application equipment fleet over time which will assist a more sustainable pesticide use.

6.3 PB3: Applied research

What is the challenge?

In the regional and transnational workshops, it was pointed out that often the innovations and the new technologies available to improve pesticide application are **not sufficiently perceived** by farmers as instruments ready to be used on a wide scale to improve the effectiveness of treatments and to drastically lower their environmental impact. In most cases insufficient **cost-benefit analysis** has been provided through R&D and practical on farm experiments to give enough information about the profitability of investing in new technologies.

Moreover, some advanced innovations proposed, especially the more advanced ones relying on digitalization and automation in precision farming systems (which potentially offer very significant risk and use reduction advantages), are only currently considered by a large part of end-users sustainable only on large farms and not currently suitable to small/ medium farms, which are particularly common in bush and tree crops.

Farmers often claim about that specific issues they face in their own crop context are not necessarily always dealt with enough by the technical evolution of sprayers towards precision farming and digital agriculture. However, simple and cheap technical solutions to retrofit old sprayers do exist e.g. see STEP-Water, but again sufficient R&D and practical on farm experimentation is required to demonstrate suitability and cost/benefit advantages (which has generally only been undertaken for a few crops to date).

In general the adoption of new sprayer technologies and features needs to be proved effective in R&D and practical field experiments and then demonstrated in practice to advisors and farmers.

Policy Recommendations

- Fund research and long-term field studies for innovative risk and/or dose reducing application techniques and equipment to demonstrate cost/benefits, in addition to risk and/or use reduction, in specific application situations to justify the investment required by farmers;
- Horizon scanning through continual discussions between all stakeholders, including regulators (as called for by OECD), to ensure that new and forthcoming application techniques and technologies to reduce risks and/or use are recognized so that R&D can be planned;
- Harmonisation of advice on PPP labels, particularly for bush and tree crops (and greenhouses) where this information is still often deficient in adapting PPP doses and spray volumes appropriately to the crop canopy being sprayed;
- Fund or incentivize research projects aimed at solving practical issues raised by farmers through the adoption of innovations and new technologies, including those that can be applied to existing sprayers;
- Incentive demonstration and training programs that provide end users with tangible proof-s of the effectiveness and economic benefits from the use of risk and/or reducing application equipment;
- Encourage communication and collaboration between industry, researchers, academics and farmers in the EU aimed at developing innovative solutions enabling to match the objectives of SUD Directive and Farm to Fork strategy;
- Carry out cost-benefit analysis of new techniques and technologies available and that may come to the market soon;
- Establish economic incentives for farmers who take part in practical field trials as part of research projects aimed at optimizing spray application and PPP use;
- Promote the development of easy to transport (trailer) demonstration equipment for application trainings.
- Incentivise research on solutions enabling applications to be adaptable to the canopy structure being sprayed, including spray transport, drift and deposition models to assist risk and use reduction;
- Reducing the amount of remnants; defining key success factors which make a training on application effective;
- Fund common Industry and university/institutes research to further develop test methods (incl. model prediction) for spray drift measurement, which serve for more precise and faster determination of the spray drift reduction, especially for orchard sprayers. (e.g. consider to enlarge number of wind tunnel labs, or the capacity of current facilities.);

<ul style="list-style-type: none"> Consider the future of the INNOSETA Platform beyond the end of INNOSETA Project.
Expected impact
<ul style="list-style-type: none"> Availability of a wide range of technical solutions capable of being implemented in the field following practical field trials and cost/benefit analysis to support introduction, to improve application of PPPs and reduce the risks of human health or environmental impact; Development of intermediate technical solutions (e.g. kit for retrofitting sprayers in use); Promote practical demonstrations of benefits achievable, and practical limitations, with new sprayer technologies/features in order to convince farmers to adopt them; Higher interaction between regulators (especially risk assessors), research institutes, industry and farmers.

6.4 PB4: Disconnection of consumers from farming realities

What is the challenge?
<p>The INNOSETA workshops identified a low understanding of modern agricultural techniques and how food is produced by the general public today. Urban populations are largely disconnected from farming and from the entire production process, often still holding an outdated view of how agriculture does or should look like. Public media communication, based primarily on alarmist reports by NGOs, mainly focuses on the perceived risks related to Plant Protection Product (PPP) use and says very little, or in some cases nothing at all, on their benefits and why farmers use them. Efforts to modernize and improve Crop Protection methods to ensure compliance with Integrated Pest Management (IPM) principles are often not presented in a way that reflects modern agricultural production. European farmers are the amongst the most resource efficient producers in the world, giving 500 million citizens across Europe access to high quality, safe and affordable food. In the context of the climate change challenge, European farmers understand that society and policymakers expect them to ensure food security in the EU and worldwide while at the same time mitigating the effects of climate change and preserving biodiversity. Farmers are willing to step up to the challenge, but they need access to the newest, cutting edge technologies in order to do so.</p>
Policy Recommendations
<ul style="list-style-type: none"> Agricultural topics should be included in general school curricula; Effective communication on modern agricultural practices with the public is needed. To be effective, this communication needs to involve regulators, industry, researchers and academics and farmers. Such a multi-stakeholder approach should concentrate on developing clear messages directed at the public and specifically at consumers, to ensure they understand that their food is amongst the safest in the world; Food companies and retailers are also important stakeholders and should be involved in communicating food safety and production; Food certification schemes may help to provide more insight into food production processes to enable consumers to make informed decisions.
Expected impact
<ul style="list-style-type: none"> Increase the perceived benefits of training of farmers in using innovative technologies such as Precision Farming and digital agriculture, continued implementation of Integrated Pest

Management (IPM), and new application techniques/equipment that reduces the risks and/or use of Plant Protective Products (PPPs);

- Establish trust amongst regulators, policy makers, farmers and consumers that food is produced safe and in a sustainable manner.
- Better image of modern farming and farmers

6.5 PB5: Set the stage for the Advisory Services of the future

What is the challenge?

EU agricultural holding's average mean size was 16.6 ha in 2016. However, only about 15 % of farms were this size or larger. From the 10.5 million agricultural holdings in the EU in 2016, 65% were less than 5 ha in size ([link](#)) and over 95% were considered as family farms ([link](#)). Therefore, the size of the majority of EU farms is classified as small to medium and their ownership is owned by different individuals. Thus, the increased number of farmers and farms scattered with numerous crop types leads to significant differences in knowledge about the optimum agricultural practices and the current measures and techniques/technologies that contribute to a more sustainable and viable agriculture.

There is an established Farm Advisory System (FAS) in each EU member state that assists farmers to better understand and meet the EU requirements for the environment, public and animal health, animal welfare and good agricultural and environmental condition . The FAS provides information about (i) the farm's obligations resulting from 'cross-compliance'; (ii) the agricultural practices about 'greening'; (iii) the measures for farm modernisation, competitiveness building, sectorial integration, innovation, market orientation, as well as the promotion of entrepreneurship; (iv) the requirements for efficient and sustainable water use and protection; (v) **the use of plant protection products (PPPs)** and (vi) **integrated pest management (IPM) systems**.

The FAS, as structured today, is not sufficient due to non-precise and up-to-date knowledge in many member states. The knowledge on the above mentioned services within the wider Agricultural Knowledge, Information and Innovation system (AKIS - a system concept that links people and institutions to promote mutual learning, to generate, share, and utilize agriculture related technology, knowledge, and information) in Europe is missing to some extent. AKIS integrates all relative actors (i.e. farm owners and workers, agricultural educators, researchers, non-academic experts, public and independent private advisors and supply chain actors) to harness knowledge and information from various sources. What is required to be developed is (i) small-scale farmers' access to relevant and reliable knowledge, (ii) services bridging scientific research topics and farmers' demands and (iii) appropriate support for diverse rural actors that form networks around innovations in agriculture and rural areas.

These three pillars of services are subject to modern FAS and touch directly the correct use of all PPP application technologies and techniques.

Policy Recommendations

- Continuous R&D and extensive demonstration is required for innovative technologies and techniques on PPP application, particularly to highlight cost-benefit advantages demonstrated by R&D and practical use to showcase the technical characteristics (advantages and practical limitations) and the economic result of applying these innovative application technology solutions;

- Farm advisory services are all the organisations or activities that use AKIS and assist farmers to produce knowledge and enhance skills by creating service connexions with advisors in order to finally co-produce farm-level solutions.
- Farm advisory services should be reinforced with additional human capital and resources/infrastructure to function in a regular and consistent manner for the benefit of farmers;
- Farm advisory services should develop a common scheme between state authorities, research centres and universities, as well as private consultants and advisors after accreditation and continuous training;
- Research centres and universities, since they have high geographical distribution in the EU, could act as points of interest for all policy makers/regulators, FAS, and farmers with a flow of information preferably by integrating them in -the national FAS;
- Regarding spraying techniques and technologies, such a system can provide information about risks of point and diffuse sources of pollution, personal protection measures, risk of inappropriate PPP use for the environment and about the novel technologies that can make farmers' lives easier and their work more efficient;
- Training is needed, so that farmers can consider how to integrate innovative application techniques/technologies in their daily agricultural practices and applications. Furthermore, training assists in staying updated regarding forthcoming innovative new technologies, learning about the use (and practical limitations) of new techniques and technologies;
- Establish a reference framework at EU level in terms of training about good spraying practices that could be adapted to each member state and then adopted by their FAS in order to try and ensure a good and common knowledge base for all EU farmers;
- Provide training support to all stakeholder types: regulators, advisors, farmers (including farmers associations and cooperatives), , contractors, and sprayer and PPP dealers;
- Use the material developed during INNOSETA, including the INNOSETA Platform, to help inform regulators, trainers and advisors, including FAS, throughout the EU and seek opportunities to enhance this material beyond the end of the INNOSETA project.

Expected impact

- Development of trustworthy Farm Advisory System in all member states;
- Continuous demonstration of innovative PPP application techniques and technologies showcasing their tangible benefits, but also their practical limitations, to assist farmers in making a good/relevant investment for their particular farm;
- Bring researchers, advisors and farmers in a common framework, reducing the knowledge and societal gap between them;
- Increasing the knowledge of farmers about innovative PPP application techniques and technologies that can reduce the risks and/or use of PPPs through dissemination of the results of R&D in practical training relevant to their specific situation that would assist them to use their machinery in a correct way in IPM programmes and increase application efficiency and reduce risks to the environment and human health;
- Addressing the need for continuously updated material for the benefit of all agricultural stakeholders (possibly via the continued use of a sustained INNOSETA Platform).

6.6 PB6: Investment Support

What is the challenge?
<p>Investment support is a key point for the forthcoming paradigm shift on crop protection within the EU. The main objective is making public subsidies efficient in order to reach the objectives such as reduction of PPP use and limitation of risk/impacts.</p> <p>Lack of knowledge/advice - the issue of the lack of (appropriate) training was the main identified bottleneck in INNOSETA for all cropping systems and all of the thematic groups (precision spraying, drift reduction, point sources mitigation, operators' risks). A challenge is to find the required numbers of trainers with sufficient expertise, since this does not exist at present.</p>
Policy Recommendations
<ul style="list-style-type: none"> • Evolution of the sprayer fleet: National plans and European Rural Development Plans should include economic incentives to facilitate and encourage the purchase of efficient SETAs. → Initiate financial support for the renewal of Pesticide Application Equipment (PAE) in order to achieve a more sustainable Plant Protection Products (PPP) application. Such subsidies should take into account the potential efficiencies of the SETAs as developed on a EU level - preferably in CEN as mandated under the Machinery Product Regulation; • Invest in spraying training and advices (theory + practice); • Member States (MS) should invest in training courses with practical content on sprayer use and adjustment in practice, for all actors, including policy makers/regulators, advisers, farmers and sprayer operators (sprayer operators, who actually perform the application, should be trained principally be on the practical aspects of the equipment they are using) and should be continually updated so that all actors are aware of the latest R&I on innovative application equipment and techniques that can reduce risks and/or use programs of 'train the trainers' should be setup.
Expected impact
<ul style="list-style-type: none"> • Improvement of the tools available to assist more efficient crop protection (less PPP used, less drift and environmental contamination and more flexibility in the use of alternative); • Improvement of the skills of all the actors involved in plant protection (policy makers/regulators, advisers, sprayer and PPP dealers, farmers and applicators) to ensure a better use of PPP; • Linking subsidies to potential efficiency gains based on harmonised test methodologies developed on a consensual basis by all stakeholders and will build trust among advisers and farmers and increase the uptake of new technologies/techniques while ensuring the good working of the internal market.

6.7 PB7: Harmonization of requirements at EU level in order to support technology uptake

What is the challenge?
<p>In relation to farmers needs on information flows and practices:</p> <ul style="list-style-type: none"> • There are too many different ways in which the information is provided to farmers. Also Member states (MS) practices like treatment methods of residues or calculation methods for buffer zones are differing which makes comparison difficult and makes European action on policy monitoring and evaluation difficult. <p>For novel techniques/technologies on crop protection equipment:</p> <ul style="list-style-type: none"> • Many new and innovative technologies like variable rate and site-specific application technologies have appeared in recent years that can contribute to risk reduction AND use

reduction, with other application techniques and technologies that can reduce risks and/or use in certain application situations available but not yet tested or used in other application situations;

- Research and long term field studies for innovative risk and/or dose reducing application techniques and equipment will be required to demonstrate cost/benefits, in addition to risk and/or use reduction, in specific application situations to justify the investment required by farmers for such new and innovative technologies;
- However often such trials are needed to be done in a particular setup addressing a regional culture of agricultural practices on crop growing, PPP use/application patterns and history and accepted current risk mitigation practices;
- Such trials are indication of the potential of new technologies but lack the basis for comparison that is needed to accelerate uptake across Europe;
- Member States are under pressure to reach the pesticide reduction targets and provide incentives for the use of certain features. Often these incentives are linked to particular tests to prove the potential benefits of the technology with respect to risk and/or use reduction;
- What can be observed currently on the particular topic of drift reduction is expected to be replicated for any new technology in the absence of harmonization: the risk of having to do many different field tests in each country due to deviating requirements for the test methodology and the specific request to make such test with the national testing bodies will result in barriers to trade and thus slow down the effective introduction of new technologies across Europe;
- As it stands, and in support of this, the uptake of new technologies and sophisticated standard equipment is low, despite risk and/or use reduction potential having been proved in certain application situations.

Policy Recommendations

For novel techniques/technologies on crop protection equipment

- Any action must be compatible with the overall political goal of ensuring that farmers/contractors have access to the necessary tools to achieve risk and/or dose reduction in support of the goals of SUD and F2F without trade barriers and at the lowest cost, taking into account the limited resources/capabilities of the small volume crop protection equipment industry which primarily comprises SMEs (sometimes micro-enterprises in the case of specialised equipment);
- Development of harmonised Standards has been accepted as the key method of implementing the 'New Legislative Framework' and offers a transparent and democratic method for all stakeholders to reach consensus on the requirements, with the past 20 years having resulted in a huge number of harmonised Standards covering crop protection equipment to be placed on the European market – with many of these Standards to be revised, and new ones required, due to the development of new innovative equipment for risk and/or dose reduction and the forthcoming revision of SUD (and MPR);
- Promote and support the development of **harmonized test methodologies** that provide reproducible findings on the risk and/or dose reducing performance potential of SETAs, thus helping farmers to take their decision on using spraying equipment, and providing proof by data for Member States to incentivize new technologies without further national restrictions. Mandating CEN to start this work would be a clear signal, particularly as many Standards will need to be revised following the revision of the SUD (and MPR);
- Investigate whether such standards could become **harmonized standards under the Machinery Product Regulation** to support use reduction potential classification.

In relation to farmers needs on harmonized information flows and practices:

- Harmonization of the way to indicate the PPP dosage in the label for 3D crops. In 3D crops, dose expression on the PPP labels is quite different according to countries (single dose in Kg or L/ha in France, % in Spain or Italy, dose according to growth stage in Germany and Switzerland). Those differences in terms of dose expression make difficult the registration process of products when analysing the trials carried out in different countries. A new dose expression (kg or L/10000m² LWA – for Leaf Wall Area) where the dose is expressed according to the quantity of vegetation to protect has been chosen to conduct efficacy around Europe but this new rate expression is not yet planned to appear on national labels although it would lead to dose rate optimisation and the reduction of PPP use;
- Legislation concerning the treatment of residues differs greatly from country to country. For example, France legislated very early to regulate the treatment of pesticide effluents (2006), while this is not yet the case in Italy, Spain or Greece. In France, 18 systems based on different principles (filtration, evaporation, biological degradation, etc.) are authorised for the treatment of residues. Working groups bringing together both authorities and technical experts should be set up to allow easier recognition of these processes from one country to another;
- The standardization of PPP can and packages would lead to facilitate the adoption of CTS (Closed Transfer System) that remain seldom used because of this lack of uniformity;
- Harmonization of the calculation of the width of the buffer zones to be applied in the vicinity of sensitive areas (water and neighbourhood) at European level: until now, while the objective risk is the same, the perceived risks differ from one country to another, depending on the sensitivity of public opinion, and lead to major differences that result in unfair competition between countries.

Expected impact
For novel techniques/technologies on crop protection equipment

- Embedding such harmonized test methodologies in the current applicable legal framework for placing on the market of crop protection equipment would ensure the proper working of the single market and greatly assist uptake of the innovative risk and/or dose reducing technologies that are necessary to achieve the goals of the SUD revision (particularly given the resource constraints faced by SME manufacturers of CPE);
- If the results of the harmonised test methodologies are accepted in all EU Member States for incentive programmes, it will provide the best and quickest means of providing farmers with the full access to all possible available new technologies for risk and/or dose reduction;
- With no additional national restrictions/third party testing/... the affordability as well as the accessibility of such new technologies will increase and will therefore allow a quicker uptake.

Information flow, practices to be complied with by farmers

- Harmonization of the way information is provided, or practices like treatment methods of residues or calculation methods for buffer zones, could play a role in establishing a more level playing field in relation to sustainability overall for the European agricultural production.

7 Annex: Testimonials gathered by Hub Leaders with detailed information that led to the identification of policy gaps and recommendations

Background of the action:

Partners were asked to provide info on more specific aspects when it comes to practice and barriers that technology users are facing while implementing innovative spraying technologies and practices. The main idea behind the testimonials is as follows:

a) Objectives

Policies were reviewed in terms of their **encouragement – or discouragement – of innovation and use of SETAs and the actual uptake of these innovations in practice**. Based on the findings, the project partners will seek to identify potential gaps and produce dedicated policy briefs with specific suggestions.

b) Target group:

This template targets **Project Partners** and, in particular, **Hubs' leaders**. Each Hub Leader provided at least one (and maximum three) example(s) of policy testimonial (one policy testimonial per template) and return this form filled to CEMA. Partners were encouraged to provide examples according to their own experience. They were meant to focus either on successful stories (concrete examples of one/ more of such policy measures that have effectively addressed the challenges while supporting innovative spraying equipment adoption) or failure ones (policy measures that have failed addressing the challenges and/ or supporting innovative spraying equipment adoption), explaining the factors featuring “success” or “failure”.

Collected testimonials are listed in the section 7.1 – 7.5 of this annex.

Highlights of Testimonials produced by the Hubs:

- **BELGIUM Testimonial:** Needs and recommendations for a better implementation of drift mitigation measures and buffer zone rules in Belgium;
- **ITALY Testimonial #1:** Need for update the reference standard for the inspection of sprayers in use EN-ISO 16122, establish a register of sprayers in use and provision of instruments to speed up and harmonize the sprayers inspections among the different Member states and promote the adoption of new SETAs;
- **ITALY Testimonial #2:** Need for a simplification of the procedures to define buffer zones width to help farmers to adopt them. Needs for Economic incentives to boost the upgrade of PAE with drift reducing devices;
- **SWEDEN Testimonial:** Need for an harmonized system for the classification of drift reducing technology across EU; Needs for funding, improvement of approval phases of PPP to take into account the DRT, and take into account precision SETAs in the assessment;
- **GREECE Testimonial:** Needs for the development of extensions services and training/advisory courses;
- **FRANCE Testimonial #1:** Need for Machinery Directive (2009/127/CE) improvement for a better use → The directive defines general objectives for the sprayers, but the means, methods and thresholds to verify that the requirements are fulfilled are not specified. As it stands, the text is not usable.
- **FRANCE Testimonial #2:** Make application parameter dashboard on sprayers mandatory for real time monitoring of application parameters;
- **FRANCE Testimonial #3:** Adapt the mandatory training courses to get PPP licenses for farmers and advisers (Article 5 from the Directive 2009/128/EC) with a practical part dedicated to the “correct sprayer use and adjustment”;

- **SPAIN Testimonial:** Development of practical guides and documents “Manual for inspection of sprayer” to support the inspection of sprayers;
- **POLAND Testimonial:** Signalling and messages in plant protection by development of national projects with the possibility of enlarging the decision support system and constant updating of the plant protection products database.

7.1 Belgium

Testimonials	
1. Basic information	ILVO
2. Policy	<p><i>Topic: The mandatory use of drift reducing equipment (in combination with buffer zones) in Belgium</i></p> <p><i>Legislations involved:</i></p> <ul style="list-style-type: none"> • Belgian buffer zone regulation since 2005: Surface water protection, buffer zone regulation and drift reduction measures - practical guide <ul style="list-style-type: none"> - Dutch: https://fytoweb.be/sites/default/files/guide/attachments/bescherming_van_het_oppervlaktewater_20190620_0.pdf • Flemish IPM guidelines prescribing the mandatory use of a 50% drift technology in Flanders since 2014 and a 1 m crop free zone on all field borders: https://lv.vlaanderen.be/nl/plant/gewasbescherming • Belgian Royal decrees considering the mandatory inspection of sprayers in Belgium (in Dutch & French) <ul style="list-style-type: none"> - Basis document: Royal decree 13/03/2011: https://www.ilvo.vlaanderen.be/Portals/44/documents/KB050411.pdf - Changes to Royal decree of 13/03/2011 <ul style="list-style-type: none"> ▪ 15/01/2014: https://www.ilvo.vlaanderen.be/Portals/44/documents/KB150114_BS120214.pdf ▪ 07/04/2017: https://www.ilvo.vlaanderen.be/Portals/44/documents/KB-BS%202017-04-25.pdf?ver=2017-04-27-154626-813 • <i>Flemish VLIF funding for innovations in agriculture (https://lv.vlaanderen.be/nl/subsidies/vlif-steun-voor-de-land-en-tuinbouw). Among others drift reducing technologies are subsidized (tunnel sprayer, air support, shielded spray boom, row sprayers, lower boom height and nozzle spacing, etc.)</i>
3. Policy issue(s) experienced NOTE: Please indicate	<p><i>The Belgian drift and buffer zone regulation was first introduced in 2005. This regulation prescribed the use of drift reducing technologies along water courses in combination with a buffer zone. The spray-free buffer zone width depends on the PPP and can be further reduced using a technology with a higher drift reduction class.</i></p>

<p>details such as crop type and thematic already identified on the INNOSETA level</p>	<p><i>Today, drift reducing technologies are widely adopted by Belgian farmers although during the implementation process, several challenges/problems occurred:</i></p> <ol style="list-style-type: none"> <i>1. The first years (2005-2010) after the introduction of the drift and buffer zone regulation, the regulation was hardly followed in the field. Main reasons:</i> <ul style="list-style-type: none"> • <i>Farmers were not (well) informed about the new regulation.</i> • <i>Weak or no enforcement of the rules in the field. Variable buffer zones are difficult to inspect.</i> <i>2. Later on (2011-2015), the use of drift reducing techniques gradually increased mainly because of an intensive communication campaign. In addition, the Flemish government prescribed the mandatory use of a 50% drift technology in Flanders since 2014 and a 1 m crop free zone on all field borders (easier to enforce). Still there were some problems/challenges with the wide introduction of drift reducing technology for the following reasons:</i> <ul style="list-style-type: none"> • <i>Farmers remain having questions about the practical feasibility and bio efficacy of drift reducing nozzles although various bio-efficacy trials were performed</i> • <i>Weak or no enforcement of the use of drift reducing technologies in the field. On the other hand, 1 m crop free zones are easier to control.</i> <i>3. More recently (2016-2020), drift reducing technologies were widely introduced among Belgian farmers following the mandatory use of 50% drift reducing technologies and the continuation of the communication campaign in combination with field trials. Today the remaining challenges are:</i> <ul style="list-style-type: none"> • <i>To establish a control system for the mandatory use of drift reducing technologies. The idea is now to check the <u>presence</u> of a drift reducing technology in near future during the mandatory inspection of sprayers.</i> • <i>Some farmers still have questions about the bio efficacy of coarse droplet drift reducing nozzles. That is why there is a need for alternative drift reducing techniques in addition to drift reducing nozzles that are : (i) affordable (w/wo subsidies), (ii) reliable, (iii) user-friendly/fully automatic, (iv) Suitable for various crops and problems. These more innovative techniques are expensive. Subsidies might help to increase their use.</i> • <i>In Belgium, different buffer zone regulations are in place (nitrates, pesticides, cross compliance, ecological focus areas (EFA), etc.) which might also vary between regions. There is a need to simplify and harmonize as far as possible the rules of different buffer zones</i> • <i>There are differences in drift reduction classes (and buffer zone widths) between different EU member states. This is very confusing for farmers as well as for manufactures and dealers. There is a need to harmonize drift and buffer zone legislation at EU level.</i> • <i>The evaluation and registration process for new drift reducing technologies is not very transparent and raises questions for manufacturers. There is need for a clear registration procedure. Again,</i>
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	<p><i>harmonization at EU level would solve this problem especially for a small market such as Belgium.</i></p> <ul style="list-style-type: none"> • <i>Flemish farmers can get VLIF funding for innovations in agriculture, among others for drift reducing. The problems with this VLIF funding are:</i> <ul style="list-style-type: none"> ○ <i>Only farmers have access to VLIF funding. Spray contractors do not have access to VLIF funding although they spray big areas</i> ○ <i>In the VLIF list of accepted drift reducing technologies, you can find technologies which are not accepted in the Belgian drift and buffer zone regulation which is very confusing. One example is the combination of a reduced boom height and nozzle distance.</i>
4. Who are the actors involved?	Farmers, contractors, manufacturers and dealers, advisors and researchers getting a lot of questions, spray nozzle and sprayer manufacturers, policy makers, etc.
5. Recommendation(s) for policy makers	<ul style="list-style-type: none"> • <i>Clear, harmonized and practically achievable legislation</i> • <i>Enforcement of the legislation in the field</i> • <i>Harmonization at EU level of drift and buffer zone regulation and common risk mitigation measures</i> • <i>Intensive communication and training campaign including applied research with field trials</i> • <i>Foresee investment support for sprayer innovations which are in line with the current legislation</i>
6. Any additional comments or support information (factsheets, videos, pictures, presentations, news, etc.)	<i>See above</i>
7. Sources	<i>Lots of contacts with farmers, policy makers, manufacturers, etc. the last years about the Belgian buffer zone and drift regulation</i>

7.2 Italy

Testimonial 1	
1. Basic information	<i>DiSAFA – University of Torino</i>
2. Policy	<i>Inspection of pesticide application equipment</i>

	<p>a) Reference document: Legislative Decree no. 150 of 14/08/2012 https://www.minambiente.it/sites/default/files/dlgs_14_08_2012_150.pdf</p> <p>b) List of sprayer inspection services officially licensed: http://www.laboratorio-cpt.to.it/centri%20prova/</p>
<p>3. Policy issue(s) experienced</p> <p>NOTE: Please indicate details such as crop type and thematic already identified on the INNOSETA level</p>	<p>At present the EN 13790 is the reference Standard to follow for carrying out the inspection of sprayers in use in Italy. It is necessary to update the reference Standard for sprayers inspections to ENISO 16122.</p> <p>There is a need to clearly identify which types of machines for PPP application are to be inspected at regular intervals, but with a different time interval with respect to field crop and air-assisted sprayers.</p> <p>Test methodologies for some pesticide application equipment (e.g., dusters, micro granulators, etc.) are still to be defined as relative EN- ISO Standards are being prepared and are still not available.</p> <p>As PAE inspection is managed at Regional level, differences in number of inspected PAE were observed from Region to Region, and the overall amount of inspected PAE at present is still below 50% of the total number of PAE in use. Consequence is that there are still a lot of not inspected sprayers applying pesticides either on field crops or on vineyards and orchards, with a consistent risk of environmental contamination. Therefore, the adoption of innovative SETAs and virtuous practices enabling to improve precision of application is still limited.</p>
4. Who are the actors involved?	Farmers, sprayers inspectors and advisors.
5. Recommendation(s) for policy makers	Update the reference standard for the inspection of sprayers in use to EN-ISO 16122, establish a register of sprayers in use and provide instruments to speed up and harmonize the sprayers inspections among the different Regions in order to meet the goal of checking all the professional PAE in use at national level and promote the adoption of new SETAs.
6. Any additional comments or support information (factsheets, videos, pictures, presentations, news, etc.)	The new National Action Plan, reporting the update of the methodology for inspection of sprayers in use according to ENISO 16122, should be released by the end of 2021.
7. Sources	

Testimonial 2

1. Basic information	DiSAFA – University of Torino
2. Policy	Risk mitigation measures to protect water and aquatic organisms

	<p>Reference document: National Action Plan 2014 – Section A.5 https://www.minambiente.it/sites/default/files/archivio/allegati/vari/pubbli_PAN.pdf</p>
<p>3. Policy issue(s) experienced</p> <p>NOTE: Please indicate details such as crop type and thematic already identified on the INNOSETA level</p>	<p><i>At level of single communities sometimes local laws are put into force to protect sensitive areas and water bodies with prescriptions of buffer zone widths. Criteria for their definition are not the same from community to community, therefore confusion is high.</i></p> <p><i>Concerning the management of PPP waste water some regions and provinces are envisaging money incentives for the building of well-equipped filling/cleaning areas for sprayers and for the installation of systems for treatment of PPP contaminated liquids at farm or at farms consortium level.</i></p> <p><i>At present there is still not any official definition of buffer zones width according to the crop context in Italy, but only a generic indication regarding the minimum buffer zone width that in any case should be at least 5 meters. A detailed guideline document enabling to calculate the buffer zone distance to respect from water bodies and sensitive areas concerning spray drift and runoff was prepared by a group of experts under the umbrella of Ministry of Public Health. It was published in 2017. To date it has still to be officially included in the new National Action Plan that will be released in the next months.</i></p> <p><i>Nowadays farmers are confused as they have prescriptions about buffer zone widths on the PPP labels with possible widths reduction linked to the capability of PAE used to reduce by 25%, 50%, 75% or 90% the amount of spray drift. Nevertheless, without an official classification of spraying equipment according to drift risk, they do not know which buffer width they shall maintain. The DiSAFA – University of Torino has promoted a test methodology to assess potential spray drift from field crop sprayers (ISO 22401) and from air-assisted sprayers (UNI 11797) in order to build such classification, but an official recognition from the Ministries of Agriculture, Environment and Public Health should be released.</i></p> <p><i>Moreover, it is not clear who can make controls in the field about the respect of buffer zones. The local communities' laws further complicate the situation.</i></p>
<p>4. Who are the actors involved?</p>	<p><i>Farmers, advisors, public authorities, PPP companies.</i></p>
<p>5. Recommendation(s) for policy makers</p>	<p><i>A simplification of the procedure to define buffer zones width would help in making farmers more available to adopt them. Economic incentives should be foreseen to boost their implementation on wide scale and to upgrade PAE with drift reducing devices (not only air induction nozzles, but also shields, air sleeves on boom sprayers, system to close the air flow on one side of the air-assisted sprayers, etc.)</i></p> <p><i>It is needed an official recognition of the allowed systems to manage PPP contaminated water (residues of spray mixtures, washings of sprayer and of PPP containers) at farm level. Incentives to equip farms with adequate</i></p>

	<i>sprayer filling/cleaning areas enabling to collect contaminated water would help in the adoption of virtuous practices.</i>
6. Any additional comments or support information (factsheets, videos, pictures, presentations, news, etc.)	<i>The new National Action Plan, likely reporting more detailed guidelines about management of buffer zones and for the classification of PAE according to drift risk, should be released by the end of 2021.</i>
7. Sources	

7.3 Sweden

Testimonial	
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1. Basic information	VISAVI
2. Policy	Lack of harmonized system for classification of drift reducing technology
3. Policy issue(s) experienced NOTE: Please indicate details such as crop type and thematic already identified on the INNOSETA level	<p>Sweden has a system for classification of drift reducing equipment and calculating size of buffer zones, based on German JKI approval. Since ca 10 years this system has been used by Chemical Inspectorate to be able to approve products that otherwise would need so big buffer zones that they would not be approved. Classes 25,50, 75, 90 and 99% drift reduction has been used. Sizes of buffer zones shall be determined as if the DRT was not used, leading to a 25-99 % reduction of PPP outside the field. This is a mandatory requirement which is also controlled by local authorities checking spray records and available technology.</p> <p>Since only equipment approved by JKI is recognized it leads to misunderstandings and frustration among industry and farmers that equipment approved in other countries is not approved. If manufacturer has not invested in tests also in Germany they are shut out of the market.</p> <p>It leads to reduced available technologies on the Swedish market.</p>
4. Who are the actors involved?	Farmers, contractors, machine industry, advisors and audit staff.
5. Recommendation(s) for policy makers	<p>Funding is essential to get test institutes possibilities to compare drift reduction systems in order to harmonize systems. It could be via anchor points.</p> <p>It is important that the drift reduction is connected to the methods/models in approval phase of plant protection products to be able to really quantify the mitigation.</p>

	<p>Harmonization connected to international standards.</p> <p>A way of reducing drift is to spray less area and with higher precision. There is a need to define “Precision agriculture” and set performance criteria to be able to compare and use criteria for financial support systems in order to renew and improve the fleet of sprayers over Europe.</p>
6. Any additional comments or support information (factsheets, videos, pictures, presentations, news, etc.)	
7. Sources	<p>mitigating-spray-drift-in-sweden-29-april-2014 (4).pdf</p> <p>Eskil Nilsson, VISAVI. Advisor.</p>

7.4 Greece

Testimonial	
1. Basic information	Greek Hub (AGENSO/AUA/CERTH)
2. Policy	Provide extension services and training/advisory courses
3. Policy issue(s) experienced NOTE: Please indicate details such as crop type and thematic already identified on the INNOSETA level	<p>The size of the majority of Greek farms is characterized as small to medium regarding the land area coverage. Thus, the increased number of farmers leads to significant differences between the agricultural practices applied as well as the adoption and implementation of the current measures and technologies that contribute to the establishment of sustainable and viable agriculture for the future.</p> <p>Extension services in Greece are mainly given by private entities and individuals with the danger of biased information flow derived by possible personal benefits of these actors. At the same time, state extension is not functioning in a regular and consistent manner. Therefore, it is suggested to enforce the state system by developing a common scheme between state authorities, Universities and Research Centres, as well as private consultants after accreditation and continuous training of the trainers. Especially regarding the expertise of Universities and Research Centres, since they have a high geographical distribution in the country, it is suggested that they act as points of interest for all farmers with continuous flow of information either by forming their extension service department or by integrating them in a national system organized by the Ministry of Rural Development and Food. Such a unified system can bring training and technology transfer to the farmers for all agricultural practices.</p>

	<p>Specifically for spraying techniques and technologies, such a system can provide information flow about point and diffuse sources of pollution, personal protection measures, the dangers of inappropriate PPP use for the environment and new technologies that can make farmers' lives easier and their work more efficient.</p> <p>Finally, training is needed, so that farmers can integrate the aforementioned services in their daily agricultural practices and applications. Furthermore, training assists in staying updated regarding innovative new technologies, learning about new techniques and methodologies. Promotion of training related to novel equipment and tools in addition with corresponding subsidies are needed, so that their acquisition, proper use and calibration can be guaranteed.</p>
4. Who are the actors involved?	Farmers, advisors, academics
5. Recommendation(s) for policy makers	Development of customized extension services for farmers and mainly smallholders and execution of seminars/workshops/activities with training and instructive purposes, for gaining the optimum benefit and better utilization by the integration of the aforementioned extension services provided by independent entities such as Universities and Research Centres.
6. Any additional comments or support information (factsheets, videos, pictures, presentations, news, etc.)	
7. Sources	INNOSETA Regional Innovation Workshops in Greece

7.5 France

Testimonial 1	
1. Basic information	IFV - French Institute for Vine and Wine
2. Policy	Directive 2009/127/EC of the European Parliament and of the Council of 21 October 2009 amending Directive 2006/42/EC with regard to machinery for pesticide application
3. Policy issue(s) experienced	This directive from 2009 aims at defining prerequisites for the construction and sale of machines dedicated to pesticide application on the European territory.
NOTE: Please indicate details such as crop type and thematic already identified on the INNOSETA level	The objectives of the directive are clearly defined (see text in bold): "The design, construction and maintenance of machinery for pesticide application play a significant role in reducing the adverse effects of pesticides on human health and the environment.... This Directive is limited to the essential requirements with which

	<p>machinery for pesticide application must comply before being placed on the market and/or put into service</p> <p><u>2.4. MACHINERY FOR PESTICIDE APPLICATION</u></p> <p>The manufacturer of machinery for pesticide application [...] must ensure that an assessment is carried out of the risks of unintended exposure of the environment to pesticides [...] Machinery for pesticide application must be designed and constructed taking into account the results of the risk assessment referred to in the first paragraph so that the machinery can be operated, adjusted and maintained without unintended exposure of the environment to pesticides. Leakage must be prevented at all times.</p> <p><u>2.4.3. Controls and monitoring</u> - It must be possible to easily and accurately control, monitor and immediately stop the pesticide application from the operating positions.</p> <p><u>2.4.4. Filling and emptying</u> - The machinery must be designed and constructed to facilitate precise filling with the necessary quantity of pesticide and to ensure easy and complete emptying, while preventing spillage of pesticide and avoiding the contamination of the water source during such operations.</p> <p><u>2.4.5. Application of pesticides</u></p> <p><u>2.4.5.1. Application rate</u> - The machinery must be fitted with means of adjusting the application rate easily, accurately and reliably.</p> <p><u>2.4.5.2. Distribution, deposition and drift of pesticide</u></p> <p>The machinery must be designed and constructed to ensure that pesticide is deposited on target areas, to minimize losses to other areas and to prevent drift of pesticide to the environment. Where appropriate, an even distribution and homogeneous deposition must be ensured.</p> <p><u>2.4.5.3. Tests</u></p> <p>In order to verify that the relevant parts of the machinery comply with the requirements set out in sections 2.4.5.1 and 2.4.5.2 the manufacturer or his authorized representative must, for each type of machinery concerned, perform appropriate tests, or have such tests performed.</p> <p>The Directive Machinery Directive (Directive 2006/42/EC and amendment Directive 2009/127/EC) indicates that manufacturers must perform tests of the machines to justify he fulfills the requirements prescribed in the chapter “<i>Distribution, deposition and drift of pesticide</i>”. However, while the objectives are defined, the means, methods and thresholds to verify that the requirements are fulfilled are not specified. However, while the objectives are defined, the means, methods and thresholds are not specified.</p> <p>This regulation applies to sprayers for every cropping system (orchard, vineyard, field crops, greenhouses).</p>
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4. Who are the actors involved?	State, manufacturers, research Institutes
5. Recommendation(s) for policy makers	<p>The recommendation for policy makers is to create a working group at EU level, including experts in pesticide application from the different state members (as we can find in INNOSETA project) and to ask for defining the methodologies and thresholds to be used for the test of the sprayers. It deals with the definition of the requirements.</p> <p>From IFV's point of view, those high level requirements will help to:</p> <ol style="list-style-type: none"> 1) protect the European machinery market; 2) contribute to high efficiency agriculture in the future.
6. Any additional comments or support information (factsheets, videos, pictures, presentations, news, etc.)	
7. Sources	EUR-Lex - 32009L0127 - EN - EUR-Lex (europa.eu)

Testimonial 2	
1. Basic information	IFV - French Institute for Vine and Wine
2. Policy	Mandatory application settings dashboard on sprayers for real time monitoring of application parameters and traceability
3. Policy issue(s) experienced NOTE: Please indicate details such as crop type and thematic already identified on the INNOSETA level	<p>Make it compulsory for sprayers sold on EU territory to be fitted with devices allowing continuous monitoring of application parameters (forward speed, pressure, flow rate on the left and right sections, volume rate) as well as their geo-localized recording for traceability.</p> <p>Most sprayers sold today, especially for orchard and vineyards, are simply equipped with a rudimentary control, which is a simple pressure gauge on the circuit placed on the sprayer and therefore far from the producer's control post.</p> <p>Pressure is too indirectly linked to the volume/ha and the dose actually applied. Simply knowing the pressure alone does not guarantee compliance with application instructions and does not make it possible to identify technical incidents (nozzle clogging, nozzle wear, speed problems, etc.). One of the challenges is to give producers the possibility of carrying out precise control of spraying with appropriate devices.</p>

	This proposal applies to sprayers for every cropping system (orchard, vineyard, filed crops, greenhouses).
4. Who are the actors involved?	State, manufacturers, research Institutes,
5. Recommendation(s) for policy makers	Make it mandatory to sell new sprayers with devices allowing to control and record spraying parameters. It will be useful for farmers to give them the means to control the quality of spraying to help farmers to prove that spraying has been operated in the respect of the rules (Buffer zone, ...)
6. Any additional comments or support information (factsheets, videos, pictures, presentations, news, etc.)	
7. Sources	

Testimonial 3

Testimonial 3	
1. Basic information	IFV - French Institute for Vine and Wine
2. Policy	In the mandatory training courses to get PPP licenses for farmers and advisers (Article 5 from the Directive 2009/128/EC), it should be mandatory to foresee a practical part dedicated to “correct sprayer use and adjustment”. This would support the improvement of spray application methods and get positive impacts on savings PPPs and in terms of less environmental contamination.
3. Policy issue(s) experienced NOTE: Please indicate details such as crop type and thematic already identified on the INNOSETA level	<p>All stakeholders agree that there is a need to better train Growers but also Trainers and advisors in application technology and sprayers.</p> <p>Article 5 of Directive 2009/128/EC related to training</p> <p>1. Member States shall ensure that all professional users, distributors and advisers have access to appropriate training by bodies designated by the competent authorities. This shall consist of both initial and additional training to acquire and update knowledge as appropriate.</p> <p>The training shall be designed to ensure that such users, distributors and advisers acquire sufficient knowledge regarding the subjects listed in Annex I, taking account of their different roles and responsibilities.</p> <p>certificates shall, as a minimum, provide evidence of sufficient knowledge of the subjects listed in Annex I acquired by professional</p>

	<p>users, distributors and advisors either by undergoing training or by other means.</p> <p>Certification systems shall include requirements and procedures for the granting, renewal and withdrawal of certificates.</p> <p>3. Measures designed to amend non-essential elements of this Directive relating to amending Annex I in order to take account of scientific and technical progress shall be adopted in accordance with the regulatory procedure with scrutiny referred to in Article 21(2).</p>
4. Who are the actors involved?	State, manufacturers, research Institutes
5. Recommendation(s) for policy makers	<ul style="list-style-type: none"> • Add explicitly subjects related to “correct Sprayer use and calibration” in the list of subjects listed in Annex 1 for mandatory training. • Ask country members to define a common framework and training resources concerning sprayers calibration and use • Add a significant training on “the correct use of sprayers and setting” to get the license to use PPP
6. Any additional comments or support information (factsheets, videos, pictures, presentations, news, etc.)	
7. Sources	https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32009L0128&from=FR

7.6 Spain

Testimonial 1	
1. Basic information	<i>UPC – Polytechnic University of Catalonia</i>
2. Policy	<p><i>Inspection of pesticide application equipment</i></p> <p><i>c) Reference document: Real Decreto 1702/2011 about mandatory inspection of sprayers in use.</i> <i>https://www.boe.es/eli/es/rd/2011/11/18/1702/con</i></p> <p><i>d) Manual for inspection of sprayers. Official document available at:</i> <i>https://www.mapa.gob.es/en/agricultura/publicaciones/manual_inspeccion.aspx</i></p>

<p>3. Policy issue(s) experienced</p> <p>NOTE: Please indicate details such as crop type and thematic already identified on the INNOSETA level</p>	<p><i>In Spain, EN 16122 series for inspection of sprayers in use became mandatory after the publication of the new standards. Ministry of agriculture, in collaboration with Polytechnic University of Catalonia (UPC, project coordinator) established the basis for the publication of the Official manual for inspection of sprayers in use according ISO 16122 series.</i></p> <p><i>Knowing the difficulties to implement and follow with success all the requirements established at ISO 16122, UPC developed a practical guide which became the official document to follow the mandatory inspection program in Spain.</i></p> <p><i>The document is available at the Ministry of Agriculture website and it has been distributed for all the attendants to the mandatory training courses for inspectors (more than 3000).</i></p> <p><i>Following the example of this manual, Ministry of Agriculture in Spain also developed a series of guidelines for inspection of other type of sprayers not included in the standards.</i></p>
<p>4. Who are the actors involved?</p>	<p>sprayers inspectors, advisors, local authorities, Ministry of Agriculture, trainers at mandatory training courses.</p>
<p>5. Recommendation(s) for policy makers</p>	<p>The example of practical document as the Manual for inspection of sprayers in use has been positively referred during the official audit about the implementation of the Sustainable Use Directive in Spain. This fact has been linked and recognized as a clear and positive training activity, demonstrating once more how important is a well-structured training program.</p>
<p>6. Any additional comments or support information (factsheets, videos, pictures, presentations, news, etc.)</p>	<p>Following this interesting initiative, it has been arranging something similar concerning the accomplishment of ISO 16119. In this sense another manual has been arranged and produced by UPC in collaboration with the Spanish Association of Agricultural Machinery Manufacturers (ANSEMAT).</p>
<p>7. Sources</p>	<p>www.uma.deab.upc.edu</p>

Testimonial 2	
<p>8. Basic information</p>	<p>UPC – Polytechnic University of Catalonia</p>
<p>9. Policy</p>	<p><i>Inspection of pesticide application equipment</i></p> <p><i>e) Reference document: Real Decreto 1702/2011 about mandatory inspection of sprayers in use.</i> https://www.boe.es/eli/es/rd/2011/11/18/1702/con</p> <p><i>f) PRITEAF - http://lamaagri.unizar.es/Priteaf</i></p>

<p>10. Policy issue(s) experienced</p> <p>NOTE: Please indicate details such as crop type and thematic already identified on the INNOSETA level</p>	<p><i>Once the official Manual of inspection of sprayers in use was officially published in Spain by Ministry of Agriculture (see testimonial 1) it was detected the absolute need to develop a harmonized and common software to manage all the data regarding the inspection of sprayers in use.</i></p> <p><i>For this purpose, University of Zaragoza developed PRITEAF, a dedicated software specifically designed to manage all the data (technical and administrative data) to organize the inspection of sprayers in use in Spain.</i></p> <p><i>The software has been developed by the University of Zaragoza (xx) and it is freely available in four different languages.</i></p> <p><i>The structure of PRITEAF software follows the structure of Manual of inspections and those two initiatives have been positively mentioned in the official EC audit about the implementation of SUD in Europe.</i></p>
<p>11. Who are the actors involved?</p>	<p>sprayers inspectors, advisors, local authorities, Ministry of Agriculture, trainers at mandatory training courses.</p>
<p>12. Recommendation(s) for policy makers</p>	<p>The example of this practical software has been positively referred during the official audit about the implementation of the Sustainable Use Directive in Spain. This fact has been linked and recognized as a clear and positive training activity, demonstrating once more how important is a well-structured training program.</p>
<p>13. Any additional comments or support information (factsheets, videos, pictures, presentations, news, etc.)</p>	
<p>14. Sources</p>	<p>http://lamagri.unizar.es/Priteaf</p>

7.7 Poland

Testimonial	
<p>8. Basic information</p>	<p>ZODR</p>
<p>9. Policy</p>	<p>Signaling and messages in plant protection</p>
<p>10. Policy issue(s) experienced</p> <p>15. NOTE: Please indicate details such as crop type and thematic already identified on the INNOSETA level</p>	<p>PEST SIGNALING PLATFORM</p> <p>As of March 14, 2020, the rules for signaling the occurrence of harmful pests have changed.</p> <p>The Act of February 13, 2020 on the protection of plants against pests (Journal of Laws of 2020, item 424) increased the supervision of the State Plant Health and Seed Inspection Service over quarantine pests,</p>

	<p>while limiting the remaining tasks in the area of low phytosanitary risk to control over the presence of non-quarantine pests not yet present in the territory of the Republic of Poland.</p> <p>In view of the above, the Internet Agrophage Signaling System has been disabled (so far available at: https://piorin.gov.pl/sygn/start.php).</p> <p>However, the signaling of the presence of selected harmful organisms is still carried out as part of the Long-Term Programs of the Institutes:</p> <p>1. Institute of Plant Protection - National Research Institute in Poznań on the website maintained by this Institute: Agrophage Signaling Platform (https://www.agrofagi.com.pl/).</p>
11. Who are the actors involved?	Farmers
12. Recommendation(s) for policy makers	The decision support systems in integrated pest management developed under the eDWIN project will include: potato blight in potatoes, beetroot agriculture, beetroot tassel, horsetail, brown rust, potato blight in tomatoes, Colorado potato beetle, fungal diseases in winter wheat, powdery mildew in winter barley, dry rot of brassica in oilseed rape. The project is of a developmental nature with the possibility of enlarging the decision support system and constant updating of the plant protection products database.
13. Any additional comments or support information (factsheets, videos, pictures, presentations, news, etc.)	
14. Sources	https://zodr.pl/download/wiadomosci/projekt-edwin.pdf http://piorin.gov.pl/platforma-sygnalizacji/