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Compendium of conditions of use to reduce exposure and risk from plant protection products

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Contents

1. Introduction	4
2. Objectives and scope	5
3. Categories of conditions of use to reduce exposure and risk	6
4. How to integrate conditions of use in the regulatory processes under Regulation (EC) No 1107/2009	9
4.1. Application dossiers	9
4.2. Risk assessment.....	10
4.3. Risk Management.....	10
4.4. Challenges for mutual recognition and the need for harmonisation	12
5. List of conditions of use for plant protection products to reduce exposure	14
6. Future developments: Research projects on conditions of use to reduce exposure ..	15

1. INTRODUCTION

For a fair, healthy, and environmentally friendly food system, the Green Deal ⁽¹⁾ and the Farm to Fork Strategy ⁽²⁾ aim to reduce by 50% the use and the risk of chemical plant protection products by 2030. The Biodiversity Strategy 2030 ⁽³⁾ sets the objective of providing space for wild animals, plants, pollinators, and natural pest regulators by mobilizing at least 10% of agricultural area under high-diversity landscape features including for instance setting buffer zones where plant protection products cannot be applied.

Plant protection products (PPP) are regulated in the EU via the Regulation (EC) No 1107/2009 ⁽⁴⁾, which sets rules and procedures for placing on the market of plant protection products, and the Sustainable Use Directive 2009/128/EC (hereafter referred to as “the SUD”⁽⁵⁾), which provides measures to reduce risks and impacts of pesticide use on human health and the environment and encourages the development and introduction of integrated pest management (IPM) and alternative techniques to reduce dependency on pesticides.

Under the Regulation (EC) No 1107/2009, plant protection products (and the active substances contained in them) are authorised under specific conditions that ensure safe use. Conditions of use for plant protection products are described in the Good Agricultural Practice (GAP) table which serves as a basis for the approval of each active substance and each PPP use authorisation, and in the conditions of approval and authorisation once they are granted. The user of PPP is obliged to implement these conditions of use to ensure a safe use, reducing the exposure and avoiding risk to humans and the environment.

During the last years, there has been a significant development of application techniques that contribute to reduce the human and the environmental exposure such as precision application technologies, drift reduction techniques, drones, among others. Many of these application technologies are already available or are ready to be placed on the market and used. Furthermore, these technologies can contribute to achieve the objectives of reduction of pesticide uses and risks set by the Green Deal, and the Farm to Fork and Biodiversity Strategies. However, in most of the cases quantitative and qualitative data have to be made available for a detailed consideration of these techniques during risk assessment of plant protection products.

(1) https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en

(2) https://ec.europa.eu/food/horizontal-topics/farm-fork-strategy_en

(3) https://eur-lex.europa.eu/resource.html?uri=cellar:a3c806a6-9ab3-11ea-9d2d-01aa75ed71a1.0001.02/DOC_1&format=PDF

(4) <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02009R1107-20221121>

(5) <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:02009L0128-20091125>

2. OBJECTIVES AND SCOPE

This compendium ⁽⁶⁾ lists conditions of use for plant protection products (PPP) that can reduce human and environmental exposure – and thereby mitigate the risks of the use of PPP - needed for authorisation of PPP.

In the short term, this compendium aims to be the starting point for further mapping and validation of the available conditions of use and specific technologies to reduce exposure from pesticides in the European Union. The specific and innovative conditions of use could be considered in the risk assessment and in the regulatory decision making of plant protection products, encouraging harmonisation. It is intended to update this document regularly to keep pace with technical and regulatory innovation.

Personal protective equipment, specific spraying technologies (including precision application techniques), application rates, time restrictions for the applications, indoor uses and other land use measures as buffer zones, are examples of conditions of use included in the document. Practices to prevent risks of phytotoxicity or practices recommended by integrated pest management which need to be implemented before the use of any plant protection products in order to reduce dependency on pesticides (for instance the use of resistant varieties, the sowing density of the crop, or fertilisation regimes) are not in the scope of this document since they are not considered for the risk assessment/management of active substances/plant protection products.

This document also describes the role that these conditions of use may play in different steps of the regulatory context process, i.e., risk assessment and regulatory decision making of active substances and plant protection products.

(6) This document was developed by the European Commission with support of a working group of experts from Member States and the European Food Safety Authority (EFSA) and the Standing Committee on Plants, Animals, Food and Feed. The draft document was also consulted with relevant stakeholders via an ad-hoc working group of the Advisory Group on the Food Chain and Animal and Plant Health.

3. CATEGORIES OF CONDITIONS OF USE TO REDUCE EXPOSURE AND RISK

Conditions of use to reduce exposure of human and the environment– and therefore risk- are very diverse. Personal protective equipment, specific spraying technologies, application rates, time restrictions during the applications, pre-harvest intervals, indoor use and other land use measures as buffer zones are some examples. They can be set during the whole life cycle of a PPP from the formulation of the product, to mixing and loading, application phase, up to storage and disposal. When setting specific conditions of use, the efficacy of the product should be maintained.

In general, these conditions can be categorized into:

1. **Formulations:** specific types of formulations of PPP to reduce environmental and human exposure. For example, formulations that make the PPP easier to handle or apply, reduce dust from a granular PPP, reduce spray drift or vapor or reduce the impurities of concern. This is up to manufacturers to propose the most appropriate formulation types fitting the conditions of use. This is up to authorities to impose specifications for relevant impurities, to restrict the use to certain types of formulation where exposure is minimal.
2. **Packages:** the type of packaging in which the product is/will be supplied may reduce the human exposure. For instance, water-soluble bags and ready-to-use packaging (used mainly for non-professionals users).
3. **Personal protective equipment:** conditions of use that aim to reduce the exposure of humans - of operators ⁽⁷⁾ and workers ⁽⁸⁾. They usually help to reduce skin, eye, or respiratory exposure to the PPP. The most used are skin and eye protective equipment (gloves, coveralls, safety shoes, helmets, and goggles) and respiratory protective equipment (masks, respirators).



Figure 1. Goggles and mask



Figure 2. Coverall and gloves

(7) operators: are involved in activities relating to the application of a plant protection product, such as mixing, loading, application, or relating to cleaning and maintenance of equipment containing a plant protection product; operators may be professionals or amateurs.

(8) workers: as part of their employment, enter an area that has previously been treated with a plant protection product or who handle a crop that has been treated with a plant protection product.

4. **Technical conditions of the plant protection product application:** conditions of use that aim to reduce the human and/or environmental exposure during the mixing and loading or application phase. For instance, soil injection, closed transfer systems ⁽⁹⁾, spray drift reduction technologies, shielded sprayers ⁽¹⁰⁾, shielded and precision granule dispensers, tractor cabins, tunnel sprayers or post-treatment protection methods (plastic covering fumigated soils). Among the technical conditions for pesticides application, **nozzles** are widely used in combination with other spraying equipment. Drift reduction strategies typically combine specific drift reducing nozzles with parameters such as liquid pressure, velocity, and height above the culture. This technology aims to reduce the drift of PPP to non-target areas, reducing the human (bystanders/residents) and environmental exposure. Depending on the mechanism of droplet generation, three main general categories of nozzles can be distinguished: hydraulic nozzles; pneumatic atomizers and spinning disc (rotary) atomizers.



Figure 3. Closed transfer system



Figure 4. Different types of nozzles



Figure 5. Spraying machinery with nozzles

5. **Restrictions in time:** conditions of use that aim to reduce the human and/or environmental exposure restricting the use of the plant protection product to specific seasons (e.g., only from March till October or every second or third year) or time during the day (e.g., only applications during the morning), or growth stage of the crop (e.g., only during pre-flowering). Other examples are specific safety intervals between the last application and for instance the sowing/planting of the crop to be protected or the succeeding crops; the re-entry intervals ⁽¹¹⁾ to the treated area are also considered in this category.
6. **Field management and restrictions in space:** conditions of use that aim to reduce the exposure of environmental compartments in reach of the field where the PPP are applied or in its surroundings; these restrictions in space would also reduce the human exposure of

(9) Close transfer systems: remote handling systems avoiding contamination and spillage of PPP during the pouring to the tank of spraying equipment, possibly coupled with a self-cleaning transfer system for liquid PPPs. Close transfer systems enable the users to proceed with a partial or complete transfers of PPP in the tank.

(10) Shielded sprayers: sprayer provided with covers to contain the dispersion of droplets around the nozzles/atomizers. Shields can be present either on boom sprayers used on field crops or on band sprayers used along crop rows (also in vineyards and orchards, or on fruit crop over the row sprayers).

(11) As defined by EFSA: Safe re-entry interval: The specific time point post application, from which the worker exposure levels calculated for the relevant re-entry tasks are lower than the AOEL considering the different PPE cases depending on the transfer coefficients (TC) availability.

bystanders⁽¹²⁾ and residents⁽¹³⁾. This category refers to practices to adapt the spatial organisation of the crop and/or its surroundings (in and off-field). Examples of the most used in the EU are buffer zones⁽¹⁴⁾, vegetated field margins or banded applications. This could also include cultivation in permanent greenhouses⁽¹⁵⁾ as they lead to a reduced exposure on human health and the environment. Other restriction on the use of plant protection products in certain catchment areas can be set due to the risk from metabolites on groundwater. This can also concern restrictions in the chosen rotational crops or following crops.



Figure 6. Buffer zones areas to protect water courses



Figure 7. Vegetated strips within the field



Figure 8. Vegetated field margins

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- (12) Bystanders: people who casually are located within or directly adjacent to an area where application of a plant protection product is in process or has taken place, but not for the purpose of working on the treated area or with the treated commodity.
- (13) Residents: are people who live, work or attend any institution near to areas that are treated with plant protection products, but not for the purpose of working on the treated area or with the treated commodity/
- (14) No-spray areas of a defined width that extend from the downwind edge of an area where PPP are applied to the closest edge of a sensitive aquatic or terrestrial habitat. It acts as a natural barrier, preserving adjacent sensitive areas from spray drift contamination especially water bodies.
- (15) According to the Art 3.27 of the legislation 1107/2009 'greenhouse' means a walk-in, static, closed place of crop production with a usually translucent outer shell, which allows controlled exchange of material and energy with the surroundings and prevents release of plant protection products into the environment.

4. HOW TO INTEGRATE CONDITIONS OF USE IN THE REGULATORY PROCESSES UNDER REGULATION (EC) No 1107/2009

Under Regulation (EC) No 1107/2009, active substances are approved or renewed at the European level based on at least one representative use that entails certain conditions of use. Once active substances are approved, Member States may authorise uses of plant protection products that contain the approved active substance. These authorisations can be granted for other uses than the representative uses and therefore can entail other conditions of use, within the context of the approval conditions agreed at EU level. Furthermore, Member States can impose complementary conditions of use based on their specific environmental and regulatory (e.g., SUD, CAP) conditions.

In this context, conditions of use to reduce exposure and ensure a safe use can be integrated in the regulatory processes under Regulation (EC) No 1107/2009 for 1) the approval or renewal of an active at the EU level and 2) the authorisation of a plant protection product at Member State level. In both cases, this can be done during the preparation of the dossier, the risk assessment and/or the risk management process.

4.1. Application dossiers

When preparing the application dossier for approval/renewal or authorisation, the **applicant** must describe the representative use(s) in the GAP table, detailing any relevant conditions of use. The risk assessment and regulatory decision making will be based on the representative use(s).

Usually, the GAP table covers the following information: crop, location (field, greenhouse, or in-door), pest to be controlled, kind of application (e.g., spraying, fogging, seed treatment), timing of application (e.g., ranges of BBCH and/or crop stage), number (range) of applications as well as rate (ranges) of application.

Based on the hazard properties of the active substance and the product as well as the route and the level of exposure resulting from the proposed use, the applicant may consider whether the representative use(s) represents specific conditions which reduce the human/and or environmental exposure or needs additional specific conditions to reduce such exposure to ensure a safe use. Such conditions may also include innovative application techniques.

According to the General Food Law ⁽¹⁶⁾, the applicant may request a pre-submission meeting with the RMS and EFSA to discuss the dossier. The document on problem formulation ⁽¹⁷⁾ may provide guidance during such pre-submission meetings as regards the need of exposure reduction of humans, certain environmental compartments and/or non-target organisms and/or if additional data would be needed to demonstrate exposure or exposure reduction. The data included in the dossier shall describe the routes of exposure of humans and the environment and confirm the exposure and/or exposure reduction deriving from the conditions of use. The responsibility of the applicant is to demonstrate that the proposed tool or measure will effectively reduce the level of the identified route of exposure causing the concern (i.e., the exposure that would lead to an unacceptable risk without the proposed measure) to ensure a safe use.

(16) <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:02002R0178-20220701>

(17) PAFF-PPL-January 2024-Doc.A.07.01 available at [c4d6b7df-b7f9-4b3b-8ce5-b823ccdcf98c_en \(europa.eu\)](https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:02002R0178-20220701)

At the EU level, there are several on-going initiatives to collect, generate and validate data on the exposure reduction performance of different conditions of use including precision application techniques. For specific cases, applicants, Member States, EFSA and risk managers may refer to these data. It is intended to update this document with the information generated by these initiatives to keep pace with technical and regulatory innovation.

In case of innovative techniques or conditions of use not yet included in this compendium or not yet used to address a specific compartment the information to prove the effectiveness of these proposed risk mitigation measures shall be included in the dossier on an ad-hoc basis as described above, e.g., following pre-submission advice.

4.2. Risk assessment

The qualitative and quantitative information of the specific conditions of use shall become part of the draft assessment/renewal assessment report (DAR/DRAR) and be duly discussed during the peer review.

Based on the conclusions drawn by the RMS in the DAR/DRAR, the European Food Safety Agency (EFSA) can propose specific conditions of use during the peer-review process, specifying where possible in its conclusions the risk mitigation factors that are deemed necessary to fulfil the protection goals set by the Regulation (EC) No 1107/2009 (**Article 12(2)** of the Regulation: “*Where appropriate, the Authority shall address in its conclusion the risk mitigation options identified in the draft assessment report.*”)

Most of the conditions of use when applied in practice are expected to reduce the exposure of several environmental compartments and/or human beings. For instance, use of drift reducing technology/nozzles in the treated area can reduce exposure to surface water, and at the same time the exposure of non-target organisms, bystanders, and residents.

Such multiple effects of conditions of use on various compartments need to be considered during the risk assessment and decision making. In some cases, limitations may be linked with some conditions of use, in particular with the technical ones: influence on the quality of the spraying events for the crops (drift reduction nozzles may increase the size of the droplets, reducing the efficacy for some categories of PPP), and “trade-offs” (for instance nets to reduce the drift may increase secondary exposure of workers).

4.3. Risk Management

Article 6(i) of the Regulation states that the “*approval (of an active substance) may be subject to conditions and restrictions including: (...) (i) the need to impose risk mitigation measures and monitoring after use*”. In addition, several other provisions refer to risk mitigation measures which may address risks associated with water metabolites (Article 3 (37)), negligible exposure (Article 4(7) and Annex II), the qualification as low-risk substance (Article 22) or low-risk plant protection product (Article 47) or to identify alternative plant protection practices to support the substitution of active substances (identified as candidate for substitution) after comparative assessment (recital 19, Article 50).

In this context, **risk mitigation measures are understood as the conditions of use that risk managers impose during the approval/renewal of active substances or the authorisation of plant protection products to ensure safe use fulfilling the protection goals set by the**

Regulation (EC) No 1107/2009. Thus, based on the outcome of the risk assessment and following the recommendation of EFSA (see previous reference to Article 12(2)), the European Commission and/or the National Competent Authority when acting as risk manager can impose risk mitigation measures.

In some cases, several risk mitigation measures might be necessary to reach the level of exposure reduction set at the EU level. In particular, technical conditions of use (specific application equipment or drift reducing technology) can be combined with field management conditions (buffer zones) to reach certain exposure reduction. Some Member States have validated different combinations of conditions of use, and they have created national lists of risk mitigation measures to be used in the authorisation of plant protection products, for instance:

- Czech Republic: Information on personal protective equipment ⁽¹⁸⁾ and Protective distances to protect people / buffer zones - people (bystanders, residents) ⁽¹⁹⁾
- Belgium: Recommendation towards protection of surface waters by professional users of Pesticides ⁽²⁰⁾
- The Netherlands: Methodology to derive risk performance factors for drift reducing nozzles (DRN) and classes of DRN ⁽²¹⁾
- The Netherlands: Classes of purification stations of aquaponics systems in greenhouses ⁽²²⁾
- Germany: Information on personal protective equipment ⁽²³⁾ and list of different drift reduction nozzles ^{(24) (25) (26)}
- France: List of spray drift control equipment ⁽²⁷⁾
- Sweden: Mitigating spray drift with the tool Helper ⁽²⁸⁾
- Denmark: Use of drift reducing equipment ⁽²⁹⁾
- Italy: Guidance document of Mitigation Measures for Surface water in Italy ⁽³⁰⁾
- Spain: Criteria of exposure assessment to plant protection products for operators, workers, residents and bystanders ⁽³¹⁾.

(18) <https://szu.cz/tema/pesticidy/por/pro-uzivatele-por/oopp/> (in Czech only)

(19) <https://szu.cz/tema/pesticidy/por/hodnoceni-info/rizeni-rizik/ochranne-vzdalenosti/> (in Czech only)

(20) https://fytoweb.be/sites/default/files/legislation/attachments/mb_20240201.pdf (in French and Dutch only)

(21) <https://iplo.nl/publish/pages/138112/meetprotocol-vaststellen-driftreductie-spuiddoppen-versie-2-november-2021.pdf> (in Dutch only)

(22) <https://www.helpdeskwater.nl/publish/pages/132712/bzg-lijst-20240327-.pdf> (in Dutch only)

(23) www.bvl.bund.de/PPE

(24) <https://wissen.julius-kuehn.de/mediaPublic/AT-Dokumente/03-Abdrift/PlantProtectionEquipment-drift-reduction/01-Universal-application-chart-for-drift-reducing-flat-fan-nozzless-02-035.pdf>

(25) <https://wissen.julius-kuehn.de/mediaPublic/AT-Dokumente/03-Abdrift/PlantProtectionEquipment-drift-reduction/02-Universal-application-chart-for-drift-reducing-flat-fan-nozzles-04-06.pdf>

(26) <https://wissen.julius-kuehn.de/mediaPublic/AT-Dokumente/03-Abdrift/PlantProtectionEquipment-drift-reduction/03-Universal-application-chart-for-drift-reducing-flat-fan-nozzles-90percent.pdf>

(27) <https://info.agriculture.gouv.fr/gedei/site/bo-agri/instruction-2022-425>. See Annex1. Équipements de limitation de la dérive de pulvérisation

(28) <https://www.sakertvaxtskydd.se/media/xnmbr03t/mitigating-spray-drift-in-sweden-29-april-2014.pdf>

(29) <https://mst.dk/kemi/pesticider/anvendelse-af-pesticider/brugere-professionel-brug/sproejteteknologi/reduktion-i-vindafdrift/>

(30) <https://www.salute.gov.it/portale/fitosanitari/homeFitosanitari.jsp;%20Fitoweb%20ICPS>

(31) <https://www.sanidad.gob.es/ciudadanos/saludAmbLaboral/fitosan/prodfitosan/docs/criterioexpo.pdf>

It is important to note that considering the limitations mentioned before, a maximum level of exposure reduction should be agreed to allow for a harmonised approach (see next section).

4.4. Challenges for mutual recognition and the need for harmonisation

Article 36 (3) of the Regulation (EC) No1107/2009 provides the possibility for a Member State to consider the most appropriate options to mitigate the risks in accordance with the specific conditions of use prevailing in its territory. This provision needs to be applied with an appropriate degree of harmonised approach when authorising plant protection products, especially within the same geographical zone considering national conditions.

It is to be noted that different interpretations might however be given as regards their appropriateness to address risks for human health or the environment across Member States, leading to difficulties of mutual recognition. It is therefore important to work on the harmonisation of the decisions taken by the national regulatory authorities when imposing risk mitigation measures in the authorisation of PPPs.

In this context, Member States belonging to the same Zone, in particular the ones of the Northern Zone, have developed a document ⁽³²⁾ to support the mutual recognition of RMM among them.

This compendium intends to contribute to such harmonisation, in particular because the legislator has considered this need for consistency amongst the Member States in the next indent of the same Article 36(3), as stated hereafter: *“Where the concerns of a Member State relating to human or animal health or the environment cannot be controlled by the establishment of the national risk mitigation measures referred to in the first subparagraph, a Member State may refuse authorisation of the plant protection product in its territory if, due to its specific environmental or agricultural circumstances, it has substantiated reasons to consider that the product in question still poses an unacceptable risk to human or animal health or the environment.”*

In addition, ex-post authorisation checks of the implementation shall be planned and further regulatory intervention in case of non-compliance is provided by the Regulation in its **Article 44** where *“The Member State shall withdraw or amend the authorisation, as appropriate, where (...)*
c) a condition included in the authorisation has not been met.

This could be the case when a Member State observed that a specific risk mitigation measure cannot be realistically implemented by the users, and therefore it requires to be modified/adapted. This decision shall be communicated to the authorisation holder but also to the Commission and the other Member States, with a particular attention for the other Member States belonging to the same zone to consider similar withdrawal or amendment of the authorisation conditions, including adaptation of the risk mitigation measures, where relevant.

It is also necessary to further harmonise the methods to measure potential of mitigation measures and techniques (e.g., methods to measure drift reduction) and to organise the

(32) <https://eng.mst.dk/chemicals/pesticides/applications-for-authorisation/cooperation-in-the-northern-zone>

collection of data recorded by the users as regards the implementation of the conditions of use covered by this document.

5. LIST OF CONDITIONS OF USE FOR PLANT PROTECTION PRODUCTS TO REDUCE EXPOSURE

The list below compiles different conditions of use to reduce exposure and therefore risk from the use of plant protection products and includes techniques, tools and practices found in the EU market. It is intended to be updated regularly to keep pace with technical and regulatory innovation. It is structured considering the following information:

- Type of plant protection product application: Horizontal crops (HC), Vertical crops (VC), granules (GR) or treated seeds (TS), storage rooms (STR).
- Nature of the exposure reduction considered: Operator Exposure (OPEX), drift, drainage, leaching or runoff.
- Compartment benefiting from the concrete condition of use in the Risk Assessment. This follows the structure of the EFSA Peer Review Conclusions for the risk assessment of active substances and plant protection products.
 - Human health: operators, workers, bystanders and residents
 - Environmental compartments: surface water & aquatic organisms, terrestrial field area and non-target organisms, groundwater.
- Performance: If the risk reduction performance is known it is included. References to performances of different countries are also included.
- References: national guidelines, research projects or other sources of information that provide information regarding the risk reduction performance of the concrete technique is mentioned.
- Possibility to consider the condition of use as refinement for the risk assessment.

It is important to note that:

- availability of data supporting the exposure reduction may differ significantly among entries, in particular some entries are not yet fully characterised as regards their quantitative exposure reduction, hence no or only an indicative performance reported with a high degree of uncertainty.
- the performance for a group or a type of entries shall be reported with a range of values to reflect the variable technical performance among them: however, for the sake of refined risk assessment, if there is a range for a specific technique a realistic” worst case” value should be assigned.

6. FUTURE DEVELOPMENTS: RESEARCH PROJECTS ON CONDITIONS OF USE TO REDUCE EXPOSURE

Different research projects have collected information on the exposure reduction of different conditions of use, in particular innovative technical conditions of use and field management practices. The outcome of these research projects can be used to complement the list presented in this document.

Many of these projects describe how the technologies work in practice, the type of crops where the equipment should be used, the type of exposure and risk that is reduced, the price on the market, details on the manufacture, among others.

- **INNOSETA:** [<http://www.innoseta.eu>] a Thematic Network delivering a freely accessible repository of innovative spraying technology, training and advising material.
- **WATERPROTECT:** [www.water-protect.eu] action labs showing good practices to contain diffuse pollution of drinking water sources by pesticides.
- **FARMDEMO:** [<https://farmdemo.eu/>] On-farm demonstrations Hub including good plant protection practices.
- **NEFERTITI:** [<https://nefertiti-h2020.eu/>] an EU-wide highly connected network of demonstration and pilot farms designed to enhance knowledge exchanges, and efficient innovation uptake in the farming sector through peer-to-peer demonstration of techniques on 10 major agricultural challenges in Europe, including pesticides application.
- **OPTIMA:** [<http://optima-h2020.eu/>] Optimize plant disease prediction models and develop advanced early disease detection methods, so that appropriate plant protection product type, dose, timing and location will be recommended.
- **IWMSPRAY:** [<https://iwmpraise.eu/>] Solutions for an integrated weed management (IWM)
- **PERFECTLIFE:** [<http://perfectlifeproject.eu/>] Demonstration of reduction of environmental contamination of pesticides and their metabolites in the air using Optimal Volume Rate Adjustment tools (OVRA) and drift reducing tools (SDRT).
- **SMARTPROTECT:** [<https://www.smartprotect-h2020.eu/>] Thematic network offering advanced farming technology and data analysis, by identifying the needs of farmers and purpose methodologies for daily practices based on smart IPM.
- **NOVATERRA:** [<https://www.novaterraproject.eu/>] Project to develop a pool of novel, integrated and sustainable strategies, technically and economically viable, resulting from three different approaches
- **IPMDECISIONS:** [<https://www.ipmdecisions.net/>] a web-based framework providing farmers, advisors and researchers access to a wide range of Decision Support Systems (DSS)
- **IPMWORKS:** [<http://www.ipmworks.com/>] database of services to public and private sector clients to reduce pest and pesticide hazards in agriculture and communities.
- **PHYTHODRON:** [<https://gophytodron.es/>] project dedicated to application of pesticides by unmanned aerial machines (drones) – in Spanish.

- **BREAM:** [[https://www.ssau.co.uk/bream#:~:text=The%20BREAM%20project%20\(Bystander%20and,a%20tool%20in%20risk%20assessments](https://www.ssau.co.uk/bream#:~:text=The%20BREAM%20project%20(Bystander%20and,a%20tool%20in%20risk%20assessments))] model to predict the potential exposure to pesticides for bystanders and residents in the countryside that can be used as a tool in risk assessments.
- **MAGPIE:** [Mitigating the Risks of Plant Protection Products in the Environment: MAGPIE - Society of Environmental Toxicology and Chemistry \(setac.org\)](https://www.setac.org/)

New conditions of use or new information supporting existing conditions of use shall be notified to the EU Commission or an EU member state for the purpose of initiating a consultation of the SCoPAFF and possible inclusion into this document.

New measures not yet covered by this document can also be considered:

1. Once an application containing a new condition of use/risk mitigation measure not listed in this document has been submitted and is deemed complete, the applicant should inform the European Commission without delays and provide further explanation on how this new measure contributes to further reducing risks.
2. The Commission or the member state evaluating the new condition of use will inform all Member States and seek their views on the proposal through the SCoPAFF.
3. Based on the outcome of the consultation, the Commission will decide if the measure should be included in the compendium of RMMs.

Personal protective equipment (PPE)

The efficiency of some PPE, including gloves for Operators, is listed in table 8 from EFSA Guidance on the assessment of exposure of operators, workers, residents and bystanders in risk assessment for plant protection products ⁽³³⁾. Other institutions as the German Federal Office of Consumer Protection and Food Safety have compiled specific information on the model type and manufacturer of PPE for plant protection ⁽³⁴⁾.

PPE item	To be used in: Horizontal crops (HC), Vertical crops (VC), granules (GR) or treated seeds (TS), indoor.	Compartment where the exposure can be reduced in the Risk Assessment	Specific exposure value affected	Exposure reduction value	Is it possible to use the item to refine the risk assessment?
Protective (chemical-resistant) gloves	All	Human health for professional operators and workers	Hands dermal exposure	Operators, liquids 90%; operators, solids 95%; workers, solids 90%	Yes
Protective coverall			Body dermal exposure	Operators 90%	
Protective coated coverall ⁽³⁵⁾			Body dermal exposure	Operators protective coverall 95%	
Hood and face shield			Head dermal exposure	Operators 95%	
Hood			Head dermal exposure	Operators 50%	
Respiratory Protective Equipment mask type : Half and full-face masks FFP1, P1 and similar			Inhalation exposure	75%	
			Head dermal exposure	20%	
Respiratory Protective Equipment mask type : Half and full-face masks FFP2, P2 and similar			Inhalation exposure	90%	
			Head dermal exposure	20%	

(33) <https://efsa.onlinelibrary.wiley.com/doi/epdf/10.2903/j.efsa.2022.7032>

(34) https://www.bvl.bund.de/SharedDocs/Downloads/04_Pflanzenschutzmittel/BVL-PSA-Datensammlung_EN.pdf?__blob=publicationFile&v=7

(35) Some MS requested to clarify the difference between protective coverall/coated. To check in OPEX Guidance document.

Technical conditions of the PPP application – Drift Reduction Technologies – Nozzles

The listed nozzles and other technical conditions of uses do not function as a single measure for spray drift reduction. Drift reduction will result from the combined effect of the sprayer, nozzles and pressure, as well as the modification of the machine as well as the conditions on the field (e.g., crop, application speed, wind speed, wind direction, temperature). Therefore, the detailed list below becomes meaningful taking into account all the other conditions of use.

Nozzles	PPP application scenario:	Nature of exposure/ risk	Compartment benefitting in the risk assessment/ Possible to use it to refine the risk assessment?					Performance	Could it be defined in the GAP table?	
	Horizontal crops (HC), Vertical crops (VC), granules (GR) or treated seeds (TS), indoor		Human Health		Environment					
			Operators/workers (professionals)	Bystanders/residents (citizens)	Surface Water + Aquatic organisms	Terrestrial area + non-target organisms	Groundwater			
Drift reduction nozzles ⁽³⁶⁾	HC + VC	DRIFT	X	X	X	X	X (in case it concerns areas adjacent to treated fields)	X	<p>From 50 to 95 % based on spray drift entries</p> <p>Examples of regulatory implementation in Member States;</p> <p>Up to 99% used in Sweden in Orchards and in Italy</p> <p>Up to 90% in Austria - (95% in combination with hail nets)</p> <p>Up to 95% in Poland, Netherlands, Croatia, Spain and Malta</p> <p>In Italy for Vertical Crops also 25% is considered</p> <p>DRT99 for upward/sideward spray is also used in NL</p> <p>Recently finalized research project on the use of 50%, 75% and 90 % drift reducing nozzles in bystander exposure assessments (Project: BREAM 3 -see next page).</p> <p>Recently finalized research project on the use of 75% drift reducing nozzles in bystander exposure assessments in orchards (DE Project: Data published and submitted to EFSA).</p>	Yes, it could be defined in the GAP table if recommended alone – w/o combination with buffer zones.

Complementary information:

- **ISO** identifies 6 classes of drift reducing technologies (ISO 22369-1, 2006) relating respectively to 25, 50, 75, 90, 95 and 99% of drift reduction (ISO 22369-1 CROP PROTECTION EQUIPMENT-drift classification of spray equipment. Part 1 drift reduction classes.
- **SETAC DRAW:** During application using boom sprayers, the diluted product solution is forced under pressure through nozzles that form spray droplets to provide good product coverage on target surfaces. A range of droplet sizes are generated by many nozzle types with smaller droplets being more vulnerable to drift carried with the prevailing wind. Consequently, one important strategy to reduce drift at the point of application involves reducing or avoiding generation of smaller droplets through choice of nozzle and care and attention taken with application pressure (<https://www.spraydriftmitigation.info/background>).
- **SETAC MAgPIE:** Spray drift reduction nozzles (SDRN) provide an alternative or supplementary means of mitigating drift. SDRN are effective by reducing the production of droplets of ca <100 µm, thereby reducing the impact of variables such as wind speed and release height. It is noteworthy that SDRN has a number of important benefits to growers, including:
 - SDRN can be used without any significant change of all other application parameters such as water volume, pressure, application speed, use rate or frequency of application etc.

(36) As defined in EFSA guidance: “Spray application technologies that have scientifically demonstrated to reduce drift compared to standard applications, and which have been officially recognised as meeting specific standards of drift reduction.”

(37) <https://esdac.jrc.ec.europa.eu/projects/swan>. This model is accepted by some competent authorities of the Member States but not by all.

- SDRN can easily substitute for standard hydraulic nozzles for a reasonable price, without any significant technical modification to the sprayer.
 - The reduction in drift also means that in-field buffers may be reduced, thereby helping the grower to maximise the area of production at their disposal.
- **TOPPS Best management practice for spray-drift:** Further information on use and correct implementation spray drift reduction nozzles as a component of a spray drift management framework can be found here: http://www.topps-life.org/uploads/8/0/0/3/8003583/ansicht_drift_book_englisch.pdf
- **BREAM3 Study** - Research project on the use of 50%, 75% and 90 % drift reducing nozzles in bystander exposure assessments: <https://croplifeurope.eu/resources/bream3-study-to-support-the-introduction-of-mitigation-from-spray-drift-reduction-into-the-bream2-model/>
- **Novel field data for exposure of bystanders and residents towards spray drift during application of plant protection products in orchards:** <https://doi.org/10.1007/s00003-023-01468-3>

Technical condition of the PPP application

The listed nozzles and other technical conditions of uses do not function as a single measure for spray drift reduction. Drift reduction will result from the combined effect of the sprayer, nozzles and pressure, as well as the modification of the machine as well as the conditions on the field (e.g. crop, application speed, wind speed, wind direction, temperature). Therefore, the detailed list below becomes meaningful taking into account all the other conditions of use.

Item	To be used in:	Nature of exposure/ risk	Compartment benefitting in the Risk Assessment					Performance (38)	References	Is it possible to use the item to refine the risk assessment?
	Horizontal crops (HC), Vertical crops (VC), granules (GR) or treated seeds (TS), indoor		Human Health ⁽³⁹⁾		Environment					
			Operators/ workers (professional)	Bystanders/residents (citizens)	Surface Water + Aquatic organisms	Terrestrial field area + non-target organisms	Groundwater			
Emission shields, shielded sprayers, hooded sprayers	HC + VC	DRIFT			X	X		90% for shields in Italy	Guidance document of Mitigation Measures for Surface water in Italy	To be discussed
Tunnel sprayers	VC	DRIFT			X	X		Can mitigate 90-99% (depending on the possible combination with Drift Reduction Nozzles).	Guidance document of Mitigation Measures for Surface water in Italy	Tbd
Sensor controlled sprayers – targeted applications	HC + VC	DRIFT, DRAINAGE, LEACHING and RUN-OFF			X	X	X	Depends on many factors like the crop, the area treated, etc.		Tbd
Cross flow fan sprayer with reflection shields or One-sided spraying of the last tree row	VC	DRIFT			X	X		35% drift reduction	Guidance document of Mitigation Measures for Surface water in Italy	Tbd

(38) This column contains percentage values that are lacking a reference point, drift value, application rate, PEC and should be considered as the initial elements of information available at the moment of note taking of the current version.

(39) Not considered in the OPEX guidance document for benefits to operators/workers/bystanders/residents.

Closing air flow for the last 3 rows (in combination with DR nozzles)	VC	DRIFT			X	X		50%	Guidance document of Mitigation Measures for Surface water in Italy	Tbd
Turret sprayer	VC	DRIFT			X	X		They can increase reduction of risk of hail nets (from 50 to 90%) and of closing the airflow for the last 3 rows (from 50 to 60%)	Tbc	Tbd
Air sleeve or air-assisted spraying equipment	HC	DRIFT			X	X		75%	Guidance document of Mitigation Measures for Surface water in Italy	Tbd
Hail nets	VC	DRIFT			X Yes, for surface water, increase drift reduction from 90 to 95 %. Model: SWAN	X		50%	Guidance document of Mitigation Measures for Surface water in Italy	

Item	PPP application scenario:	Nature of risk	Compartment benefitting in the Risk Assessment					Performance	References	Is it possible to use the item to refine the risk assessment?
	Horizontal crops (HC), Vertical crops (VC), granules (GR) or treated seeds (TS), indoor		Human Health		Environment					
			Operators/ workers (professionals)	Bystanders /residents (citizens)	Surface Water + Aquatic organisms	Terrestrial + non-target organisms	Groundwater			
Dust drift reducing sowing equipment or pneumatic seeding machine which operates with negative pressure	GR, TS (including seed potatoes)	DRIFT	X	X	X	X	limited effect	50%, 75%, 90%	Guidance document for the Authorisation of Plant Protection Products for Seed Treatment – Risk Assessment – Measures and innovative techniques to reduce dust drift from pesticide seed dressing during sowing - Spray Tech Lab (vlaanderen.be)	Yes. For, Surface Water exposure assessments this can be represented directly in SWAN based on input of drift reduction effectiveness (%).
Downward directed deflectors for the exhaust air stream of sowing machines	GR, TS (including seed potatoes)	DRIFT	X	X	X	X	limited effect			
Closed transfer systems	HC + VC	OPEX, RUN-OFF	X		X		X	>>90% during Mixing and Loading compared with open-pour data from the EFSA model.	CTS-evaluation.pdf (croplifeurope.eu) Sasturain, J., Blaschke, U., Stauber, F. et al. Minimizing operator exposure: field data analysis of three closed transfer systems for pesticide mixing and loading. J Consum Prot Food Saf (2024). https://doi.org/10.1007/s00003-023-01472-7	Not for the moment
Automatic application systems (e.g., gantry sprayers or misting equipment in glasshouses, automated	HC, indoor	OPEX	X					EFSA OPEX GD: “In case of automated applications, exposure cannot		Usually part of the GAP table

dipping or drenching equipment)								limited to mixing/loading since maintenance and cleaning activities during application should not be excluded and no data are available for this scenario		
Electrostatic spraying booth for forestry transplants	Forestry	DRIFT	X	X	X	X			usually part of the GAP table.	
Foam treatment equipment for onion sets	Treated bulbs	RUN-OFF					X		Usually part of the GAP table.	
Closed cabins	HC, VC, GR, TS, For all open field applications	OPEX	X ⁽⁴⁰⁾					An UIPP-IRSTEA study 2011 showing that the protective effect of the cabin has a range from 19 to 98%, depending on the types of cabins, their maintenance and the cabin pressure. Further data available – Molnar et al. paper submitted	EFSA Guidance on the assessment of exposure of operators, workers, residents and bystanders in risk assessment for plant protection products. EPA unit exposure document includes data for upward and downward spraying with closed cabs. Occupational Pesticide Handler Unit Exposure Surrogate Reference Table May 2021 https://www.epa.gov/sites/default/files/2021-05/documents/occupational-pesticide-handler-unit-exposure-surrogate-reference-table-may-2021.pdf Development of a selective testing method to pesticide aerosols for characterization and comparison of agricultural tractor cabs classified according to EN 15695-1	Tbd

(40) Closed cabin can be chosen in EFSA calculator as option to reduce exposure of operators during application in high crops.

									(Journal für Kulturpflanzen, 75 (05-06). S. 130–137, 2023 DOI: 10.5073/JfK.2023.05-06.02 Molnar et al)	
									“Assessing Operator Exposure and Cabin Protection in Plant Protection Product Application” – Molnar et al. paper submitted	
Targeted liquid application - Direct injection systems	HC+VC	OPEX, RUN-OFF	X	X	X	X	X	Up to 100%	Occupational Pesticide Handler Unit Exposure Surrogate Reference Table May 2021 (see previous reference)	Usually part of the GAP table.
Targeted liquid application - Tractor mounted or hand held weed wiper, brush application	HC + VC	OPEX, RUN-OFF	X	X	X	X	X			Tbd
Targeted liquid application -in-furrow applicator	Potatoes	OPEX, DRIFT,	X	X	X	X				Usually part of the GAP table.
Local exhaust ventilation (LEV) systems	Indoor uses including seed treatment facilities	DUST DRIFT	X	X						Usually part of the GAP table.
Controlled working height (between the nozzles and the top of the plant)	HC	DRIFT		X	X	X		In Belgium 75 %		No, it is a technical specification of the machine.
GIS-controlled nozzles (e.g., closure when nearing field limit/resident/water)	HC + VC	OPEX, DRIFT	X	X	X	X				Tbd
In-situ drift control - responsive to wind conditions (direction and wind speed)	HC + VC	DRIFT		X	X	X				Tbd.

Droplegs	HC	OPEX, DRIFT	X	X	X			1 or 2 nozzles on drop leg + anti-drift (50%) nozzles.	Mercier, T., 2020. Direct dermal and inhalation exposure of bystanders and residents during vine foliar application using sprayer equipment fitted with an anti-drift device: a comparison between measured exposure levels and existing exposure models. Journal of Consumer Protection and Food Safety https://doi.org/10.1007/s00003-020-01274-1	Tbd. Capability to model impact directly through pro-rata adjustment of drift loading (% of applied). For Surface Water exposure assessments this can be represented directly in SWAN based on input of drift reduction effectiveness (%).
Hail protective covers with mesh nets (orchards)	VC	DRIFT		X				According to JKI classification for drift reduction (updated 27 Nov 2020) NFO (Nederlandse Fruittelers Organisatie) 2021 have classified the fruit fly nets for drift reduction together with adjusted spray adjustments for 75-97.5%. ⁽⁴¹⁾	JKI classification for drift reduction (updated 27 Nov 2020) NFO (Nederlandse Fruittelers Organisatie) 2021 ⁽⁴²⁾	Tbd

(41) Since hail protective covers with mesh nets are widely used in orchard growing areas, this is a relevant scenario to be considered. Waldner, W., Knoll, M., 2012. Experiences with and benefits of the inspection of air-assisted sprayers from the fruit- and winegrowers' point of view. Fourth European Workshop on Standardised Procedure for the Inspection of Sprayers – SPISE 4 –, Lana (South Tyrol), March 27-29, 2012.

(42) Herbst, A., et al., 2012. Test procedure for drift reducing equipment. Fourth European Workshop on Standardised Procedure for the Inspection of Sprayers – SPISE 4 –, Lana (South Tyrol), March 27-29, 2012. Triloff, P., et al., 2012. Low-Loss-Spray-Application - The Scientific Basis. Fourth European Workshop on Standardised Procedure for the Inspection of Sprayers – SPISE 4 –, Lana (South Tyrol), March 27-29, 2012.

Treated seeds

Item	PPP application scenario:	Nature of risk	Compartment benefitting in the Risk Assessment					Performance	References	Is it possible to use the item to refine the risk assessment?
	Horizontal crops (HC), Vertical crops (VC), granules (GR) or treated seeds (TS), indoor		Human Health		Environment					
			Operators/workers (professionals)	Bystanders/residents (citizens)	Surface Water + Aquatic organisms	Terrestrial + non-target organisms	Groundwater			
Automatic bagging of treated seeds	TS	OPEX	X					Longest task in multiple activities working shift. 50% inhalation	SeedTropex ⁽⁴³⁾ new model information submitted to EFSA	Yes. Only for seeds packed in lower than 25 kg bags
Automatic calibration of seed treater	TS	OPEX	X					Exposure is considered negligible as there is no direct contact with the product	SeedTropex new model information submitted to EFSA	Yes No quantitative risk assessment would be required for automated calibration
Automatic cleaning of seed treatment equipment	TS	OPEX	X					Exposure is considered negligible as there is no direct contact with the product	SeedTropex new model information submitted to EFSA	Limited market introduction but new trend in industrial sites for hybrid seeds as well as cereals
Closed transfer systems	HC + VC + TS	OPEX,	X		X		X	>>90% during Mixing and Loading compared with open-pour data from the EFSA model.	CTS-evaluation.pdf (croplifeurope.eu)	Not for the moment

(43) Tbc -Seedtropex model

Formulations

Specific types of formulations of PPP do not have a quantitative performance on the reduction of the exposure. Formulations are part of usually part of the conditions of use as described in the GAP table, therefore they cannot be used to refine the Risk Assessment.

Item	PPP application scenario:	Nature of exposure/risk	Compartment benefitting in the Risk Assessment					References
	Horizontal crops (HC), Vertical crops (VC), granules (GR) or treated seeds (TS), indoor		Human Health		Environment			
			Operators/workers (professionals)	Bystanders/residents (citizens)	Surface Water + Aquatic organisms	Terrestrial + non-target organisms	Groundwater	
High quality coating of treated seeds or granules preventing / reducing dust production when manipulated	Treated seeds, Granules	OPEX, NON-TARGET ORGANISMS	X	X	X	X		ESTA https://euroseeds.eu/esta-the-european-seed-treatment-assurance-industry-scheme/ https://euroseeds.eu/app/uploads/2020/02/ESA_11.0387.1.pdf
Formulations destined to target the effects on local applications	Baits, paste or paints	All	X	X	X	X	X	
Water soluble bags		OPEX	X. ⁽⁴⁴⁾					Occupational Pesticide Handler Unit Exposure Surrogate Reference Table May 2021 https://www.epa.gov/sites/default/files/2021-05/documents/occupational-pesticide-handler-unit-exposure-surrogate-reference-table-may-2021.pdf
Embittering agent added to formulation		Children bystander /resident		X		X		

(44) According to the EFSA GD (2022), the default exposure deriving from mixing and loading activities of water-soluble bag should be assumed to be 10% of the corresponding formulation.

Field management measures

The performance of these measures will depend on different environmental and agronomic factors of the field where the plant protection product is going to be applied. The exposure of humans (including dietary exposure) and the environment not only depends on which areas within the field are treated (rows, patches, spots, full field), but also on the application equipment. Especially equipment for spot treatment can be based on other technology than 'conventional' spray booms. Exposure scenarios (notably also for dietary exposure) for new application techniques are currently lacking. In the table below, row and spot treatments are interpreted as being performed with conventional spraying equipment equipped with precision techniques (sensors, regulation of nozzles).

Technical tools	PPP application scenario:	Nature of exposure/ risk	Compartment benefitting from risk mitigation					Performance	References	Is it possible to use the item to refine the risk assessment?
	Horizontal crops (HC), Vertical crops (VC), granules (GR) or treated seeds (TS), targeted liquid application (TLA), storage rooms (STR)		Human Health		Environment					
			Operators/workers (professionals)	Bystanders/residents (citizens)	Surface Water + Aquatic organisms	Terrestrial + non-target organisms	Groundwater			
Row applications	HC	DRIFT, DRAINAGE, LEACHING, RUNOFF		X ⁽⁴⁵⁾	X	X	X	Up to 75%	Established and consolidated in some EU Member States (see SETAC Magpie 2017) Guidance document of Mitigation Measures for Surface water in Italy (ICPS - Centro Internazionale per gli Antiparassitari e la Prevenzione Sanitaria)	Tbd
Spot treatment (usually in combination with GPS systems)	HC	DRAINAGE, LEACHING, RUNOFF			X	X	X	25-50% depending on field surface treated	Established and consolidated in some EU Member States (see SETAC Magpie 2017) Guidance document of Mitigation Measures for Surface water in Italy	Tbd
No-spray Buffer zones (edge of field)	HC + VC	DRIFT, OPEX		X? EFSA GD (2022)	X	X		Variable, Standard regulatory drift curves provide basis for increasing mitigation	EFSA Guidance on the assessment of exposure of operators, workers, residents and bystanders in risk assessment for plant protection products	Yes, For Surface Water exposure assessments this can be represented directly in SWAN based on input of buffer width: 5,10, 15, 20 m. Applicable with or without VFS.

(45) Tbc - To review the VFS for instance.

								effectiveness with buffer width.		Yes, could be also defined in the GAP table.
<p>European Directive 128/2009/EC: Article 11 of this Directive, which is entitled “Specific measures to protect the aquatic environment and drinking water”, foresees the necessity to reduce drift risk exposure by “use of mitigation measures which minimise the risk of off-site pollution caused by spray drift, drain-flow and run-off. These shall include the establishment of appropriately-sized buffer zones for the protection of non-target aquatic organisms and safeguard zones for surface and groundwater used for the abstraction of drinking water, where pesticides must not be used or stored”</p> <p>TOPPS Best management practice definition: Buffers are an area of a defined width along the field boundary that is preferably not cropped and is not directly sprayed; it has the function of preventing adjacent sensitive areas from spray drift contamination (https://croplifeurope.eu/wp-content/uploads/2023/12/Spray-Drift-Core-Doc-1.pdf)</p> <p>SETAC MAgPIE:</p> <ul style="list-style-type: none"> • No spray zone in the field and/or at the field border to avoid direct spray of off-field area • Usually product-specific • Width typically comprised between 1 and 50 meters • Benefits on all off-field area and organisms through spray drift reduction <p>FOCUS SW: The FOCUS Surface Water Working Group has recommended that a 90th percentile cumulative drift probability be used for all drift applications made during a single cropping season. Individual regression curves were developed based upon BBA (2000) for each crop grouping as well as for each number of applications, based on fitting the various percentile drift results as a function of distance from the edge of the treated area (BBA (2000), Bekanntmachung über die Abtrifteckwerte, die bei der Prüfung und Zulassung von Pflanzenschutzmitteln herangezogen werden. (8. Mai 2000) in : Bundesanzeiger No.100, amtlicher Teil, vom 25. Mai 2000, S. 9879).</p>										
Vegetated Filter Strips (VFS)	HC+VC	RUNOFF			X	X	X	From 12% to 95% according to width, antecedent moisture, and hydraulic load	FOCUS Landscape and Mitigation (SANCO SANCO/10422/2005 Guidance document of Mitigation Measures for Surface water in Italy	Tbd. Capability of modelling regulatory defaults (e.g., FOCUS Landscape and Mitigation directly in SWAN. SWAN also includes capability of simulating dynamic effectiveness based on soil and weather conditions via VFModel ⁽⁴⁶⁾ .

(46) VFS Model: <https://abe.ufl.edu/faculty/carpenna/vfsmod/index.shtml>. This model is accepted by some competent authorities of the Member States but not by all.

EU Directive 2009/128/EC: (15) "...particular attention to be paid to avoiding pollution of surface water ... by taking appropriate measures, such as the establishment of buffer and safeguard zones...along surface waters to reduce exposure of water bodies to...run-off. The dimensions of buffer zones should depend in particular on soil characteristics and pesticide properties, as well as agricultural characteristics of the areas concerned...

SETAC MAgPIE: VFS widths of 5m/10m/20m are recommended; effectiveness for risk assessment either based on field evidence or modelling with VFSSMOD (SWAN). The proposed evaluation of the pesticide trapping equation in VFSSMOD has meanwhile been successfully completed (Reichenberger et al. (2019): Recalibration and cross-validation of pesticide trapping equations for vegetative filter strips (VFS) using additional experimental data. Sci Tot Environ 647, 534-550.)

TOPPS Best Management Practice Handbook:

Vegetative buffers can be considered as infrastructure measures (established for several years) in a catchment. The functions of buffers are to:

- Provide infiltration areas for surface runoff water
- Slow down surface runoff water through appropriate vegetation and to catch sediments.
- Provide habitats to increase biodiversity
- Provide areas where PPPs are not applied, reducing applications close to surface water in vulnerable locations

FOCUS Landscape and Mitigation: Fixed reduction percentages for run-off, erosion, and pesticides intercepted by 10m- and 20m- wide VFSs are listed. These can be used for FOCUS Step 4 simulations enabled with the SWAN suite. When this report was issued (2006) VFSSMOD was not available as an option with integrated pesticide reduction algorithms.

Implementation in Risk Assessment: Two ways are proposed: 1. Field evidence-based approach using the fixed factors from the FOCUS Landscape and Mitigation report on a lower-tier; 2. Dynamic modelling of the VFS performance under the environmental conditions of the regulatory run-off scenarios with VFSSMOD (SWAN). This approach provides a much better assessment of the effectiveness taking into consideration VFS width, compound properties, rainfall intensity, antecedent soil moisture, and soil infiltration capacity. Buffer efficacy from VFSSMOD can also be smaller compared to the fixed reduction factors, as the efficacy for a given VFS can vary greatly between 10% and 100% based on the actual weather conditions (Spatz, R., 1999. Rückhaltevermögen von Pufferstreifen für pflanzenschutzmittelbelasteten Oberflächenabfluss. Shaker Verlag, Aachen (Dissertation, Institut für Phytomedizin, Universität Hohenheim, 176 pp.). ISBN: 978-3826566950).

Presence of hedges	HC+VC	DRIFT		X	X	X	removed	25 to 75% depending on shape of the canopy	Guidance document of Mitigation Measures for Surface water in Italy E-fate: guidance in NL: https://iplo.nl/publish/pages/170619/drd-lijst-20240206-.pdf (hedges = windhaag)	Capability to model impact directly through pro-rata adjustment of drift loading (% of applied). For Surface Water exposure assessments this can be represented directly in SWAN based on input of drift reduction effectiveness (%).
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Field management tools	Positioning	Nature of exposure/ risk	Compartment benefitting fin the Risk Assessment					Is it possible to use the item to refine the risk assessment?
			Human Health		Environment			
			Operators/ workers (professionals)	Bystanders/residents (citizens)	Surface Water + Aquatic organisms	Terrestrial area + non-target organisms	Groundwater	
In-Field	Vegetated filter strip, across slope (e.g. 5 m width)	RUN-OFF			X	X	X	
	Inter-row vegetated filter strips in permanent crops				X	X	X	
	In-field bunds/microdams for row crops (e.g. potatoes, maize)				X	X	X	Tbd. Representation in refined modelling through adjustment of soil parameters to reflect decreased potential for run-off/drainage based upon relevant literature.
	No-till or reduced tillage				X	X	X	
	Application followed by incorporation into the soil	RUN-OFF		X	X	X		
Hedges	Edge of the field	DRIFT + RUN OFF		X	X	X		
Edge-of-field and off field	Vegetated filter strip (5 m, 10 m, and 20 m width)	RUN-OFF			X	X	-	Yes
	Artificial wetland or retention pond				x	x		Tbd
	Vegetated ditches							
	Edge-of-field bunds							Tbd. Representation in refined modelling through adjustment of soil parameters to reflect decreased potential for run-off/drainage based upon relevant literature.

Restrictions of use

Restriction of use meant to be a result of the refined risk assessment. However the listed restrictions, mainly linked to time and frequency of application, application rate and growing status of crop may not modify the GAP in such a way as reducing the efficacy of the active substance/product. Conditions of use defined in the GAP to deliver acceptable level of efficacy cannot be changed afterwards as mitigation measures.

Restrictions on use	Specification of the restriction	Compartment benefitting in the Risk Assessment/ Can be used to refine the Risk Assessment?				
		Human Health		Environment		
		Operators/ workers (professionals)	Bystanders/residents (citizens)	Surface Water + Aquatic organisms	Terrestrial area + non- target organisms	Groundwater
Application timing according to Plant growth stage	Pre-emergence only	X	X		X	
	Non-flowering period (crops + weeds)				X	
	Before fruit setting	X				
	Pre-harvest interval					
Temporal restrictions	Period (s) of the year	X	X	X	X	X
	Period (s) of the day		X		X	
	Frequency of application (once every X years, X months)					X
	Re-entry period	X ⁽⁴⁷⁾				
	Non-breeding period of birds or mammals				X ⁽⁴⁸⁾	
	Daily working hours	X				
No foliar applications ⁽⁴⁹⁾		X	X	X	X	
Do not use on drained land restriction				X		
Soil property-based restrictions (PH, texture, Organic Content)				X		X
Spatial restrictions	No-spray zones of X meters		X	X	X	

(47) Differences exist among MS: some of them do not accept restricted entry interval due to the fact that the worker has the need to access the crop at any time after the application. The EFSA definition for safe re-entry interval is recommended: “The specific time point post application, from which the worker exposure levels calculated for the relevant re-entry tasks are lower than the AOEL considering the different PPE cases depending on the TC availability”.

(48) Tbc: some MS consider it as not acceptable as there is no general breeding season for all birds and mammals. Additionally, pre-mating exposure can still lead to a risk. Tbc whether EFSA guidance on birds and mammals (2023) allows for certain margins of manoeuvre? Currently not accepted in the central zone.

(49) Tbc if this is not part of the GAP and not a RMM?.

	Buffer strips of X meters (vegetated or bare soil)		X	X	X	
	No/limited use in drinking water protection area		X	X		X
Restriction of number of applications in combination with another method of control (mechanical, chemical...)		X	X	X	X	X
Restriction to a maximum application rate per ha ground area (if the main authorised dose is per hL or per ha LWA) or maximum treated height of the crop.		X	X	X	X	X