EUROPEAN COMMISSION

DIRECTORATE-GENERAL FOR HEALTH AND FOOD SAFETY

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Report of the workshop *Specific Protection Goals for the Environmental risk assessment of PPP – moving on with the EFSA method* (3 - 4 February 2020, Brussels)

Executive summary

This workshop followed the two workshops "Specific Protection Goals for the Environmental risk assessment of PPP - setting the basis" that took place with experts from Members States (21 June 2019) and with stakeholders (25 September 2019).

The objective of the workshop was to identify the ecosystem services that may be affected by the use of plant protection products (Step 1 of the European Food Safety Authority (EFSA) method[1][2]) based on several pesticide application scenarios. The workshop was also intended to deepen the understanding of ecosystem services and of the method proposed by EFSA, and it provided an opportunity to address questions, concerns, and recommendations from the participants.

The workshop showed that by applying the EFSA method the list of the affected ecosystem services differ for various pesticide application scenarios. In some cases, such as storage rooms, permanent greenhouses or the use of microorganisms or pheromones as pesticides, no or very few ecosystem services are expected to be affected. In contrast, soil treatment is expected to have effects on all ecosystem services. All scenarios spraying pesticides in the field (herbicide, fungicide or insecticide) are expected to affect the same sub-set of the ecosystem services, but in different manners. Further developments of the scenario setting and the need for a better definition for some ecosystem services were discussed in view of their larger scale deployment in the project.

In order to establish how to move forward towards defining specific protection goals (SPG), participants identified and discussed ten topics during the second day of the workshop:

1. Baseline of protection goals which are already implemented

[1] EFSA Panel on Plant Protection Products and their Residues (PPR): Scientific Opinion on the development of specific protection goal options for environmental risk assessment of pesticides, in particular in relation to the revision of the Guidance Documents on Aquatic and Terrestrial Ecotoxicology (SANCO/3268/2001 and SANCO/10329/2002). EFSA Journal 2010;8(10): 1821. 55 pp.|

[2] EFSA Scientific Committee, 2016. Guidance to develop specific protection goals options for environmental risk assessment at EFSA, in relation to biodiversity and ecosystem services. EFSA Journal 2016; 14(6):4499. 50 pp

2. How can we improve consistency of assessment of ecosystem services impacts?
3. Who makes the decision of a safe use? Decisions at EU landscape level vs. subsidiarity
4. Pesticide application equipment used in risk assessment scenarios
5. Benefits to ecosystem services in setting SPGs and in decision making process
6. Does the Ecosystem Services Approach (ESA) enable defining the right SPGs?
7. How (and who) to define Service Providing Units (SPUs)?
8. How to improve the current environmental risk assessment?
9. Holistic view (for pesticides) multiple exposure to actives and products?
10. Land sparing versus land sharing (where to set baselines for good ecosystem)

The workshop took place in a positive and constructive atmosphere. The lively discussions and active participation of the attendants showed strong engagement and interest. Participants emphasised in their individual feedback the benefits of the open discussions and the opportunity to listen to the different points of views and the search for common positions.

At the same time, participants pointed out that still more clarity is needed on the purpose of the SPG project, the EFSA method, ecosystem services and the link to protection of biodiversity. They recommended keeping up the speed of the project, being more specific and concrete to ensure efficiency in use of resources as well as continuing working with stakeholders.

Contents

1. Context

The workshop was part of a project on Specific Protection Goals (SPG) that is intended to support future update(s) and/or developments of guidance documents for conducting the environmental risk assessment for pesticides. The project builds upon previous work of the EFSA[1,2] and current scientific knowledge.

The reason for the project:

The Plant Protection Products (PPP) Regulation[3] sets out that a PPP shall have no unacceptable effects on the environment. Inter alia, impacts on biodiversity and ecosystems must be considered. To decide which impacts are acceptable or unacceptable, it is necessary to agree on specific protection goals as benchmarks for risk assessment. The need of defining SPG for the environmental risk assessment of PPP was also identified by the Group of Chief Scientific Advisors in 2018[4].

How the project is planned:

Considering the high scientific complexity of the topic, its multifaceted policy aspects (with links to e.g. agricultural environment, regulation of PPPs, legislations concerning the protection of the environment), and high stakeholders' interest, the Commission has involved all parties concerned since the outset of the project in 2019 and is taking a step-wise approach.

2. Who Participated in the Workshop?

A total of 83 participants attended the workshop. The affiliations of the participants were: 35 experts from 21 Member States, 1 expert from Norway, and 29 participants representing 20 different stakeholder organisations including academia. In Annex 1 the invited and participating Member States, EEA-States and stakeholder organisations are listed.

The experts were appointed[5] by their national authorities or stakeholders organisation as experts in one or more of the following areas: biodiversity, regulatory framework of PPPs, ecosystems, protection goals, environmental risk management, for the whole duration of the project in order to ensure continuity of participation. The majority of the experts had already participated at one of the workshops in 2019.

In addition, 15 policy officers from different Commission services (DGs Health and Food Safety, Environment, Agriculture, Joint Research Centre, Human Resources) and 3 experts from the European Food Safety Authority (EFSA) participated.

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3 Article 4 (3)(e) of Regulation (EC) 1107/2009

4 The Group of Chief Scientific Advisors is an expert group of the European Commission and provides independent scientific advice to the College of European Commissioners to inform their decision making.. (EU authorisation processes of Plant Protection Products https://ec.europa.eu/research/sam/pdf/sam_ppp_report.pdf#view=fit&pagemode=none)

5 In 2019, the Commission invited the Member States, the EEA-States and interested stakeholders express their interest and to appoint experts in the areas of biodiversity, regulatory framework of PPPs, ecosystems, protection goals, environmental risk management for the whole duration of the project, in order to ensure continuity of participation.

3. Outline of the Workshop

The workshop consisted of presentations and discussions - under Chatham House rules[6] - in smaller and larger groups using participatory leadership techniques and building on the method developed by EFSA[1,2]. The detailed agenda and the presentations can be found in Annex 2 (Agenda), Annex 3 (Environmental Risk Assessment of PPP in the EU and the need of SPGs) and Annex 4 (Synergies between biodiversity and ecosystem services).

The ecosystem services potentially impacted by the use of plant protection products (Step 1 of the EFSA method) were identified during the workshop on the basis of case studies for different pesticide application scenarios, which were prepared in consultation with the participants. In addition, a position paper by PAN Europe was shared with all the participants before the workshop at the request of the stakeholder.

The workshop also provided an opportunity to address questions, concerns, recommendations of the participants. Participants proposed ten topics for discussion at the second day of the workshop, which were then discussed and presented to plenary.

4. Identification of potentially impacted ecosystem services for different pesticide application scenarios – Methodology and Results of the Discussions

In the invitation letter for the workshop, DG Health and Food Safety had informed the participants that one objective of the workshop is to create an inventory of ecosystem services that can be potentially impacted by pesticide use based on step 1 of the EFSA method. For this purpose, DG Health and Food Safety had drafted an overview of eight pesticide application scenarios and had invited the participants for their comments on these scenarios prior to the workshop. Participants could (and some did) also send case studies that they found important to focus on during the workshop. The case studies included details about the type of PPP (without naming a specific PPP or active substance), crop, pest, description of application method and frequency of use. Based on the feedback received prior to the workshop, DG Health and Food Safety finalised the overview of pesticide application scenarios (Table 1) and prepared twelve case studies for the exercise.

6 https://en.wikipedia.org/wiki/Chatham_House_Rule

			1	2	3	4	5	6	7	8
			Outdoor or field use (F) (including non-permanent greenhouses outside Art 3.27)					**Indoor application (I)**	**Greenhouse application (G)**	**Bait (F/I/G)***
			Liquid application		*Solid application*	*Gas/Aerosol application*		*Gas/Aerosol or Liquid application*	*Applications like for outdoor uses (1 to 5)***	
type of PPP application / type of active substance			**Spraying crops* and soil**	**Targeted liquid application (TLA)***	**Granules (GR), pellets, treated seeds, *DP (dustable podwer)**	**Soil treatment & sterilization**	**Dispenser***	**Storage rooms (STR)** (defined in Art.3.28) *	**Permanent, static and closed greenhouse** (defined in Art 3.27)*	
1	CH	Attractant (AT) / Repellent (RE) (pheromones)					**S9**			
2	CH	Fungicide (FU)	**S2**						**S11**	
3	CH	Herbicide (HB)	**S1**							
4	CH	Insecticide (IN) / Acaricide (AC)	**S3**	**S6**	**S7**					
5	CH	Nematicide (NE)				**S8**				
6	CH	Plant growth regulator (PG) / Pruning						**S10**		
7	CH	Rodenticide (RO)								**S12**
9	MO	Microorganisms - Specialist	**S4**							
10	MO	Microorganisms - Generalist	**S5**							

Table 1: Overview of pesticide application scenarios. The coloured cells represent realistic pesticide application scenarios (combination of type of active substance and type of PPP application), out of which the yellow cells indicate the case studies selected as exercises for the workshop

During the workshop, DG Health and Food Safety explained the overview of the pesticide application scenarios and presented the case studies. The presentation explaining the exercises during the workshop can be found in Annex 5 (The 1st step of the EFSA method- identifying ecosystem services affected), and the corresponding exercises in Annex 6 (Scenarios of pesticide application).

The discussions on the case studies were organised as follows:

- In a first round, the participants worked in twelve groups. Each group considered three out of the twelve case studies, so that all case studies were discussed by three different groups. The question to answer was which of the 17 ecosystem services (list of TEEB in Annex 7) could be negatively affected in the given case study. First, participants formulated their opinions individually, then they shared their views and finally the group discussed and agreed on the list of affected ecosystem services for three case studies assigned. Where relevant, diverging views were recorded.
- In a second discussion round, the groups were reshuffled and new groups were formed. The new groups consisted of participants who had discussed the same scenario in the previous round, but in three different groups. In this way, twelve groups were formed and each of them considered only one case study that all participants had discussed previously in other groups. In their new groups, the participants coming from three different groups shared the results of their discussion in that first group. Based on those results, each group re-discussed the assigned case study and agreed on which ecosystem services were affected and to which degree (no, small, medium or strong). The groups filled in a feedback form (Annex 8: Feedback forms of the 12 case studies). One person from each group presented the results to the plenary. In addition, the results from all groups were collated in plenary in an overview Table.

The general discussion in plenary showed that different patterns emerged for the different case studies (see Table 2 below). In some cases such as storage rooms, permanent greenhouses or using microorganisms or pheromones as pesticides, no or very few ecosystem services are expected to be affected, and if so, only marginally. In contrast, soil treatment and sterilisation is expected to have a medium to strong effect on all ecosystem services. Further developments of the scenario settings and the need for better definition for some ecosystem services were also discussed in some groups.

As a result of this exercise it became clear that in some cases there was a lack of clear understanding and/or definitions of ecosystem services. An example was genetic biodiversity where the question arose whether it is only the pest or also other affected organisms that have to be considered. Or in case of air quality, how to take microorganisms and their secondary metabolites into consideration.

It was generally noted that baselines such as good agricultural practise or quality of pesticide application machinery need to be defined upfront.

This would also help that discussions could become easier and more focused. In addition, the boundaries of the cases studies can significantly influence the decisions on the level of the effect. For example; the effect expected from trunk injection (S6) may vary depending on the tree and product type; field or landscape level can influence the perception for cultural services (see soil treatment scenario S8); in a storage room the type of plant protection product (S10) or the organisms targeted by pheromones (S9) can make a difference on the possible effects. In general, views differed in case of cultural services, and for these services better methodologies and definitions are needed.

In addition, a detailed summary of the twelve case studies and the feedback given in plenary by the presenters of each group are given below and the feedback forms of the groups can be found in Annex 8.

		Spraying Outdoor or Filed Use (F)					Spraying Outdoor or Filed Use (F)				Indoor application (I)	Greenhouse application (G)	
Ecosystem services list		S1 Herbicide	S2 Fungicide	S3 Insecticide	S4 Microorganisms-Specialists	S5 Microorganism-Generalists	S6 Targeted liquid application	S7 Granular insecticide application	S8 Soil treatmenet and sterilization	S9 Pheromones dispenser	S10 Storage room	S11 Greenhouse application	S12 Off- field application of rodenticide Baits
Provisioning services	Food	Small	small	medium	no	no	no	small to medium	small to strong?	no	no	no	no to strong?
	Raw materials	no	no	small	no	no	no	small	small to strong?	no	no	small	no
	Fresh water	medium to strong	no	strong	no	no (for quantity) to small (quality)	no	strong	small to strong?	no	no	no	no
	Medicinal resources	no	small	small	no	no	no	small	small to strong?	no	no	no	no
Regulating services	Local climate and air quality	no to small	no	no	no to small	no	no	small	small to strong?	no	no	no	no
	Carbon sequestration and storage	small	no	no	no	no to small	no	no to small??	strong	no	no	no	no
	Moderation of extreme events	small	no	small	no	no	no	no	small to strong?	no	no	no	no
	Waste-water treatment	small	medium	small	no	no	no	small	strong	no	no	small	no
	Erosion prevention and maintenance of soil fertility	small	no to medium	medium	no	influence on soil fertility	small	small to medium	strong	no	no	no	no
	Pollination	medium	small to strong	strong	no	no to small	small to medium	medium	strong	no	no	no	no
	Biological control	medium	small to strong	strong	no	no to small	small to medium	strong	strong	small	no	small	strong
Habitat or supporting services	Habitats for species	strong	small to strong	strong	no	no to small	small	strong	medium to strong	no	no	no	no to strong ?
	Maintenance of genetic diversity	strong	small to strong	strong	no	no to small	small to medium	strong	strong	small	no	no	medium to strong
Cultural services	Recreation and mental and physical health	small to medium	small	medium	no	no	small	small to strong?	strong?	no	no	no	small
	Tourism	small	no	small	no	no	no	small to strong?	strong?	no	no	no	strong
	Aesthetic appreciation and inspiration for culture, art and design	small	no	small to medium	no	no	no	small to strong?	strong?	no	no	no	strong
	Spiritual experience and sense of place	no	no	small	no	no	no	small to strong?	strong?	no	no	no	strong

Table 2: Results of the group discussion (feedback to plenary) on the identification of potentially impacted ecosystem services for selected scenarios of pesticide application (Step 1 of the EFSA method based on case studies).

S1: Spraying herbicide, Outdoor or Field use

Description: Spray application of a total herbicide (no residual soil activity) in late summer to a weedy field of cereal stubble prior to sowing oilseed rape within a minimum-tillage regime. Foliage of weeds must be sprayed to achieve control. **Pest**: All weed plants within the area to be sown with the oilseed rape. **Frequency:** one application in late summer. **Situation**: Arable field after harvest of cereal crop.

Feedback to the audience: Several services can be affected to a different degree (small to strong). For example, food service can be affected at small scale via honey production. Fresh water may be impacted if there is drift or run-off, but this depends on the technical standard of the application equipment and the risk mitigation measures used. The group pointed at the need to better define cultural services.

S2: Spraying fungicide, Outdoor or Field use

Description: Spray application of a fungicide in an orchard to control scab. If scab is not controlled, the quality of the apples (dessert apple) is lower. The harvest can still be sold to retailers and consumers but at depreciated values. **Pest:** Ascomycete fungus *Venturia inaequalis*, which causes scabs of fruit skins and leaves. **Frequency:** Once per week according to weather conditions, in the window April-to-October.

Feedback to the audience: the group pointed out that quality of water was not part of the ecosystem service description. Better definition for air quality, erosion prevention, and soil fertility would be essential. Depending on the mode of action of the active substance (a fungicide could potentially also have herbicidal or insecticidal action) results could vary from small to strong for some ecosystem services.

S3: Spraying insecticide, Outdoor or Field use

Description: Foliar spray application of an **insecticide** in orange orchards against red scale insects. **Frequency:** Twice per year in spring and summer.

Feedback to the audience: food service could be affected if the drift reaches e.g. wild berries or via bee products. There could be small effects on provision of raw materials e.g. due to the residues in extracted oils or impact on microorganisms that produce compost. Other services that can be strongly affected are fresh water, pollination, habitats, biological control and maintenance of genetic diversity. The views of the participants differed in general as regards cultural services.

S4: Spraying microorganisms (specialists) as biological control, Outdoor or Field use

Description: Spray application of parasitic fungus (parasite of a crop pest) in vineyards to control grapevine powdery mildew. **Frequency:** up to 12 times per year (at least 10 days interval).

Feedback to the audience: only air at a local scale can be potentially impacted.

S5: Spraying microorganisms (generalist) as biological control, Outdoor or Field use

Description: Spray application of a generalist microorganism in a variety of crops to control soil borne fungal diseases. The mode of action is by competition with the "pest". **Frequency:** up to 6 applications per year (at least 3 weeks intervals).

Feedback to the audience: If quality of water is considered, then either there is no effect or small effect could be expected for fresh water. However, if quantity of water is considered, no effect is expected. The group wondered whether the change of microbial flora would affect carbon sequestration. Another question was if and how soil quality would be influenced.

S6: Targeted liquid application of an insecticide, Outdoor or Field use

Description: Closed system of **tree injection** with a xylem/phloem mobile **insecticide** for use on forest-trees, Christmas-trees, seed cone nurseries/orchards, and ornamental trees. The aim is to control phloem-feeding insects. **Frequency**: one application (late summer or autumn).

Feedback to the audience: the group questioned whether secondary effects such as fallen leaves containing residues would affect soil organisms and/or soil fertility by decomposition. If yes, erosion may be affected in this way. In case of pollination, the results are dependent on the type of the trees and the persistence of the active substance. Biodiversity might also be affected, therefore small to medium effect can be expected for biological control and genetic diversity.

S7: Granular insecticides application Outdoor or field use

Description: **Insecticide granules** applied in the seedbed at sowing of vegetables crops, such as cabbages or carrots to protect against early-season insect pests such as Cabbage Stem Flea Beetles, Cabbage Flea Beetles, Cabbage Root Fly.

Feedback to the audience: food services and air quality could be affected due to possible dust drift. Provision of raw materials could be effected due to residues in compost. Fresh water, waste water and erosion could be affected due to leaching. There was no clear position on carbon sequestration and storage. Participants views were too diverging in case of cultural services to come to a compromise.

S8: Soil treatment and sterilisation with a fumigant gas, Outdoor or field use

Description: Soil is treated with a **fumigating gas injected** in the soil at a depth of 25 cm, followed by sealing of the soil with heavy roller and covering with a gas-tight plastic cover for a period of 48 hours. After treatment, crops are planted: vegetables, small fruit crops (tomatoes, berries), field grown nursery/ornamental crops, and forestry nursery crops. **Pests:** nematodes considered as quarantine pests (e.g. Root Knot nematodes, strawberry spring dwarf nematodes, Golden nematodes). This soil treatment also controls weeds and soil-borne plant pathogens.

Feedback to the audience: there were intensive and sometimes difficult discussions in this group, mainly on the question whether the services are for human or also for other species. The group discussed that it also makes a difference if field or landscape is considered: for instance people could find several hectares of treated field covered in plastic not attractive, therefore cultural services can be affected.

S9: Pheromones applied via passive dispensers, Outdoor or Field use

Description: Passive dispensers are manually distributed in the field and can be removed before harvest. The pheromone is highly volatile and rapidly dissipates in the air. The arthropod pheromone is also naturally produced by females of an insect pest, in order to attract the males of the same species (species specific). Because there is more pheromone in the air than naturally occurring, the success rate of males to find females is reduced (males get confused and are not able to find the females). Hence, females lay no eggs, and the population of the pest is reduced (the reproductive cycle of one species is disrupted) to levels which do not trigger further crop protection needs. **Pest:** chewing insects (Lepidoptera) **Crop**: vineyards and other crops. **Frequency:** One application per year. The dispensers are placed in the crop before start of the male flight.

Feedback to the audience: The group reported that the discussions were easy. The fact that the insects that are affected by the pheromone treatment could have been food for predators were considered in the ecosystem service of biological control and not in food services. In this scenario, pollination was not affected, however, if the target species is a pollinator, small effects may be expected.

S10: Storage room treatment with a plant growth regulator, Indoor Application

Description: A storage room (closed) with apples is treated with a vapour releasing product (**gas) of a plant growth regulator**, which controls the maturation of the stored fruits. Application lasts two hours. Treatment room is kept closed following vapour release for 2 days. Ventilation of the storage room after treatment is needed.* **Frequency:** one treatment just after storage of the freshly harvested apples.

> **Art 3.28 "post-harvest treatment means treatment of plants or plant products after harvest in an isolated space where no run-off is possible, eg. in a warehouse.*

Feedback to the audience: the group had intensive discussions. As the case study was on a plant growth regulator, there were no ecosystem services that would potentially be affected. However, as storage rooms are not so closed, in case of for example, a fungicide some effects on the environment may be possible.

S11: Greenhouse application of fungicide

Description: Use of **fungicide** for the control of cucumber downy mildew disease in permanent greenhouse*. Application is just before first disease symptoms are observed. **Frequency:** one to two applications with an interval of 10 days.

> **Art 3.27. "greenhouse" 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 PPPs into the environment.*

Feedback to the audience: Biological control might be impacted due to some side effect on beneficial organisms in greenhouses. In general, in this case, it is important for the assessment that the greenhouse is effectively a closed system.

S12: Off-field installation of Rodenticide Baits to protect crops in the area

Description: Baits are installed in vole tunnels (underground) and renewed on a regular basis until no further consumption of the bait can be observed. 'Pests': voles in the proximity of any crop.

Feedback to the audience: Depending on the interpretation of food (when rodents are food for other animals) strong effects can happen in food services. For the same reason, there are strong effects on biological control due to birds of prey which may eat poisoned voles (secondary poising). As people have strong conservation concerns, by caring a lot for birds, the group would estimate that cultural services (birds) are strongly affected.

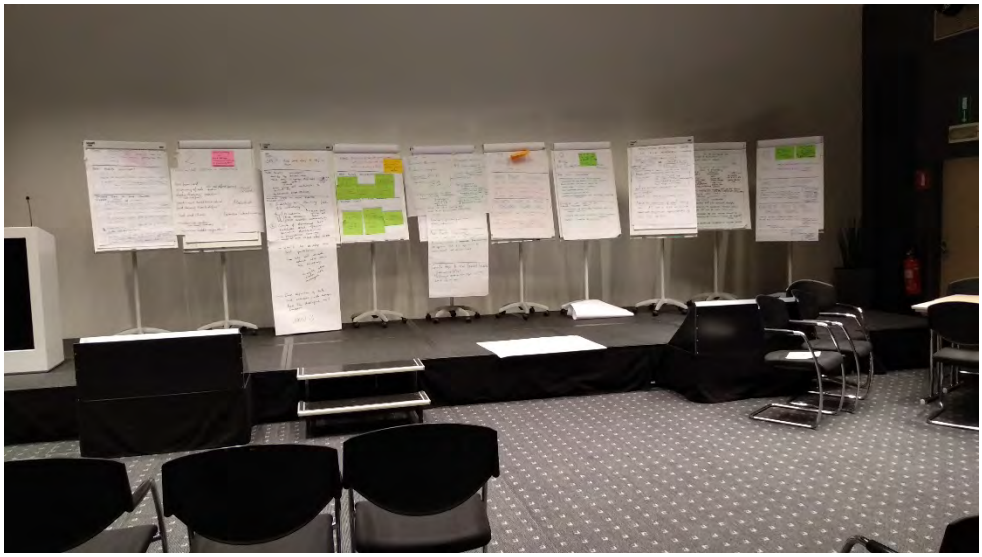
5. Open discussion based on questions identified by participants – Methodology and Results of the Discussions

The general discussion was organised using the Open Space method. Participants were invited to flag a topic they wished to discuss in relation with the guiding question "How to move forward to define SPGs".

Eleven participants raised a topic, and two of them decided to merge theirs. Then, the ten topics were discussed in smaller groups for about 90 minutes. Participants were free to join any of the discussion groups, and could also change group anytime as they found it appropriate.

The topic leaders filled in a feedback form with two questions: what were the main points discussed and concrete steps to move forward towards SPGs. The topic leaders informed the plenary one by one (in a self-defined order) on the output of the discussions on the topics.

Below a summary of the feedback on the different topics is provided, as reviewed by the respective topic leaders.



Summaries of the discussions of the ten topics

Topic 1 Baseline of protection goals which are already implemented

The group discussed which specific protection goals are already implicit in the current regulatory environmental risk assessment scheme under Regulation (EC) No 1107/2009. The Regulation provides for a screening process that filters out active substances with the following characteristics: persistent-bioaccumulative-toxic (PBT) substances, substances with endocrine disrupting properties, substances that lead to concentrations higher than the trigger value for groundwater as well as unacceptable residues in soil.

In addition, the ecotoxicological risk assessment covers different non-target organisms. For example for birds, protection goals for direct effects such as 'no visible mortality' or 'no effect on reproduction' are currently already set. The question arose whether indirect effects such as removal of potential food sources should also be considered within the scope of SPG.

The group considered that setting SPG for biodiversity protection is a wider, cross-cutting issue that involves different regulations. Thus, it cannot be addressed only at the level of the Regulation on plant protection products. A holistic approach would be necessary for a future SPG system, in the context of which the specific protection goals under the pesticides legislation should be considered.

It would also be important to have monitoring data on non-target organisms in order to establish the current baseline situation.

Topic 2: How can we improve consistency of assessment of ecosystem services impacts?

In order to achieve consistency and comparability in the environmental risk assessment across different areas (e.g. to be able to consider trade-offs between plant protection product use and tillage practices) common language and metrics, as well as a robust process which triggers confidence in the outcome is needed. Three main sources of inconsistency were identified: scope/definition of ecosystem services; how/whether to include indirect as well as direct impacts; the appropriate scale to consider.

A solution that could eliminate ambiguity about the concept of ecosystem services (ES) is to use one common ES classification system. The group proposed to use the classification system CICES (Common International Classification of Ecosystem Services). CICES is more comprehensive than other ES classification systems (e.g. including provisioning services and non-use/intrinsic values), and is clearer than other systems on how direct and indirect effects are addressed. In order to address inconsistencies related to the scale of impact on ES, it was suggested to develop a standard set of links between Service Providing Units and ES.

The group proposed as next steps to use the CICES classification; to develop some relevant examples specifically for risk assessment of PPPs; and to identify the appropriate standard scale per SPU and per ES. By following the approach used for aquatic systems, it should be possible to break down the silos between the different areas of the terrestrial risk assessment.

Topic 3: Who makes the decision of a safe use? Decisions at EU landscape level vs. subsidiarity

The group considered that because of the large variety of natural and geographical conditions in the various EU countries, an uncountable number of PPP use scenarios are possible at EU-landscape level. Therefore, a lot of effort would be needed to develop tools for environmental risk assessment, which would cover all the EU-landscapes.

The best way to make use of the knowledge that resides at local level is to harmonise the approach for environmental risk assessment by developing tools (environmental scenarios) adapted to the assessment at local level and which take into consideration technological developments. Also other scientific fields such as socio-economics need to be considered. It is important to recognise the importance of subsidiarity (consideration of local conditions), which goes hand in hand with less informed decisions at EU level.

Therefore, the effort needs to be allocated to develop harmonised plausible scenarios, which can accommodate new technologies and/or regional expertise, thus promoting predictability.

Topic 4: Pesticide Application Equipment used in Risk Assessment Scenarios

The group thought that pesticide application technologies should be better considered in the risk assessments, so that the risk assessor can take them into account in the early stages of the environmental risk assessment. In other words, the question is what should be the baseline considered for a sprayed application, in the risk assessment, i.e. what pesticide application equipment should be considered in the risk assessment model.

The group recalled that every new sprayer sold in the EU for over 10 years should be compliant with harmonised standards (EN ISO 16119), i.e. most sprayers on the market should comply by now. The EN ISO 16119 standard series sets functional and performance requirements for pesticide application equipment, which are harmonised with the EU Machinery Directive (2006/42/EC). This EU Directive covers also the environmental protection requirements for pesticide application equipment.

It needs to be clarified whether the realistic worst case in the risk assessment should consider a state-of-the-art-spraying technology that fulfils the harmonised standards used in the EU. These technologies would cover for instance drift reduction nozzles and other drift reduction technologies, spot and band sprayers, variable rate application technologies e.g. Pulse Width Modulation spraying system (PWM), weed detection sensors or cameras, closed transfer systems and many other improvements. All these improved systems are already in use and will contribute significantly to advancing precision application of Plant Protection Products to reduce losses to non-target areas, thereby improving protection of the operator, bystanders/residents and the environment.

The group called on the Commission to develop a guidance on “realistic conditions of use” stating that application technology used in risk assessment must meet performance requirements of EU standards, as for instance EN ISO 16119.

Topic 5 Benefits to ecosystem services in setting SPGs and in decision making process

The group discussed that in the context of the environmental risk assessment under Regulation (EC) No 1107/2009, the potential negative impact of pesticides on ecosystem services is primarily considered when determining whether the current approach ensures a sufficient level of protection of the environment and biodiversity. However, the potential positive impact in respect to food safety and yield should also be considered where relevant.

The discussion included questions on the baseline regarding for instance, what is appropriate and acceptable in sustainable agriculture, how to set different trade-offs and end points as some impact from agriculture on the environment will need to be accepted as the environment is managed (e.g. which % butterfly mortality can be tolerated for which % higher yield?). In addition, the group stated that the interpretation of what constitutes an 'unacceptable effect' may depend on the Member State or a region, so depending on the different zones/landscapes in the different countries, different SPGs might be necessary; in addition it is important to ensure a level playing field so that agricultural commodities still remain tradable at EU level.

SPGs should be considered as part of the zonal assessment. The assessment should include not only the active substance, but also the alternatives such as biocontrol, tillage or mechanical actions. Benefits provided by PPPs to ecosystem services as well as alternatives should be part of setting SPG, the review process, and decision making.

Topic 6: Does the Ecosystem Services Approach enable defining the right SPGs?

The group questioned whether the ecosystem services approach covers all environmental issues potentially affected by pesticides. One reason for doubts on the suitability of the ecosystem services approach was that the choice of a particular classification scheme for ecosystem services (e.g. MA[1] or TEEB[7] scheme) might already influence the definition of the SPGs. For example, the TEEB scheme, used for the workshop, puts a stronger focus on the maintenance services (e.g. habitat) than the MA scheme. The group therefore discussed also the question whether the impact on ecosystems/biodiversity can be covered by a fixed classification scheme for ecosystem services or needs more flexibility in the choice of ecosystem services.

The group proposed that the choice of ecosystem services needs to be flexible and dependent on the question of the impact on ecosystems/biodiversity. There should first be the problem formulation identifying the relevant impacts on the ecosystem and biodiversity, and from there it should be determined whether the set of chosen ecosystem services appropriately cover these environmental issues. For the Service Providing Unit (SPU), the focus should be on the protection of the most sensitive species to ensure the protection of biodiversity at structural level. Acknowledging the uncertainties in the knowledge about the role of each species in the ecosystem it was proposed not to accept the redundancy principle.

[7] http://www.teebweb.org/resources/ecosystem-services/

The SPG definition based on the identification and the selection of the SPU within the ecosystem services approach have to be complemented with already existing protection goals from other EU legislations (e.g. Water Framework Directive, Habitats Directive, Birds Directive). Finally, it was concluded that a better clarification of the meaning of the different ecosystem services is necessary.

Topic 7: How (and who) to define SPUs?

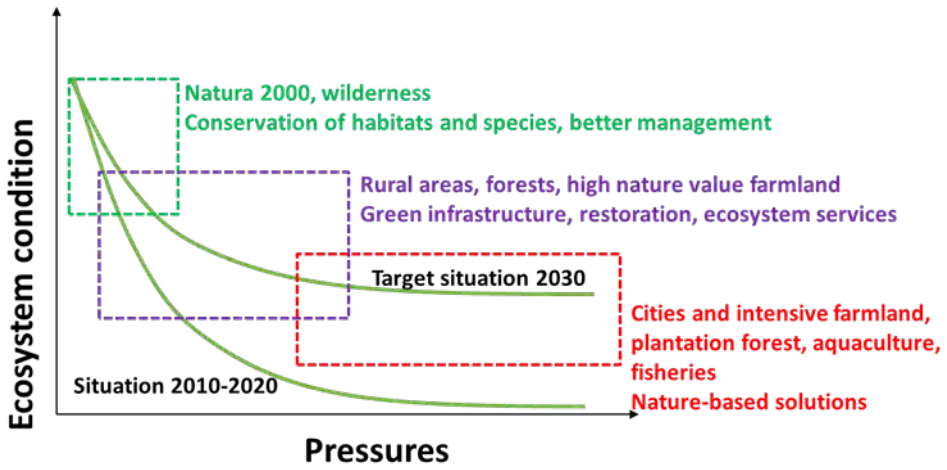
The group found it easier to define the SPUs at higher taxa level than at species level, because species vary in the EU, seasonally and between the crops. The selection of SPUs should consider taxa representing different ecological niches. Some taxa may contribute to different ecosystem services. This selection of taxa requires a scientific process, where the main players would be EFSA, risk assessors and academia.

The relevance of the current test methods and species has to be checked with species sensitivity distributions to identify the relevance of the test species for risk assessment. Trends based on data or assessment factors for extrapolation can also be considered.

Risk managers will need to be involved in the decision on the need for developing new test guidelines. The role of risk assessors and risk managers and how and when the dialogue will happen need to be clearly defined.

Topic 8: How to improve the current environmental risk assessment?

The group considered that biodiversity loss cannot be solely addressed by the improvement of the environmental risk assessment of PPPs and a holistic approach should be taken. There is a long chain from the EFSA assessment to the reality in agricultural fields. As different actors are involved from risk assessors to end users, investigation of the gaps between risk assessment and real life situation is necessary.



The group considered the links between ecosystem conditions and pressures (see the graph above), and concluded that a combined approach, harmonising different regulations/policies are needed to address the shortcomings of such a complex system.

In the group discussion, there was no agreement whether extra safety and quick fixes (e.g. assessment factors; exposure to mixture of active substances; absence of certain thresholds/SPGs for some non-target organisms) would be helpful to address those shortcomings. For the combination of exposure, even ES is not yet an option, therefore further work on it will be required.

Monitoring data should be used to analyse the current situation in the environment and improve risk assessment. A political decision on what baseline for biodiversity we want in the field should be reached.

Topic 9: Holistic view (for pesticides) multiple exposure to actives and products?

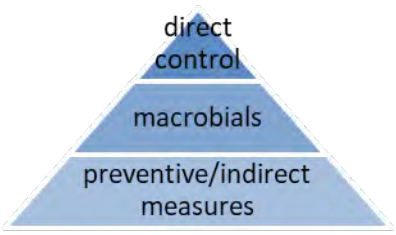
The group concluded that a fundamental missing point of the current regulatory environmental risk assessment for PPPs is that multiple exposure via several active substances and products is not covered and hence neither the related protection goals. Numerous applications of different pesticides in a field or in a season are actually the standard scenario. How to link this aspect to SPU is crucial as mixtures are especially important for higher temporal and geographical scales (ecosystem). The ecology of the exposed groups of organisms should be considered. For organisms and ecosystems, the impact can be low for one single active substance separately but could be high for several active substances combined.

Generally, the effect of multiple exposure is hard to predict. Spraying sequences as recommended by advisors could be taken into account at national level. Additive effects need to be looked at as a starting point.

Topic 10: Land sparing versus land sharing (where to set baselines for good ecosystem)

The group emphasised the importance to learn from the past, and recalled the need of an economy of scale as fancy studies are expensive. It is therefore important to share data, for instance European task forces could be created for joint dossier making. The conduct of new studies to meet the specific protection goals might not be possible for all stakeholders and therefore public money for the authorisation of natural substances of public interest and where no intellectual property rights can be claimed (e.g. botanicals) is needed.

Farmers, risk managers and experts on PPP need to consider the landscape dimension. All farmers should follow the Integrated Pest Management (IPM) principles; biodiversity in the field and out of the field is critical for the IPM approach to work properly and be effective (i.e. organic farming, agroecology).



An important question is how to define land sparing/ land sharing? Good IPM practices would trigger some basic rules which could be shared amongst farmers (as some pesticides are sold at very cheap prices, there is a need for a mind-set shift to envisage alternative approaches).

Transparency and independent farm advisory services are needed and hidden agendas should be overcome. Cross-countries cooperation is desirable.

6. Additional questions and issues collected ("wall space")

During the workshop, participants could post their questions and issues about the project on a wall space (Figures 1 and 2). All points raised on the post-its are listed in Annex 9.

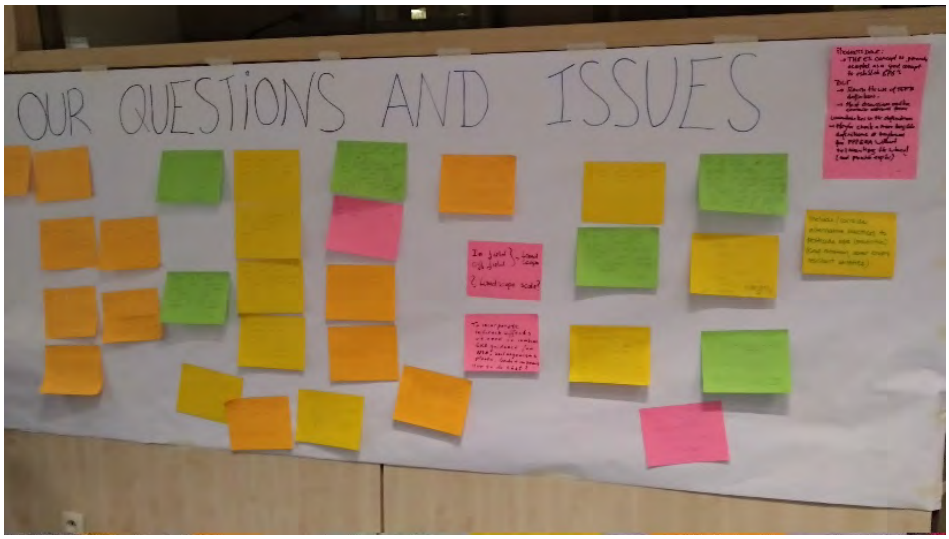


Figure 1. *wall space: Questions and issues*

<u>Summary of main ideas from the notes on the wall not covered by the case studies or general discussion (prepared by the organisers of the workshop):</u>

Several participants raised the question on "how much" of the biodiversity loss is due to the use of pesticides and how much is due to other agricultural practices or other factors such as land use changes, urbanisation or climate change.

Some participants suggested in the context of the environmental risk assessment to introduce comparative risk assessment (e.g. tillage versus application of an herbicide) or including agricultural practices such as crop rotation, cover crops, and resistant varieties as alternatives to the use of pesticides. Some participants were wondering about the role of precision application techniques in the project and in the risk assessment process for active substances.

Concerning the ecosystem systems approach, questions were raised to clarify what the final use of this approach will be and whether there are alternative methods to select SPGs. Some participants suggested that the protection levels should not only be based on the services provided by an ecosystem but also on its ecological status or condition.

In addition, participants asked how the current guidance documents on non-target terrestrial organisms; aquatic organisms or birds and mammals are related to the SPGs project.

Regarding the exercise of identifying ES negatively affected by the use of pesticides, participants underlined the importance of defining the baseline agroecosystem from where to start, especially the boundaries (in-field, off field, landscape level), the conformity of the pesticide application technology in use as well as the duration and intensity of the pesticide application. Moreover, to render the scenarios more realistic, participants noted that multiple applications of pesticides and mixture toxicity should be also part of the baseline.

Several comments pointed to the importance of having coherence and seeking for complementarity among EU policies that are dealing with environmental impacts and biodiversity protection. Some participants were wondering about the link between the EFSA method and the EU guidance on ecosystems and their services[8].

For some participants the difference between the current workshop and the previous ones carried out in 2019 was not clear. Some participants would have liked to have experts with background in ethics and in social sciences involved. Others had the feeling that they were requested to solve political issues, while they considered themselves technical experts. Finally, some participants asked about the next steps of the project and the role of Member States and other stakeholders in the future steps.

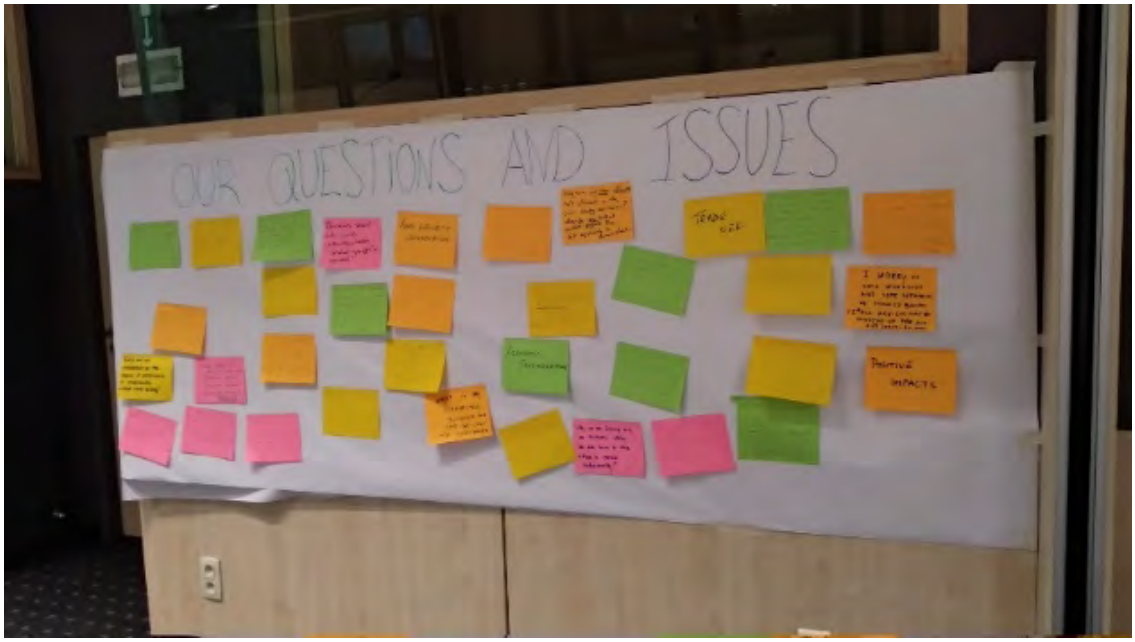


Figure 2. *wall space: Questions and issues*

8 https://ec.europa.eu/transparency/documents-register/detail?ref=SWD(2019)305&lang=en

7. General feedback and next steps

The lively discussions and active participation of the attendants showed strong engagement and interest in the topic. Participants emphasised in their individual feedback forms the benefits of the open discussions and the opportunity to listen to the different points of views and search for common positions, which required occasionally to question their personal views and convictions.

The workshop provided a positive atmosphere with broad stakeholders' participation. At the same time, participants pointed out that still more clarity is needed on the purpose of the SPG project; the EFSA method, ecosystem services and the link to protection of biodiversity. They recommended keeping up the speed of the project, being more specific and concrete to ensure efficiency in the use of resources as well as continuing working with stakeholders to bring and reinforce trust and to address their concerns.

The Commission will consider all the concerns, recommendations and feedback raised so far and will come back to all stakeholders on the next steps of the project.

Annexes

Annex 1: List of Member States, EEA-States, and stakeholders' organisations

Member States and EEA-States
Austria
Belgium
Czechia
Denmark
Estonia
Finland
France
Germany
Greece
Ireland
Italy
Latvia
Lithuania
Malta
Netherlands
Norway
Poland
Portugal
Slovakia
Slovenia
Spain
Sweden

Stakeholders' organisations
European Beekeepers Association (BEELIFE)- *Environmental NGO*
European Agriculture Machinery Association (CEMA) – *Industry*
European Farmers (COPA) -*Farmers*
European Crop Care Association (ECCA) – *Applicants (industry)*
European Crop Protection Association (ECPA) – *Applicants (industry)*
European Professional Beekeepers Association (EPBA) – *Industry*
European Potato Trade Association (EUROPATAT) - *Trade*
European Seed Association (ESA) – *Industry*
European Fresh Produce Association (FRESHFEL) – *Trade*
European Organisation of Agricultural, Rural and Forestry Contractors (CEETTAR)– *Industry*
GREENPEACE- *Environmental NGO*
International Biocontrol Manufacturers Association (IBMA) – *Applicants (industry)*
International Federation of Organic Agriculture Movements EU Regional Group (IFOAM EU GROUP) -*Farmers*
International organisation for Biological Control (IOBC)- *Academia*
Society of Environmental Toxicology and Chemistry (SETAC) - *Academia*
Pesticide Action Network Europe (PAN EUROPE) - *Environmental NGO*

European association representing the trade in cereals, rice, feedstuffs, oilseeds, olive oil, oils and fats and agro supply (COCERAL) - *Trade*
European Landowners Organization (ELO) -*Farmers*
International Federation of Beet Growers (CIBE) -*Farmers*
University of Sheffield- *Academia*

Invited but not present (apologies):

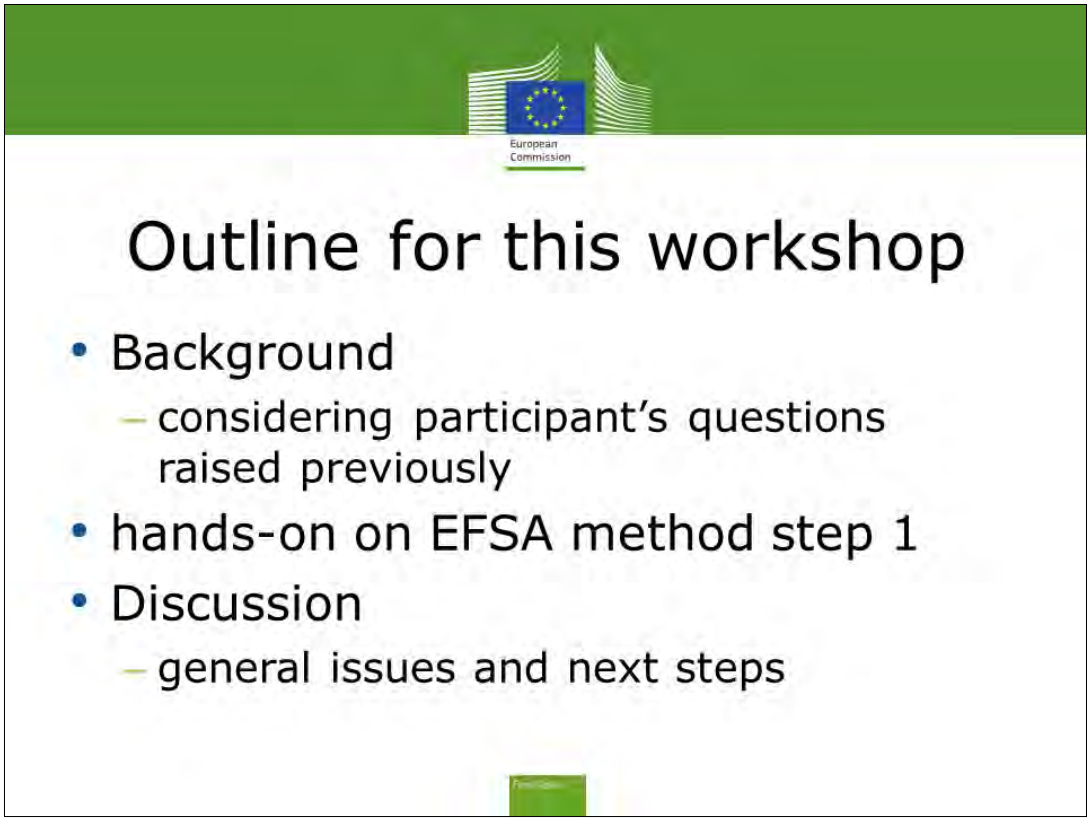
Romania
Bulgaria
Cyprus
Croatia
Hungary
Luxembourg
Switzerland

Centre for Ecology and Hydrology- *Academia*
University Koblenz- *Academia*
European Council of Young Farmers (CEJA)- *Farmers*
European Agri-Cooperatives (COGECA)- *Farmers*
European Association of Fruit and Vegetable Processors (PROFEL) - *Trade*
European Federation of National Associations of Water Services (EUREAU) – *Industry*
World Wildlife Fund (WWF) - *Environmental NGO*
Health and Environment Alliance (HEAL) - *Environmental NGO*
International Union for Conservation of Nature (IUCN) - *Academia*
European Coordination Via Campesina (ECVC)- *Farmers*
European Federation of Trade Unions in the Food, Agriculture and Tourism (EFFAT) - *Trade*

Annex 2: Agenda of the Workshop

Draft Programme		
3 February 2020 (start 12:30)		
12:30	Registration and welcome coffee	
13:00	Welcome	
	Overview presentations and Q&A: Current environmental risk assessment of plant protection products in the EU and the need of specific protection goals The method proposed by EFSA: using ecosystem services for problem formulation of environmental risk assessment How were the scenarios of pesticide application developed for this workshop?	European Commission
	Identification of impacted ecosystem services for selected scenarios of pesticide application (Step 1 of the EFSA method based on case studies)	Working group / discussion
18:00 – 19:00	End of the day cocktail	
4 February 2020 (start 9:00)		
8:30	Welcome coffee	
9:00	CONTINUED: Identification of impacted ecosystem services for selected scenarios of pesticide application (Step 1 of the EFSA method, case studies)	Working group / discussion
LUNCH		
	Recap of discussions so far	European Commission
	Open discussion based on questions identified by participants	Working group / discussion
16:00	Closing	European Commission

Annex 3: Presentation on Environmental Risk Assessment of PPP in the EU and the need of SPGs



Participation

- June workshop:
  - 41 experts from 23 Member States and 1 expert from Norway
  - 16 COM (DG SANTE E4,F3; DG ENV; DG AGRI; JRC; DG HR)
  - 3 EFSA colleagues
  - 1 external expert
- September workshop:
  - 27 participants (4 industry, 3 retailers, 3 academia, 7 farmers, 6 applicants, 4 NGOs) from 24 stakeholder organisations
  - 2 Member States' representatives
  - 17 COM colleagues (DG SANTE E4, F3;DG ENV;DG AGRI)
  - 3 EFSA colleagues
  - 1 external expert
- Report was circulated to participants

Do you find EFSA method appropriate to define specific protection goals?

Outcomes

- Workshop provided for interactive, open and serious discussions
- Willingness to move with EFSA method
- Highly complex and challenging topic
- Identified several challenges and ways for improvements

ERA of PPPs in the EU and the need of SPGs

SPG workshop
3-4 February 2020

European Commission

- ***How is ERA done today? What are its shortcomings?***
- *What is the link between protection goals and environmental risk assessment?*
- *Why this SPG project?*

Health and Food Safety

European Commission

Regulatory context

ERA (EU)

ERA (national)

APPROVAL

ACTIVE SUBSTANCE

ONE USE WITH FORMULATED PRODUCT

AUTHORISATION

USE OF PPP (GAP)

USE OF PPP (GAP)

USE OF PPP (GAP)

USE OF PPP (GAP)

SUSTAINABLE USE

USE

USE OF PPP

USE OF PPP (GAP)

APPLICATION EQUIPMENT, TRAINING, INFORMATION, IPM...

PPP PLACING ON THE MARKET REGULATION (EC) 1107/2009

SUSTAINABLE USE DIRECTIVE 2009/128/EC

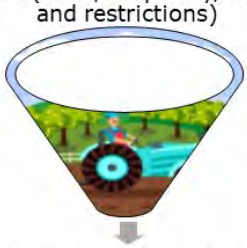
EU approval
(chemicals and microorganisms)

AS may be used in PPP (1 safe scenario)

MS autorisation of product

PPP may be used under certain conditions (dose, frequency, conditions and restrictions)

IPM use (farmer, etc)

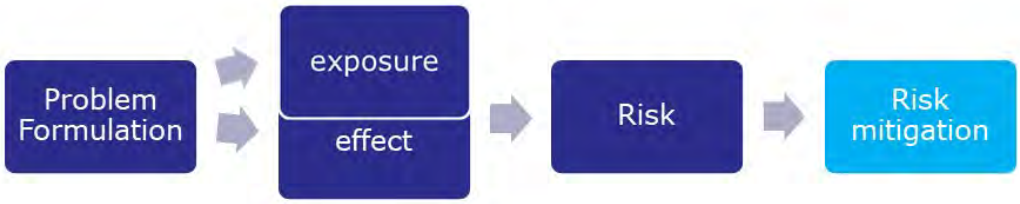


Farmer decides how to manage the crop

European Commission

European Commission

Steps in (environmental) risk assessment

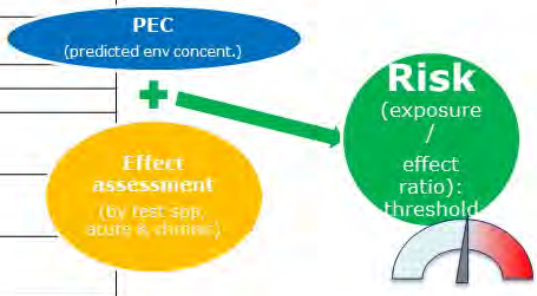


Health and Food Safety

European Commission

Current ERA covers wide range of taxa

Data requirements for active substances (Com. Reg. (EU) No 283/2013)
7. TOXICOLOGICAL STUDIES
8. RESIDUES IN OR ON TREATED PRODUCTS, FOOD AND FEED
9. FATE AND BEHAVIOUR IN THE ENVIRONMENT (soil, water & sediment, air, other routes)
10. ECOTOXICOLOGICAL STUDIES
10.1 Effects on birds and other terrestrial vertebrates
10.2. Effects on aquatic organisms (fish, aquatic invertebrates, aquatic algae and macrophytes, other)
10.3. Effects on arthropods (bees, non target arthropods)
10.4. Effects on non-target soil meso- and macrofauna (earthworms, soil mesofauna)
10.5. Effects on soil nitrogen transformation
10.6. Effects on terrestrial non-target higher plants
10.7. Effects on other terrestrial organisms (flora and fauna)
10.8. Monitoring data
11. Literature data



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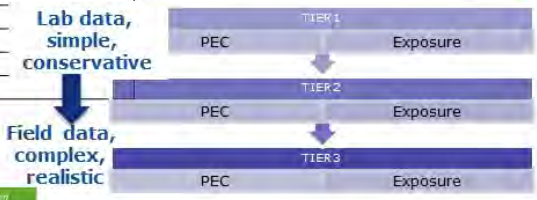
ERA is based on a Tiered approach



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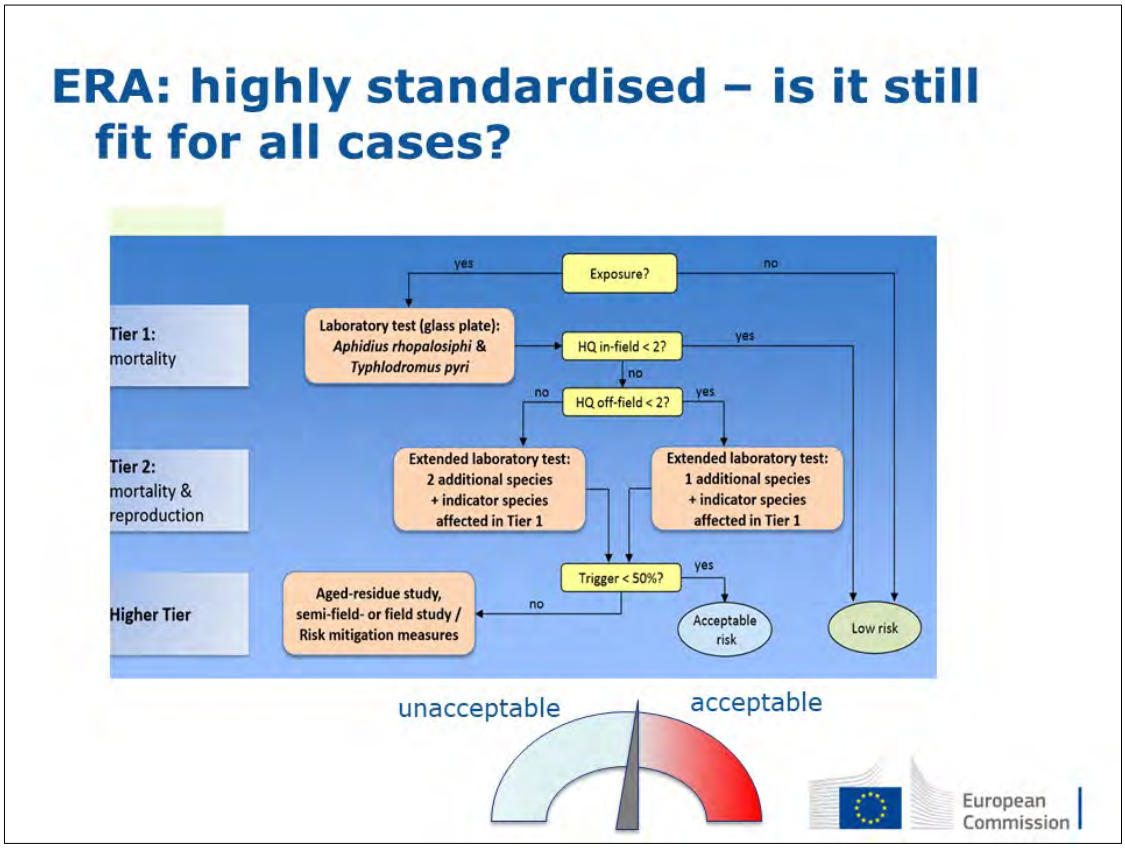
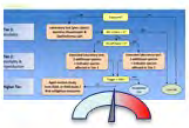
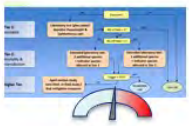
European Commission
Regulation 1107/2009
Data requirements chemicals
Data requirements microorganisms
Uniform principles chemicals
Uniform principles microorganisms
Risk Assessment guidance documents & guidelines


ERA: highly standardised – is it still fit for all cases?
Exposure?
yes
no
Tier 1: mortality
Laboratory test (glass plate): Aphidius rhopalosiphi & Typhlodromus pyri
HQ in-field < 2?
yes
no
HQ off-field < 2?
no
yes
Tier 2: mortality & reproduction
Extended laboratory test: 2 additional species + indicator species affected in Tier 1
Extended laboratory test: 1 additional species + indicator species affected in Tier 1
Trigger < 50%?
yes
Higher Tier
Aged-residue study, semi-field- or field study / Risk mitigation measures
no
Acceptable risk
Low risk
unacceptable
acceptable
European Commission

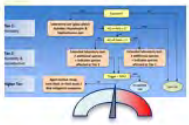
ERA: highly standardised – is it still fit for all cases?



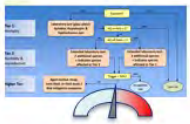
Birds
Mammals



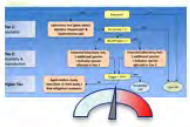
fish



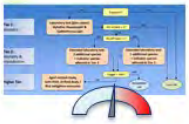
Aquatic invertebrates



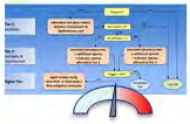
Algae macrophytes



bees



Non-target Arthropods (e.g. insects, mites)



Earthworms Soil mesofauna

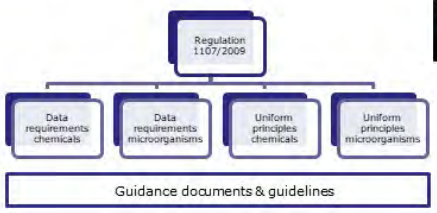
Non-target plants

microflora

European Commission

Are there shortcomings?

Experts' judgement



from the 90's

No common language
no integration (no system view)

One size fits all -
How protective is it?

Health and Food Safety

European Commission

- *How is ERA done today? What are its shortcomings?*
- ***What is the link between protection goals and environmental risk assessment?***
- *Why this SPG project?*

Health and Food Safety

European Commission

generic protection goals

"no unacceptable effects on biodiversity and ecosystem"

operationalise

where we draw the line?

unacceptable

acceptable

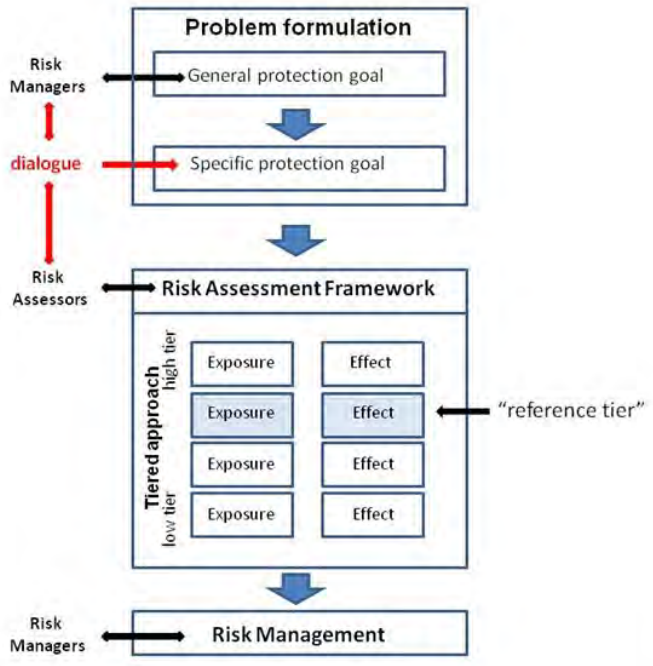
specific protection goals

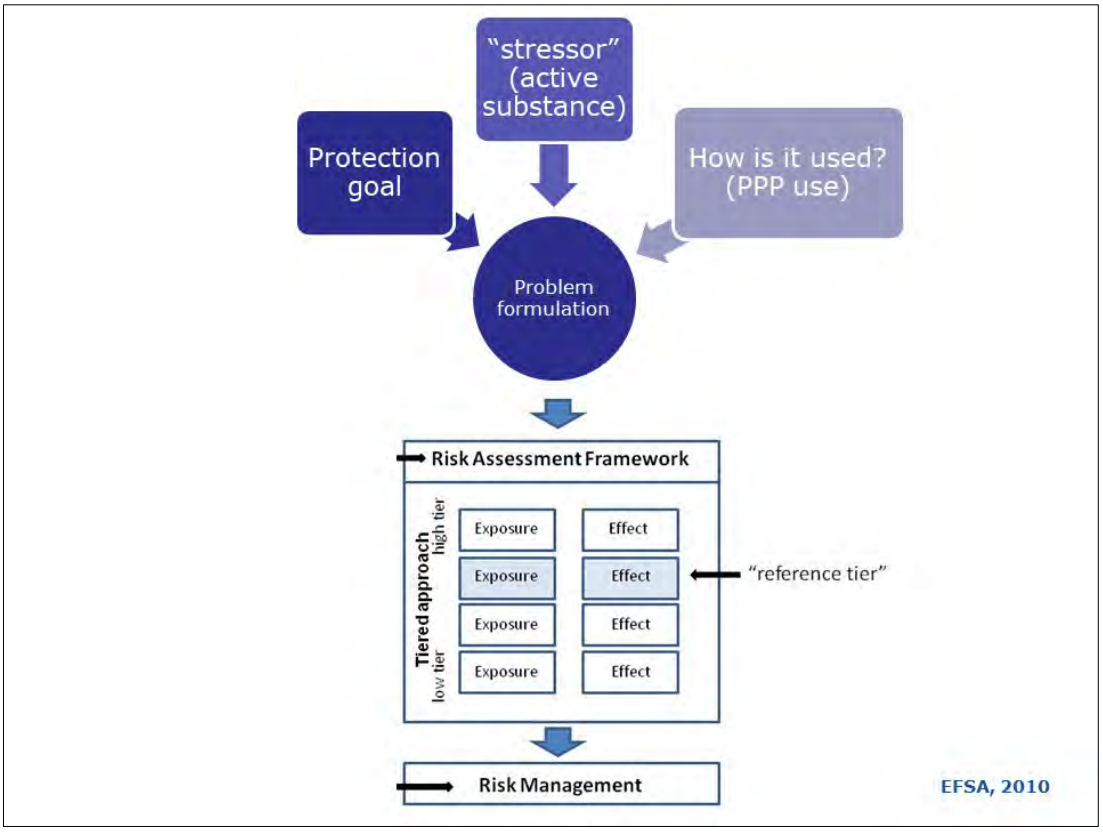
what, where, and how long to protect?

... **keeping in mind Art 4.3**:

*"...consequent on application consistent with **good plant protection practice** and having regard to **realistic conditions of use**..."*

Food Safety





European Commission

- *How is ERA done today? What are its shortcomings?*
- *What is the link between protection goals and environmental risk assessment?*
- ***Why this SPG project?***

Health and Food Safety

European Commission

We all want a healthy planet and healthy food!

We all want to protect the environment and its biodiversity!!

Health and Food Safety

European Commission

Healthy food means healthy plants

So we may need crop protection measures, including (bio)pesticides

Health and Food Safety

Regulation 1107/2009 *(Art 4.3.e)*

"…A PPP, consequent on application consistent with *good plant protection practice* and having regard to *realistic conditions of use*..
… shall have ***no unacceptable effects on the environment***, having particular regard to…
… its ***impact on biodiversity and the ecosystem***."

Regulation 1107/2009 *(definition in Art 3.29)*

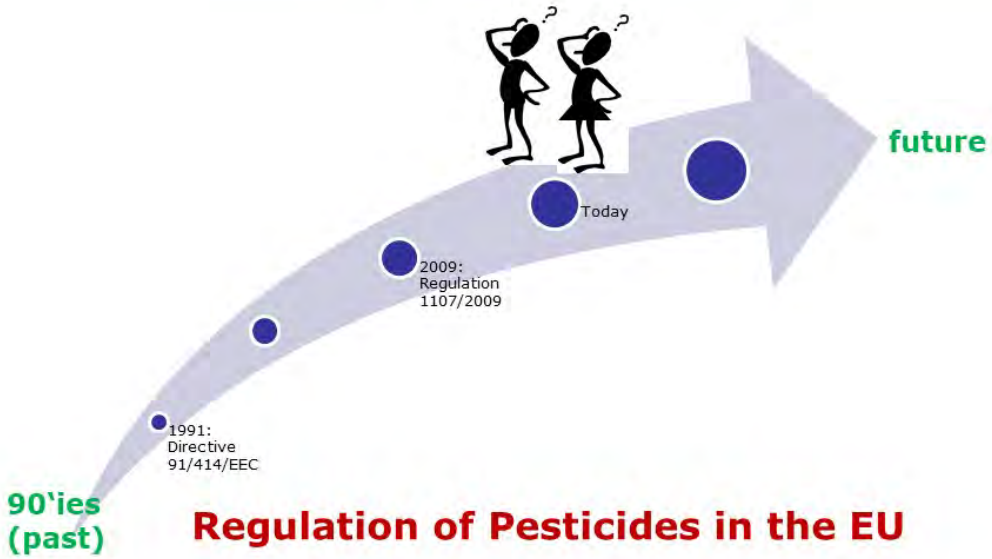
*"…'**biodiversity**' means variability among living organisms from all sources, including terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this variability may include diversity within species, between species and of ecosystems;"*

European Commission

Biodiversity
(…beyond Regulation 1107/2009…)

- Species and insect decline
- Public awareness
- Political priority new Commission

European Commission



Regulation of Pesticides in the EU

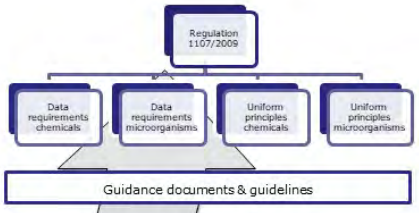
Health and Food Safety

European Commission

… to check if the current ERA is suitable for all uses and gives answers to today challenges…

"no unacceptable effects on biodiversity and ecosystem"

specific protection goals
what, where, and how long to protect?



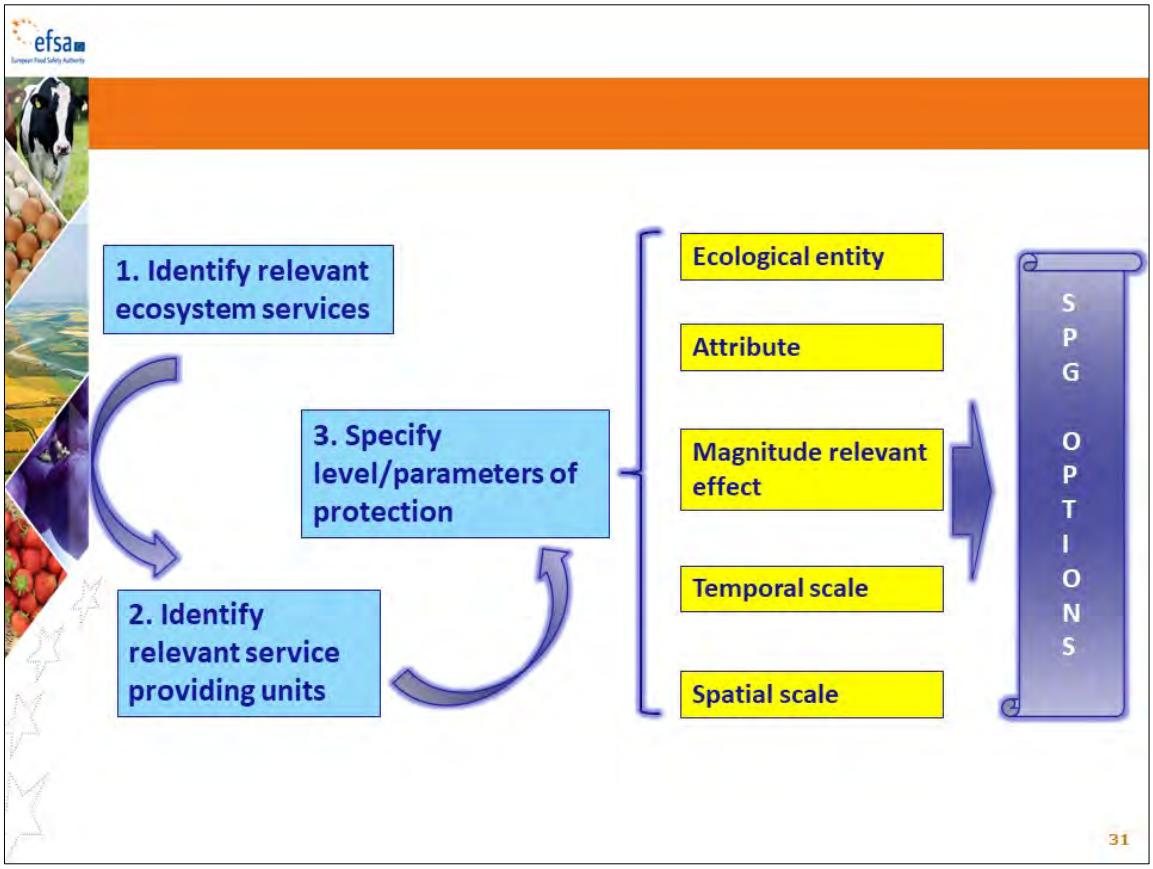
… if needed update of…

Food Safety

European Commission

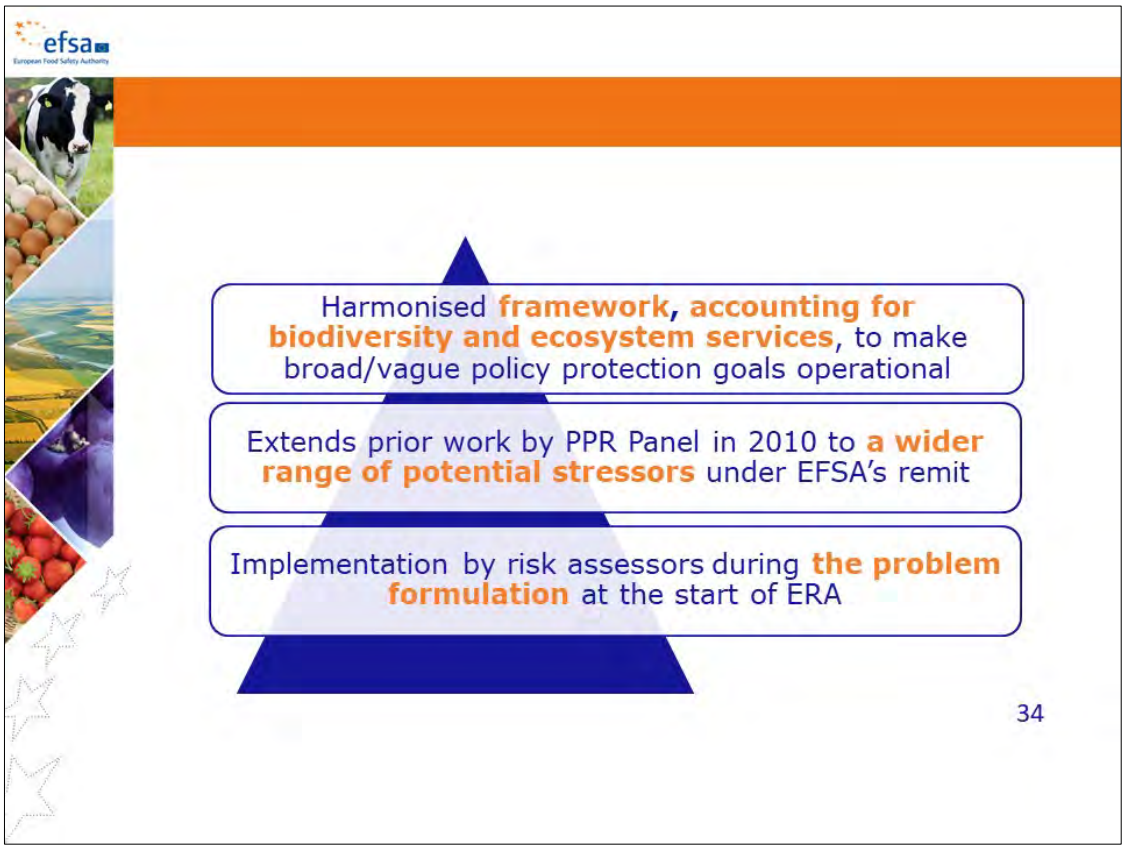
→ *SAM Opinion (2018) recommends:*
…"Clarify the protection goals of the EU PPP approval and authorization system and improve their communication – to ensure adequate functioning and to increase public trust…"

The Scientific Advisors therefore recommend that the EC ensure the setting of realistic, practical, unambiguous and quantifiable protection goals. These goals should cover human and animal health, and the environment, including wildlife. Related acceptability of risks and the required levels of certainty of the risk assessment must be clearly defined by the risk manager. These goals will need to reflect that some trade-offs between production and protection objectives are inevitable, and that trade-offs may also exist between the protection of health and the protection of the environment. In addition, 100% certainty can never be achieved and zero risk is impossible to ensure (see also SAPEA, 2018a).


1. Identify relevant ecosystem services
2. Identify relevant service providing units
3. Specify level/parameters of protection
Ecological entity
Attribute
Magnitude relevant effect
Temporal scale
Spatial scale
SPG OPTIONS
31


STEP 1: ECOSYSTEM SERVICES
Provisioning services
Food
Fibre and fuel
Genetic resources
Biochemicals/natural medicines/ pharmaceuticals
Ornamental resources
Fresh water
Regulating services
Pollination
Seed/propagule dispersal
Pest/disease regulation
Climate regulation
Air quality regulation
Water regulation
Erosion regulation
Natural hazard regulation
Invasion resistance
Water purification/soil remediation/ waste treatment/decomposition
Cultural services
Spiritual and religious values
Education and inspiration
Recreation and ecotourism
Cultural heritage
Aesthetic values
Sense of place
Cultural diversity
Species of conservation concern
32


Structural and functional components of ecosystems necessary to deliver a given ecosystem service
33


Harmonised framework, accounting for biodiversity and ecosystem services, to make broad/vague policy protection goals operational
Extends prior work by PPR Panel in 2010 to a wider range of potential stressors under EFSA's remit
Implementation by risk assessors during the problem formulation at the start of ERA
34

Clear advantages of using an ES approach, but also some challenges

Advantages	Challenges
Relevance	Anthropocentric
Transparency	Complexity
Integration	Tools
Communication	

(Maltby et al. 2018. Science of the Total Environnent 621:1342-1351)

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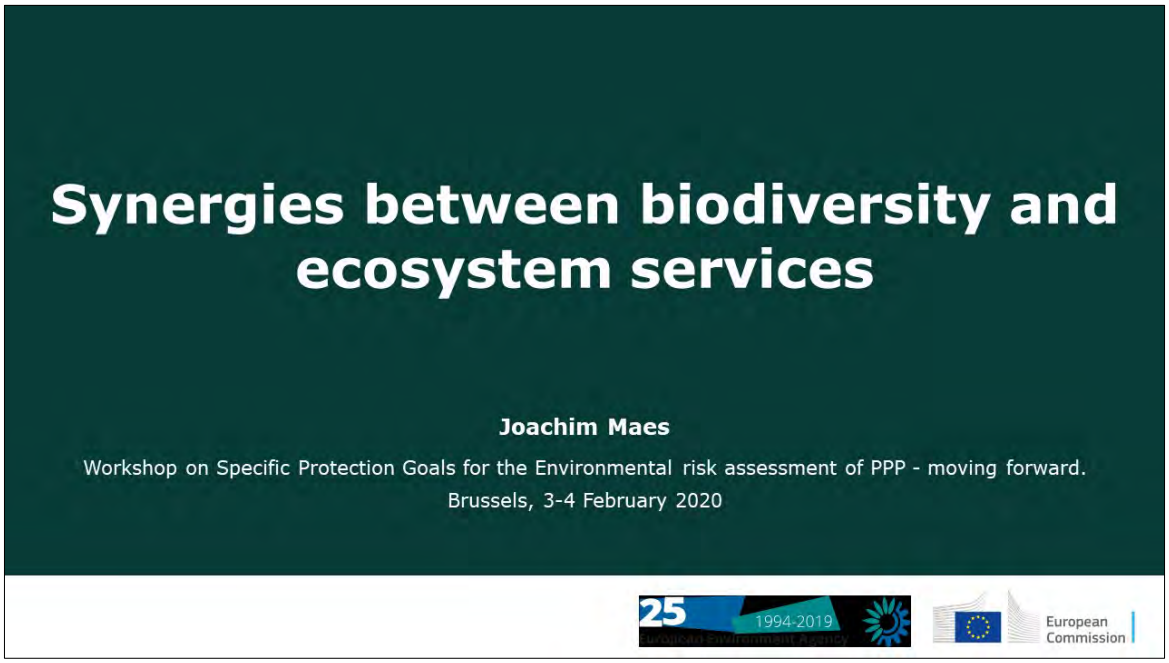
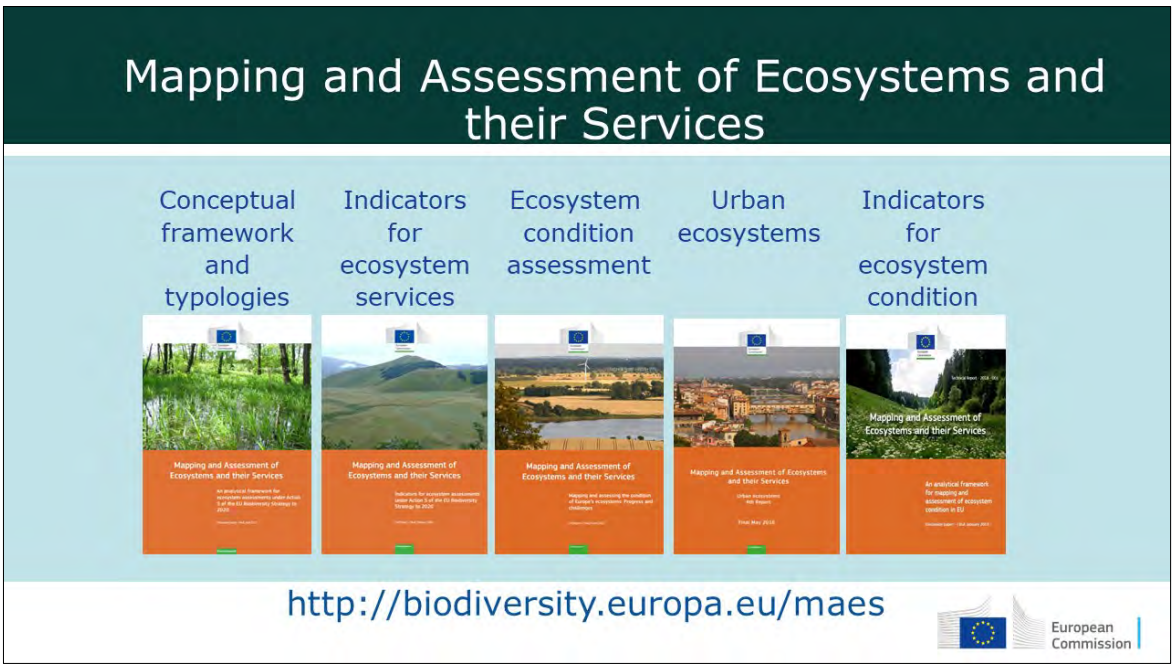
...but...
...the proof is in the pudding ...

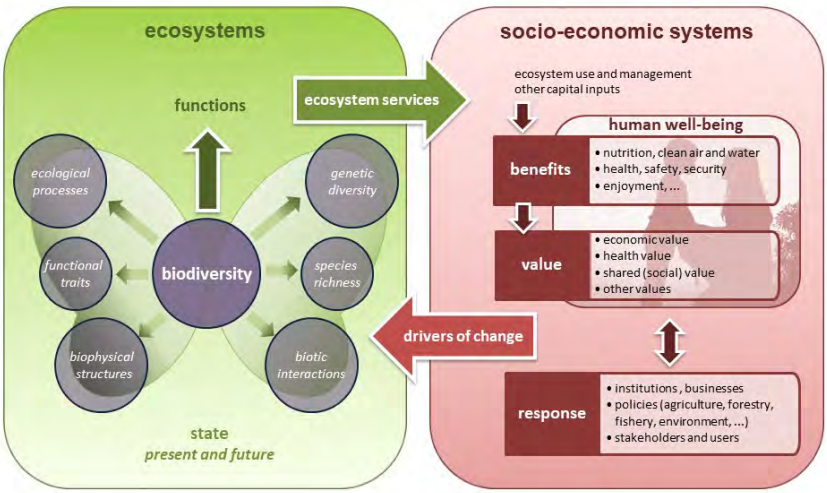
- *Moving beyond the training-workshops last year*
- *work on EFSA method – step 1*
- *Get some tangible results for particular scenarios of pesticide application*
- *Discuss tomorrow*
  - **Outcome**
  - **general questions raised**
  - **potential way forward...**

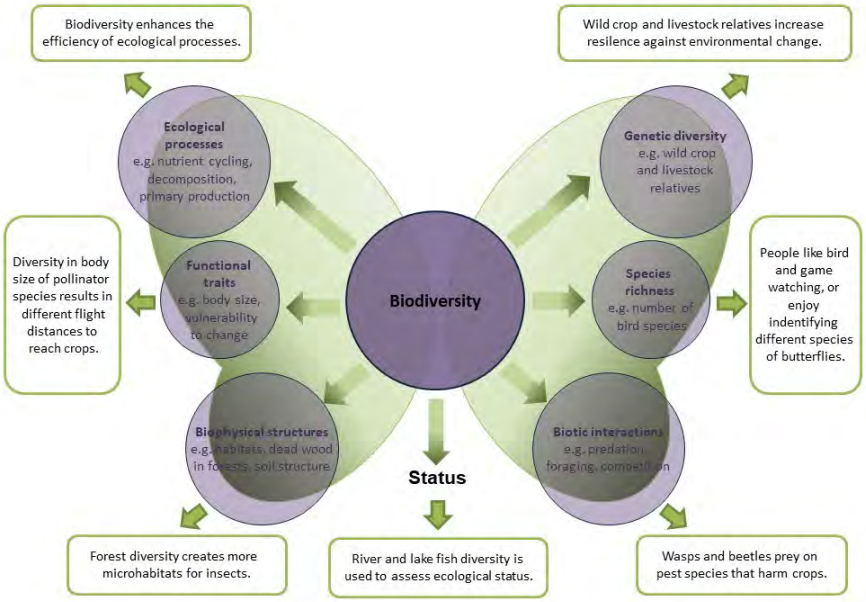
Health and Food Safety

Annex 4: Presentation on the synergies between biodiversity and ecosystem services

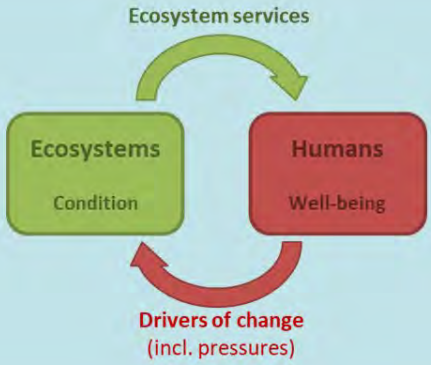





ecosystems
functions
ecosystem services
ecological processes
genetic diversity
functional traits
biodiversity
species richness
biophysical structures
biotic interactions
state
present and future
socio-economic systems
ecosystem use and management
other capital inputs
human well-being
benefits
• nutrition, clean air and water
• health, safety, security
• enjoyment, ...
value
• economic value
• health value
• shared (social) value
• other values
drivers of change
response
• institutions, businesses
• policies (agriculture, forestry, fishery, environment, ...)
• stakeholders and users


Biodiversity enhances the efficiency of ecological processes.
Wild crop and livestock relatives increase resilence against environmental change.
Ecological processes
e.g. nutrient cycling, decomposition, primary production
Genetic diversity
e.g. wild crop and livestock relatives
Diversity in body size of pollinator species results in different flight distances to reach crops.
Functional traits
e.g. body size, vulnerability to change
Biodiversity
Species richness
e.g. number of bird species
People like bird and game watching, or enjoy indentifying different species of butterflies.
Biophysical structures
e.g. habitats, dead wood in forests, soil structure
Biotic interactions
e.g. predation, foraging, competition
Status
Forest diversity creates more microhabitats for insects.
River and lake fish diversity is used to assess ecological status.
Wasps and beetles prey on pest species that harm crops.

Linking ecosystems to people



- What is the evidence base on the relation between ecosytem condition (incl. species diversity) and ecosytem services

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How natural capital delivers ecosystem services: A typology derived from a systematic review

- 780 papers **link 13 ecosystem services to 29 biotic attributes** (diversity, community/habitat, functional diversity, population dynamics)
- 2607 links identified
  - 73% are positive
  - 9% are negative
  - 7% show both positive and negative impacts
  - 11% unclear

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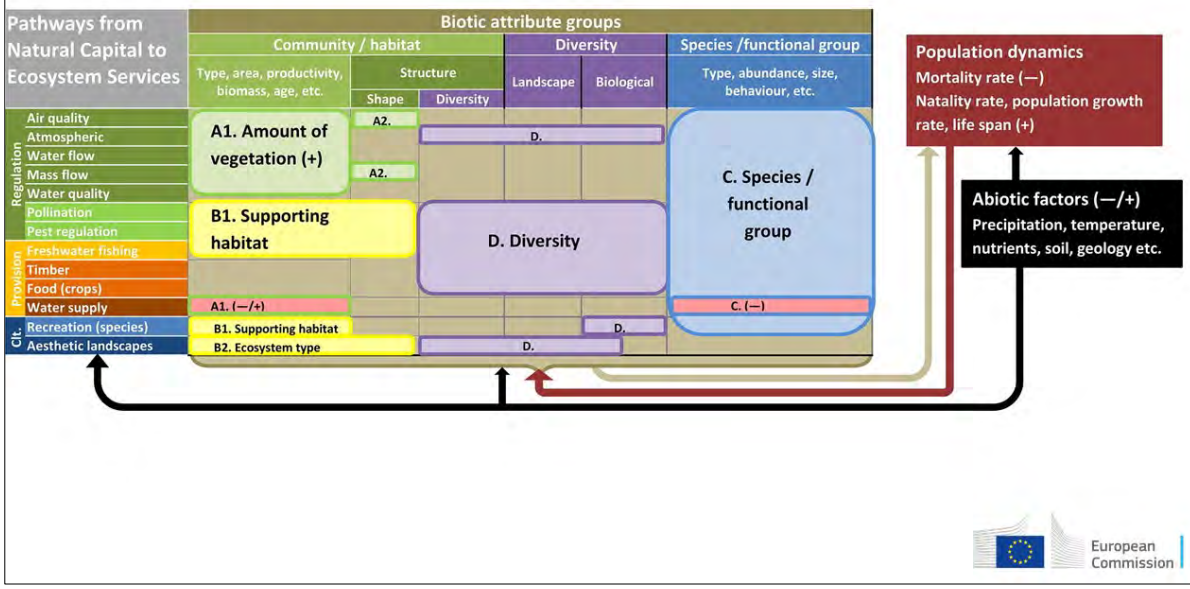
Table 1a
Number of studies showing a positive link (not including mixed or unclear) between an ecosystem service and a specific biotic attribute. More frequently cited links highlighted in darker shades of green. Total number of studies reviewed for each service = 60.

	Community / habitat										Diversity					Specific species or functional group										Population dynamic				
	Presence of a specific community/habitat	Community/habitat area	Community/habitat structure	Community/habitat/stand age	Successional stage	Primary productivity	Aboveground biomass	Belowground biomass	Stem density	Litter/crop residue quality	Landscape diversity	Species richness	Functional richness	Functional diversity	Species population diversity	Presence of a specific functional group	Abundance of a specific functional group	Presence of a specific species type	Species abundance	Species size/weight	Wood density	Sapwood amount	Leaf N content	Flower-visiting behavioural traits	Predator behavioural traits (biocontrol)	Population growth rate	Life span/longevity	Natality rate	Mortality rate	Other biotic
Air quality regulation	5	27	4	1		2	5		1			4	1	1	1	12	3	15	2	9							1			18
Atmospheric regulation	12	17	14	18	8	9	35	25	2	6		16	2	8	5	6	8	15	4	12	6		1			8	2			1
Water flow regulation	5	41	21	10	2		1	2		2						4	3	3	1	3						1				1
Mass flow regulation	34	31	28	5	8	1	11	21	8	14		7	3	7		22		20	1	3						7				1
Water quality regulation	40	37	8	3	1	3	5	5	4	3		6	1	3	2	7	4	17	6	6						1				
Pollination	22	15	19						1		8	25	10	11	7	32	21	17	20	3				15						4
Pest regulation	17	20	22	1	2	1	2		1	5	5	9	8	7	1	10	13	4	11	1					11	3	2	2		5
Freshwater fishing	12	12	10		1	6	1			2	5	8	1	1	4	4	2	16	17	21			1			6	1	2	1	
Timber production	1		7	2	1	1	2		7	3		35	5	9		6		18	7	4		1	6			2				
Food production (crops)	1	4	2				11	8		10	1	35	4	5	11	23	9	19		1			10			7				
Water supply	8	7	5	2	1			2	1	1		1			1	2		1		1										1
Recreation (species-based)	4	3										18	1	3	10	7	5	43	15	10								2		6
Aesthetic landscapes	26	7	34	2	1		1		2		7	8		2		1		5	2	3										3

Table 1b
Number of studies showing a negative link (not including mixed or unclear) between an ecosystem service and a specific biotic attribute. More frequently cited links ar highlighted in darker shades of red. Total number of studies reviewed for each service = 60. Red lines highlight that most of the negative impacts are related to mortality rate an water supply.

	Community / habitat										Diversity					Specific species or functional group										Population dynamic				
	Presence of a specific community/habitat	Community/habitat area	Community/habitat structure	Community/habitat/stand age	Successional stage	Primary productivity	Aboveground biomass	Belowground biomass	Stem density	Litter/crop residue quality	Landscape diversity	Species richness	Functional richness	Functional diversity	Species population diversity	Presence of a specific functional group	Abundance of a specific functional group	Presence of a specific species type	Species abundance	Species size/weight	Wood density	Sapwood amount	Leaf N content	Flower-visiting behavioural traits	Predator behavioural traits (biocontrol)	Population growth rate	Life span/longevity	Natality rate	Mortality rate	Other biotic
Air quality regulation							1									1													2	3
Atmospheric regulation			1				2					1		1				2									1		8	1
Water flow regulation	1	3		1					1							1		1	3	1										
Mass flow regulation	1		1	1	2											2		2		2										
Water quality regulation				2	1					1							1	1		2			1							
Pollination		1																2	2											
Pest regulation			2				1																1						2	1
Freshwater fishing												1						1		1									14	
Timber production			1		3				4			5	1	2		3	1												2	
Food production (crops)								1				1				1		2											1	
Water supply	20	26		12			2	2	9	1						5	1	10		2		2				5				1
Recreation (species-based)												2			1				5										5	
Aesthetic landscapes			1															1	1										1	



Implications for an approach based on ecosystem services

- ES as a holistic, landscape-scale approach to protect (functional) **biodiversity**
- ES as a method to find **consensus** among stakeholders on targets and implementation of policy (OpenNESS, OPERAs, BESAFE, EnRoute)

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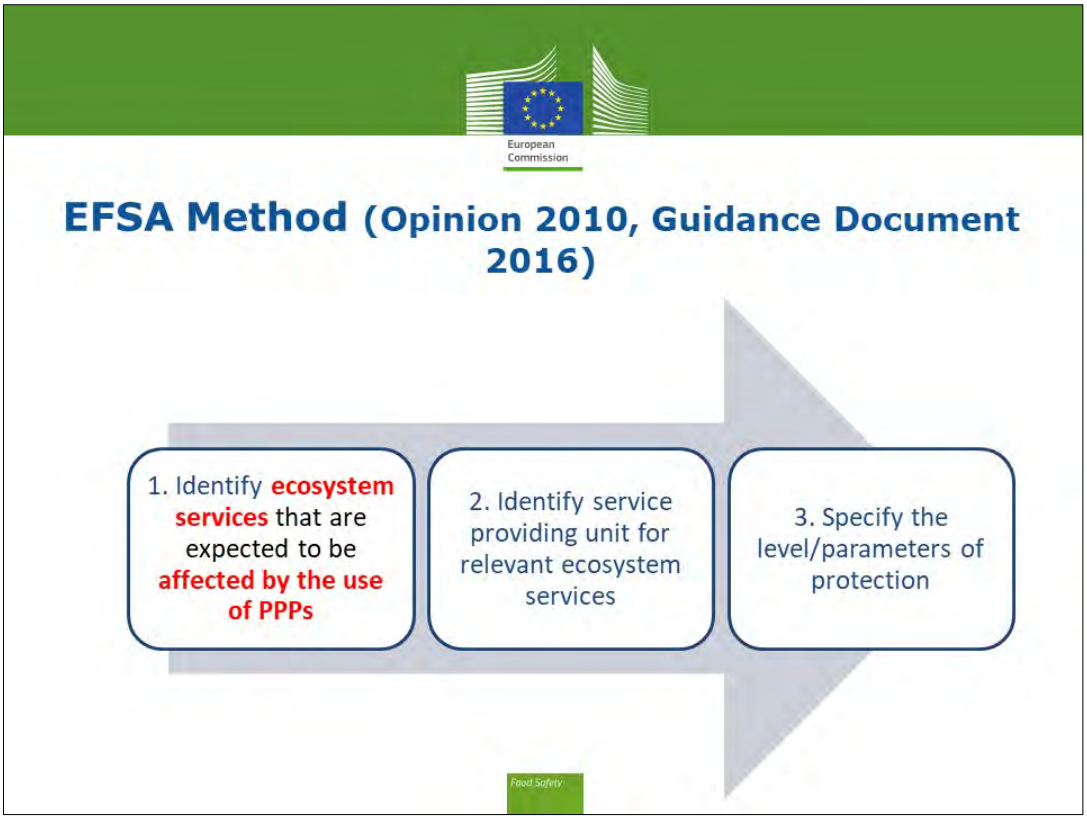
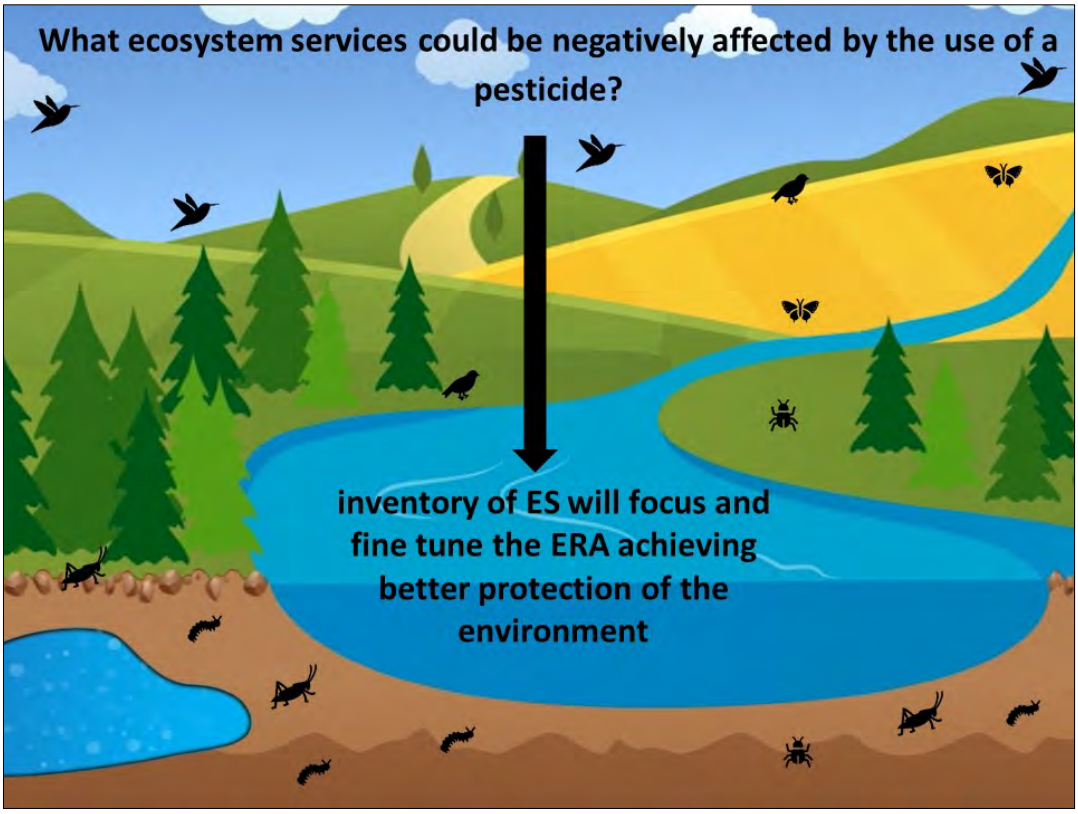
Annex 5: Presentation on the 1st step of the EFSA method- identifying ecosystem services affected





Classification of Ecosystem Services – Which one to take?

MA categories	TEEB categories		CICES categories
Food (fodder)	Food	Provisioning services	Biomass [Nutrition]
			Biomass (Materials from plants, algae and animals for agricultural use)
Fresh water	Water		Water (for drinking purposes) [Nutrition]
			Water (for non-drinking purposes) [Materials]
Fibre, timber	Raw Materials		Biomass (fibres and other materials from plants, algae and animals for direct use and processing)
Genetic resources	Genetic resources		Biomass (genetic materials from all biota)
Biochemicals	Medicinal resources		Biomass (fibres and other materials from plants, algae and animals for direct use and processing)
Ornamental resources	Ornamental resources		Biomass (fibres and other materials from plants,

Comparison of provisioning services categories in MA, TEEB, CICES (EU,2013)

Classification of Ecosystem Services – Which one to take?

MA categories	TEEB categories		CICES categories
Air quality regulation	Air quality regulation		[Mediation of] gaseous/air flows
Water purification and water treatment	Waste treatment (water purification)		Mediation [of waste, toxics and other nuisances] by biota
			Mediation [of waste, toxics and other nuisances] by ecosystems
Water regulation	Regulation of water flows		[Mediation of] liquid flows
	Moderation of extreme events	**Regulating services (TEEB)**	
Erosion regulation	Erosion prevention		[Mediation of] mass flows
Climate regulation	Climate regulation		Atmospheric composition and climate regulation
Soil formation (supporting service)	Maintenance of soil fertility	**Regulating and supporting services (MA)**	Soil formation and composition
Pollination	Pollination		Lifecycle maintenance, habitat and gene pool protection
Pest regulation	Biological control	**Regulating and maintenance services (CICES)**	Pest and disease control
Disease regulation			Lifecycle maintenance, habitat and gene pool protection
Primary production Nutrient cycling (supporting services)	Maintenance of life cycles of migratory species (incl. nursery service)		Soil formation and composition
			[Maintenance of] water conditions
	Maintenance of genetic diversity (especially in gene pool protection)		Lifecycle maintenance, habitat and gene pool protection

Ecosystem services categories in MA, TEEB, CICES (EU,2013)

Classification of Ecosystem Services – Which one to take?

MA categories	TEEB categories		CICES categories
Spiritual and religious values	Spiritual experience		Spiritual and/or emblematic
Aesthetic values	Aesthetic information		Intellectual and representational interactions
Cultural diversity	Inspiration for culture, art and design		Intellectual and representational interactions
		Cultural services	Spiritual and/or emblematic
Recreation and ecotourism	Recreation and tourism		Physical and experiential interactions
Knowledge systems and educational values	Information for cognitive development		Intellectual and representational interactions
			Other cultural outputs (existence, bequest)

Ecosystem services categories in MA, TEEB, CICES (EU,2013)

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ES - Provisioning services

Food Safety

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ES - Regulating services

Food Safety

European Commission

ES – Habitat or supporting services

Food Safety

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ES– Cultural services

Food Safety

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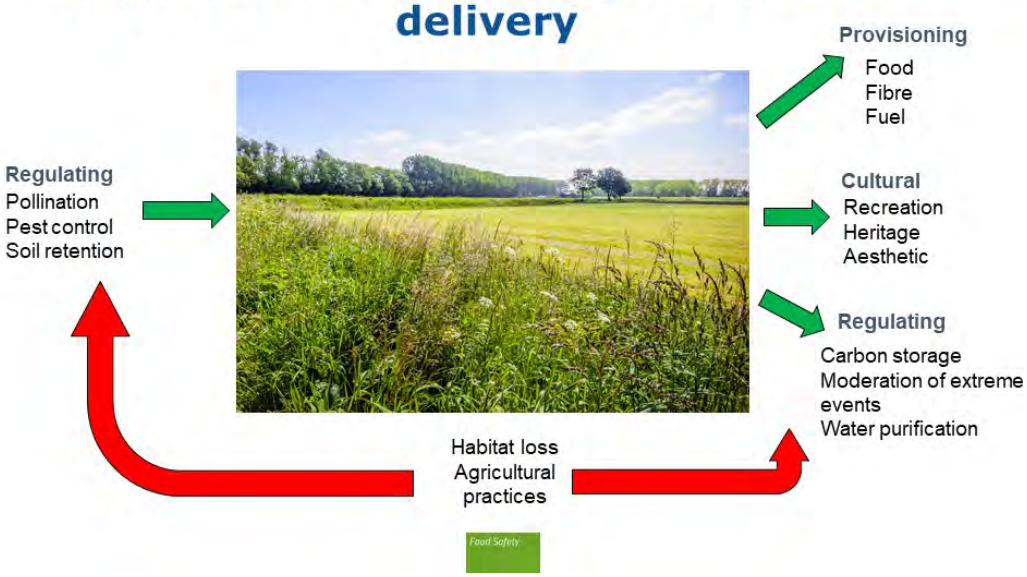
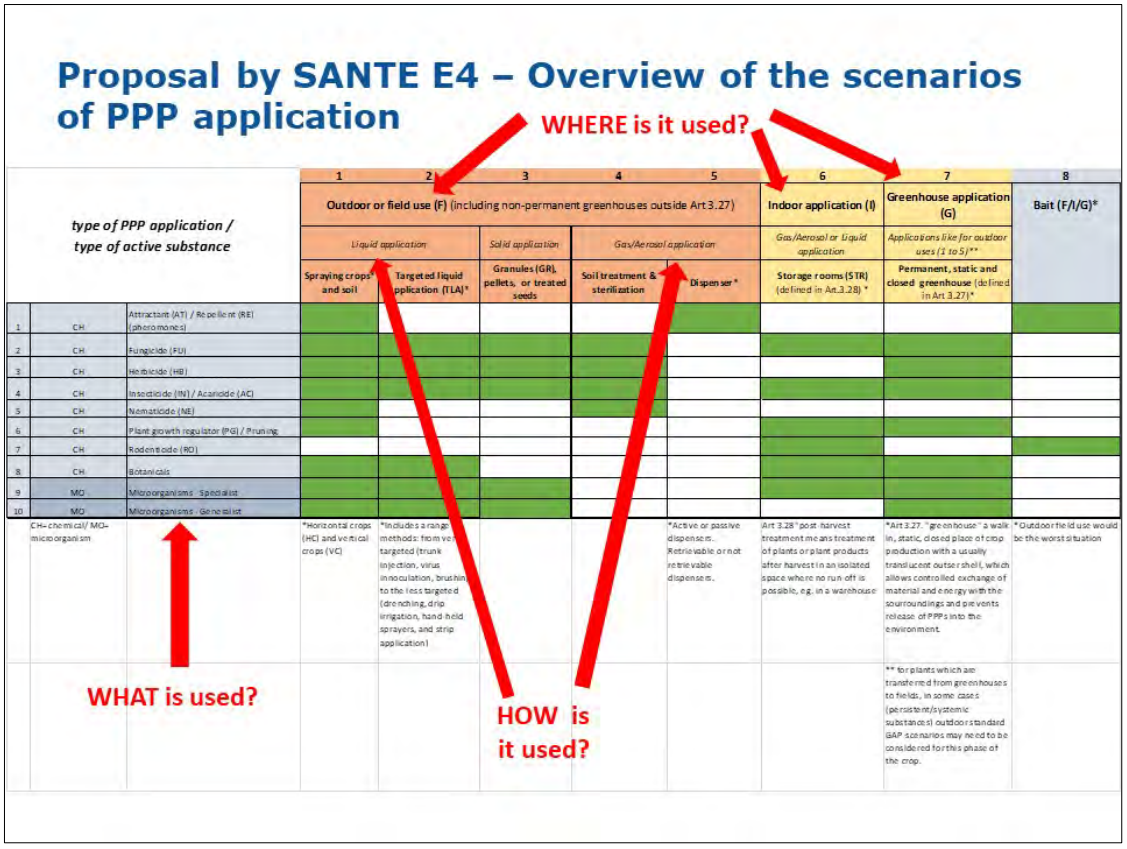
Importance of agroecosystems for ES delivery



Food Safety

Annex 6: Presentation on the scenarios of pesticide application



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What is the purpose behind this table?

EFSA method

1. Identify **ecosystem services** that are expected to be **affected by the use of PPPs**
2. Identify service providing unit for relevant ecosystem services
3. Specify the level/parameters of protection

What ecosystem services could be negatively affected by the use of a pesticide?

→ inventory of ES will focus and fine tune the ERA achieving better protection of the biodiversity

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Feedback requested

1. *Is there any **type of application (columns 1 to 8) missing** or not covered?*
2. *Is there any commonly used **application scenario -combining type and application of PPP- missing** (any "empty" cells which should be "green")?*
3. *Given that several participants expressed their preference to work on **case studies** to gain a deeper understanding of the EFSA method, you are invited to select one or more application scenarios (green cells) that you find particularly relevant and to describe a case study for those scenarios that should not be longer than 10 lines, including type of the PPP (without naming a PPP or an active substance), crop, pest, description of application method, frequency of use etc.*

Questions raised

		type of PPP application / type of active substance	1	2	3	4	5	6	7	8
			Outdoor or field use (F) (including non-permanent greenhouses outside Art3.27)					**Indoor application (I)**	**Greenhouse application (G)**	**Bait (F/I/G)***
			Liquid application		*Solid application*	*Gas/Aerosol application*		*Gas/Aerosol or Liquid application*	*Applications like for outdoor uses (1 to 5)***	
			Spraying crops* and soil	**Targeted liquid application (TLA)***	**Granules (GR), pellets, or treated seeds**	**Soil treatment & sterilization**	**Dispenser***	**Storage rooms (STR)** (defined in Art.3.28) *	**Permanent, static and closed greenhouse** (defined in Art 3.27)*	
1	CH	Attractant (AT) / Repellent (RE) (pheromones)								
2	CH	Fungicide (FU)								
3	CH	Herbicide (HB)								
4	CH	Insecticide (IN) / Acaricide (AC)								
5	CH	Nematicide (NE)								
6	CH	Plant growth regulator (PG) / Pruning								
7	CH	Rodenticide (RO)								
8	CH	Botanicals								
9	MO	Microorganisms - Specialist								
10	MO	Microorganisms - Generalist								
	CH= chemical/ MO= microorganism		*Horizontal crops (HC) and vertical crops (VC)	*Includes a range of methods: from very targeted (trunk injection, virus innoculation, brushing) to the less targeted (drenching, drip irrigation, hand held sprayers, and strip application)			*Active or passive dispensers. Retrievable or not retrievable dispensers.	Art 3.28" post-harvest treatment means treatment of plants or plant products after harvest in an isolated space where no run off is possible, e.g. in a warehouse	*Art 3.27. "greenhouse" 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 PPPs into the environment.	*Outdoor field use would be the worst situation
									** for plants which are transferred from greenhouses to fields, in some cases (persistent/systemic substances) outdoor standard GAP scenarios may need to be considered for this phase of the crop.	

Is there any commonly used application scenario - combining type and application of PPP- missing (any "empty" cells which should be "green")?

			1	2	3	4	5	6	7	8
			Outdoor or field use (F) (including non-permanent greenhouses outside Art 3.27)					Indoor application (I)	Greenhouse application (G)	Bait (F/I/G)*
			Liquid application		*Solid application*	*Gas/Aerosol application*		*Gas/Aerosol or Liquid application*	*Applications like for outdoor uses (1 to 5)***	
type of PPP application / type of active substance			'Spraying crops' and soil	Targeted liquid application (TLA)*	Granules (GR), pellets, treated seeds, *DP (dustable podwer)	Soil treatment & sterilization	Dispenser*	Storage rooms (STR) (defined in Art.3.28) *	Permanent, static and closed greenhouse (defined in Art 3.27)*	
1	CH	Acaricaent (AT) / Repellent (RE) (pheromones)								
2	CH	Fungicide (FU)								
3	CH	Herbicide (HB)								
4	CH	Insecticide (IN) / Aseticide (AC)								
5	CH	Nematicide (NT)								
6	CH	Plant growth regulator (PG) / Pruning								
7	CH	Rodenticide (RO)								
		Molluscicides								
		Repellents								
8	CH	Botanicals								
9	MO	Microorganisms - Specialks								
10	MO	Microorganisms - Generalks								

CH= chemical/MO= microorganism

*Horticorial crops (HC) and vertical crops (VC)

*Includes a range of methods: from very targeted (trunk injection, virus inoculation, brushing) to the less targeted (drenching, drip irrigation, handheld sprayers, and strip application)

*Active or passive dispensers. Refillowable or not refillowable dispensers.

Art 3.28 "post-harvest treatment means treatment of plants or plant products after harvest in an enclosed space where no run-off is possible, eg in a warehouse

*Art 3.27. "greenhouse" a walk-in, static, closed place of crop production by the wood structure with a usually translucent outer shell, which allows controlled exchange of material and energy with the surroundings and prevents release of PPP's into the environment.

* Outdoor field use would be the worst situation

** for plants which are transferred from greenhouses to fields, in some cases (persistent/systemic substances) outdoor standard GAP-scenarios may need to be considered for this phase of the crop.

Case studies – We got examples for these scenarios (X)

			1	2	3	4	5	6	7	8
			Outdoor or field use (F) (including non-permanent greenhouses outside Art 3.27)					Indoor application (I)	Greenhouse application (G)	Bait (F/I/G)*
			Liquid application		*Solid application*	*Gas/Aerosol application*		*Gas/Aerosol or Liquid application*	*Applications like for outdoor uses (1 to 5)***	
type of PPP application / type of active substance			Spraying crops* and soil	Targeted liquid application (TLA)*	Granules (GR), pellets, treated seeds, *DP (dustable podwer)	Soil treatment & sterilization	Dispenser*	Storage rooms (STR) (defined in Art.3.28) *	Permanent, static and closed greenhouse (defined in Art 3.27)*	
1	CH	Acaricaent (AT) / Repellent (RE) (pheromones)					X			
2	CH	Fungicide (FU)	X		X	X				
3	CH	Herbicide (HB)	X		X	X				
4	CH	Insecticide (IN) / Aseticide (AC)	X		X					
5	CH	Nematicide (NT)								
6	CH	Plant growth regulator (PG) / Pruning								
7	CH	Rodenticide (RO)								
8	CH	Botanicals								
9	MO	Microorganisms - Specialks								
10	MO	Microorganisms - Generalks								

Scenarios selected – Hands on!!!

			1	2	3	4	5	6	7	8
		type of PPP application / type of active substance	Outdoor or field use (F) (including non-permanent greenhouses outside Art 3.27)					Indoor application (I)	Greenhouse application (G)	Bait (F/I/G)*
			Liquid application		*Solid application*	*Gas/Aerosol application*		*Gas/Aerosol or Liquid application*	*Applications like for outdoor uses (1 to 5)***	
			Spraying crops* and soil	Targeted liquid application (TLA)*	Granules (GR), pellets, treated seeds, *DP (dustable podwer)	Soil treatment & sterilization	Dispenser*	Storage rooms (STR) (defined in Art.3.28) *	Permanent, static and closed greenhouse (defined in Art 3.27)*	
1	CH	Atractant (AT) / Repellent (RE) (pheromones)					S9			
2	CH	Fungicide (FU)	S2					S10	S11	
3	CH	Herbicide (HB)	S1							
4	CH	Insecticide (IN) / Acaricide (AC)	S3	S6	S7					
5	CH	Nematicide (NE)				S8				
6	CH	Plant growth regulator (PG) / Pruning								
7	CH	Rodenticide (RO)								S12
9	MO	Microorganisms - Specialty	S4							
10	MO	Microorganisms - Generalist	S5							

Templates scenarios – Working groups

SCENARIO 1: Spraying herbicide, Outdoor or Field use

Spray application of a total **herbicide** (no residual soil activity) in late summer to a weedy field of cereal stubble prior to sowing oilseed rape within a minimum-tillage regime. Foliage of weeds must be sprayed to achieve control.

Pest: All weed plants within the area to be sown with the oilseed rape.

Frequency: one application in late summer.

Situation: Arable field after harvest of cereal crop.

Considering the scenario just described, which ecosystem services could be negatively affected by the use of this pesticide?

Ecosystem services list		NO /small/medium/strong effects	Why? Please state the reasons
Provisioning services	Food		
	Raw materials		
	Fresh water		
	Medicinal resources		
Regulating services	Local climate and air quality		
	Carbon sequestration and storage		
	Moderation of extreme events		
	Waste-water treatment		
	Erosion prevention and maintenance of soil fertility		
	Pollination		
	Biological control		
Habitat or supporting services	Habitats for species		
	Maintenance of genetic diversity		
Cultural services	Recreation and mental and physical health		
	Tourism		
	Aesthetic appreciation and inspiration for culture, art and design		
	Spiritual experience and sense of place		

12 Scenarios – Working groups

SCENARIO 1: Spraying herbicide, Outdoor or Field use

Spray application of a total **herbicide** (no residual soil activity) in late summer to a weedy field of cereal stubble prior to sowing oilseed rape within a minimum-tillage regime. Foliage of weeds must be sprayed to achieve control.

Pest: All weed plants within the area to be sown with the oilseed rape.

Frequency: one application in late summer.

Situation: Arable field after harvest of cereal crop.

SCENARIO 2: Spraying fungicide, Outdoor or Field use

Spray application of a **fungicide** in orchard to control scab. If scab is not controlled, the quality of the apples (dessert apple) is lower and the harvest can be sold to retailers and consumers but at depreciated values.

Pest: Ascomycete fungus *Venturia inaequalis*, which causes scabs of fruit skins and leaves.

Frequency: Once per week according to weather conditions, in the window April-to-October.

SCENARIO 3: Spraying insecticide, Outdoor or Field use

Foliar spray application of an **insecticide** in orange orchards against red scale insects. **Frequency:** Twice per year in spring and summer.

12 Scenarios – Working groups

SCENARIO 4: Spraying microorganisms (specialists) as biological control, Outdoor or Field use

Spray application of **parasitic fungus** (parasite of a crop pest) in vineyards to control grapevine powdery mildew.
Frequency: up to 12 times per year (at least 10 days interval).

SCENARIO 5: Spraying microorganisms (generalist) as biological control, Outdoor or Field use

Spray application of a generalist **microorganism** in a variety of crops to control soil borne fungal diseases. The mode of action is by competition with the "pest". **Frequency:** up to 6 applications per year (at least 3 weeks intervals)

12 Scenarios – Working groups

SCENARIO 6: Targeted liquid application of an insecticide, Outdoor or Field use

Closed system of **tree injection** with a xylem/ phloem mobile **insecticide** for use on forest-trees, Christmas-trees, seed cone nurseries/orchards, and ornamental trees. The aim is to control phloem-feeding insects.

Frequency: one application (late summer or autumn).

SCENARIO 7: Granular insecticides application Outdoor or field use

Insecticide granules applied in the seedbed at the sowing of vegetables crops, such as cabbages or carrots to protect against early-season insect pests such as Cabbage Stem Flea Beetles, Cabbage Flea Beetles, Cabbage Root Fly.

12 Scenarios – Working groups

SCENARIO 8 : Soil treatment and sterilization with a fumigant gas, Outdoor or field use

Soil is treated with a fumigating gas injected and incorporated in the soil at a depth of 25 cm, followed by sealing of the soil with heavy roller and covering with a gas-tight plastic cover for a period of 48 hours. After the treatment, the crops are planted: vegetables, small fruit crops (tomatoes, berries), field grown nursery/ornamental crops, and forestry nursery crops.
Pests: nematodes considered as quarantine pests (e.g. Root Knot nematods, strawberry spring dwarf nematods, Golden nematods). Indirectly this soil treatment also controls weeds and soil-borne plant pathogens.

SCENARIO 9: Pheromones applied via passive dispensers, Outdoor or Field use

Passive dispensers are manually distributed in the field and can be removed before harvest. The pheromone is highly volatile and rapidly dissipates in the air. The arthropod pheromone is also naturally produced by females of an insect pest, in order to attract the males of the same species (species specific). Because there is more pheromone in the air than naturally occurring, the success rate of the males to find the females is reduced (males get confused and are not able to find the females). Hence, females lay no eggs, and the population of the pest is reduced (the reproductive cycle of one species is disrupted) to levels which do not trigger further crop protection needs.

Pest: chewing insects (Lepidoptera).
Crop: vineyards and other crops.
Frequency: One application per year. The dispensers are placed in the crop before start of the male flight.

12 Scenarios – Working groups

SCENARIO 10: Storage room treatment with a plant growth regulator, Indoor Application

A storage room (closed) with apples is treated with a vapour releasing product (gas) of plant growth regulator, which controls the maturation of stored fruits and vegetables. Application lasts two hours. Treatment room is kept closed following treatment for 2 days. Ventilation of the storage room after treatment is needed.*

Frequency: one treatment just after storage of the freshly harvested apples.

*Art 3.28 "post-harvest treatment means treatment of plants or plant products after harvest in an isolated space where no run-off is possible, eg. in a warehouse.

SCENARIO 11: Greenhouse application of fungicide

Use of fungicide for the control of cucumber downy mildew disease in permanent greenhouse*. Application is just before first disease symptoms are observed. Frequency: one to two applications with an interval of 10 days.

*Art 3.27. "greenhouse" 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 PPPs into the environment.

Annex 7: List of ecosystem services based on TEEB classification[9]

Provising service	**Food**	Ecosystems provide the conditions for growing food. Food comes principally from managed agro-ecosystems, but marine and freshwater systems or forests also provide food for consumption by people and other animal species. *(E.g. crops, fish, wild berries)*
	Raw materials	Ecosystems provide diversity of materials for construction and fuel including wood, biofuels and plant oils that are directly derived from wild and cultivated plant species. *(E.g. timber, cotton)*
	Fresh water	Ecosystems play a vital role in the global hydrological cycle, as they regulate the flow and purification of water. Vegetation and forests influence the quantity of water available locally. *(E.g. drinking water)*
	Medicinal resources	Ecosystems and biodiversity provide many plants used as traditional medicines as well as providing the raw materials for the pharmaceutical industry. Ecosystems are a potential source of medicinal resources. *(E.g Aloe Vera)*
Regulating services	**Local climate and air quality**	Trees provide shade whilst forests influence rainfall and water availability both locally and regionally. Trees or other plants also play an important role in regulating air quality by removing pollutants from the atmosphere.
	Carbon sequestration and storage	Ecosystems regulate the global climate by storing and sequestering greenhouse gases. As trees and plants grow, they remove carbon dioxide from the atmosphere and effectively lock it away in their tissues. In this way, forest ecosystems are carbon stores. Biodiversity also plays an important role by improving the capacity of ecosystems to adapt to the effects of climate change.
	Moderation of extreme events	Extreme weather events or natural hazards include floods, storms, tsunamis, avalanches and landslides. Ecosystems and living organisms create buffers against natural disasters, thereby preventing possible damage. *(E.g Wetlands can soak up flood water whilst trees can stabilize slopes. Coral reefs and mangroves help protect coastlines from storm damage)*
	Waste-water treatment	Ecosystems such as wetlands filter both human and animal waste and act as a natural buffer to the surrounding environment. Through the biological activity of microorganisms in the soil, most waste is broken down. Thereby pathogens (disease causing microbes) are eliminated, and the level of nutrients and pollution is reduced. (*E.g. wetlands in agricultural fields to retain phosphorus and nitrogen)*
	Erosion	Soil erosion is a key factor in the process of land degradation and desertification. Vegetation cover

[9] http://www.teebweb.org/resources/ecosystem-services/

	prevention and maintenance of soil fertility	provides a vital regulating service by preventing soil erosion. Soil fertility is essential for plant growth and agriculture and well-functioning ecosystems supply the soil with nutrients required to support plant growth.
	Pollination	Insects, wind pollinate plants and trees species are essential for the natural propagation of seeds within the ecosystems. Pollination is an ecosystem service mainly provided by insects but also by some birds and bats.
	Biological control	Ecosystems are important for regulating pests and vector borne diseases that attack plants, animals and people. Ecosystems regulate pests and diseases through the activities of predators and parasites. Birds, bats, flies, wasps, frogs and fungi all act as natural controls.
Habitat or supporting services	**Habitats for species**	Habitats provide everything that plants or animals need to survive: food; water; and shelter. Each ecosystem provides different habitats that can be essential for a species' lifecycle. Migratory species including birds, fish, mammals and insects all depend upon different ecosystems during their movements.
	Maintenance of genetic diversity	Genetic diversity is the variety of genes between and within species populations. Genetic diversity distinguishes different breeds or races from each other thus providing the basis for locally well-adapted cultivars and a gene pool for further developing commercial crops and livestock. Some habitats have an exceptionally high number of species which makes them more genetically diverse than others and are known as 'biodiversity hotspots'.
Cultural services	**Recreation and mental and physical health**	Walking and playing sports in green space is not only a good form of physical exercise but also lets people relax. The role that green space plays in maintaining mental and physical health is increasingly recognized in the society.
	Tourism	Ecosystems and biodiversity play an important role for tourism. Tourism provides considerable economic benefits and is a vital source of income for many countries. Cultural and eco-tourism can also educate people about the importance of biological diversity.
	Aesthetic appreciation and inspiration for culture, art and design	Language, knowledge and the natural environment have been intimately related throughout human history. Biodiversity, ecosystems and natural landscapes have been the source of inspiration for much of our art, culture and increasingly for science.
	Spiritual experience and sense of place	In many parts of the world natural features such as specific forests, caves or mountains are considered sacred or have a religious meaning. Nature is a common element of all major religions and traditional knowledge, and associated customs are important for creating a sense of belonging.

Annex 8: Feedback forms of the 12 case studies

Table 1 (4/2/2020)

SCENARIO 1: Spraying herbicide, Outdoor or Field use

Spray application of a total **herbicide** (no residual soil activity) in late summer to a weedy field of cereal stubble prior to sowing oilseed rape within a minimum-tillage regime. Foliage of weeds must be sprayed to achieve control.

Pest: All weed plants within the area to be sown with the oilseed rape.

Frequency: one application in late summer.

Situation: Arable field after harvest of cereal crop.

Considering the scenario just described, which ecosystem services could be negatively affected by the use of this pesticide?

Ecosystem services list		NO /small/medium/strong effects	Why? Please state the reasons
Provisioning services	Food	SMALL	Honey production + ruminants (if applicable)
	Raw materials	NO	
	Fresh water	MEDIUM / STRONG	Drift, depends on distance to water, depends on application (doses / technologies, ...)
	Medicinal resources	NO	
Regulating services	Local climate and air quality	NO / SMALL	Depends on MoA of herbicide (affects trees), air quality low during application
	Carbon sequestration and storage	SMALL	Removal of weeds → removes capacity for carbon sequestration, but relatively small impact.
	Moderation of extreme events	SMALL ~~NO~~	Capacity to avoid flooding increases with stubble and weeds
	Waste-water treatment	SMALL	Because only one application / year.
	Erosion prevention and maintenance of soil fertility	SMALL ~~MEDIUM~~	Stubble prevents erosion
	Pollination	MEDIUM	Depends on ecotox profile of PPP and availability of habitat and food resources
	Biological control	MEDIUM	"
Habitat or supporting services	Habitats for species	STRONG	In field STRONG; Off field SMALL-STRONG depending on ecotox profile + application techniques (drift)
	Maintenance of genetic diversity	STRONG	In field STRONG; off field MEDIUM - STRONG depending on ecotox profile + application techniques (drift)
Cultural services	Recreation and mental and physical health	SMALL-MEDIUM	It depends on perception
	Tourism	? ~~NO~~ SMALL	" " " "
	Aesthetic appreciation and inspiration for culture, art and design	~~NO~~ SMALL	" " " " → People sensitive to nature
	Spiritual experience and sense of place	NO.	" " " "

→ NEED FOR DEVELOPMENT OF METHODOLOGY TO EVALUATE THE IMPACT / EFFECTS

SCENARIO 2: Spraying fungicide, Outdoor or Field use

Combined (table 2)

Theo

Spray application of a **fungicide** in orchard to control scab. If scab is not controlled, the quality of the apples (dessert apple) is lower and the harvest can be sold to retailers and consumers but at depreciated values.

Pest: Ascomycete fungus *Venturia inaequalis*, which causes scabs of fruit skins and leaves.

Frequency: Once per week according to weather conditions, in the window April-to-October.

Considering the scenario just described, which ecosystem services could be negatively affected by the use of this pesticide?

Ecosystem services list		NO /small/medium/strong effects	Why? Please state the reasons
Provisioning services	Food	small	MRL-residues not considered – Human health. off-Field potentially wild food can be exposed and growth influenced
	Raw materials	N	
	Fresh water	N	water quality is not part of ES description. This however is affected
	Medicinal resources	small	potential for off-field exposure of e.g. medicinal herbs (wild)
Regulating services	Local climate and air quality	N	the ES is described ~~not~~ air quality as such. It describes growth and function of trees
	Carbon sequestration and storage	N	
	Moderation of extreme events	N	
	Waste-water treatment	medium	fungicide may effect m.o. community that is responsible for water purification
	Erosion prevention and maintenance of soil fertility	N medium	erosion is not affected. soil fertility is. Effect on soil fertility is possible
	Pollination	small - strong	potential exposure. The level depends on the molecule
	Biological control	small - strong	potential exposure. Level of effect depends on the molecule
Habitat or supporting services	Habitats for species	small - strong	" "
	Maintenance of genetic diversity	small - strong.	potential exposure. Level of effect depends on molecule, MoA and area of use
Cultural services	Recreation and mental and physical health	small	it might impact the presence of birds so bird watching as hobby is affected
	Tourism	N	positive
	Aesthetic appreciation and inspiration for culture, art and design	N	positive
	Spiritual experience and sense of place	N	~~positive~~

SCENARIO 3: Spraying insecticide, Outdoor or Field use

FINAL
4/2/20
Martin

Foliar spray application of an **insecticide** in orange orchards against red scale insects. **Frequency:** Twice per year in spring and summer.

Considering the scenarios just described, which ecosystem services could be negatively affected by the use of this pesticide?

Ecosystem services list		NO /small/medium/strong effects	Why? Please state the reasons behind
Provisioning services	Food	Medium	Can affect freshwater ecosystems and bee products (honey and pollen). Drift can affect wild berries.
	Raw materials	Small	Could have an impact on microorganisms that produce compost. Residues in plant oil.
	Fresh water	Strong	groundwater and surface water contamination.
	Medicinal resources	Small	Drift on non-targeted plants.
Regulating services	Local climate and air quality	No	
	Carbon sequestration and storage	No	
	Moderation of extreme events	Small	Insecticides residues can reduce soil life that plays a role in bioturbation (soil aeration) and prevent run-offs.
	Waste-water treatment	Small	Potential effects on purifying micro-organisms.
	Erosion prevention and maintenance of soil fertility	Medium	Potential impact on soil life. Higher impact in the field. Role in bioturbation.
	Pollination	Strong	
	Biological control	Strong	
Habitat or supporting services	Habitats for species	Strong	General harm on biodiversity including contamination via the air.
	Maintenance of genetic diversity	Strong	
Cultural services	Recreation and mental and physical health	Medium	Air contaminated can harm health.
	Tourism	Small	Gives a negative image for tourists.
	Aesthetic appreciation and inspiration for culture, art and design	Small to medium	less biodiversity = less aesthetic landscapes
	Spiritual experience and sense of place	Small	Sense of place: spraying prevents from connecting to nature.

Table 4

Mike

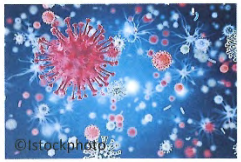
SCENARIO 4: Spraying microorganisms (specialists) as biological control, Outdoor or Field use

Spray application of **parasitic fungus** (parasite of a crop pest) in vineyards to control grapevine powdery mildew.

Frequency: up to 12 times per year (at least 10 days interval).

We assume this is an applicater asking for new authorisation

Specific



Considering the scenario just described, which ecosystem services could be negatively affected by the use of this pesticide?

Ecosystem services list		NO /small/medium/strong effects	Why? Please state the reasons behind
Provisioning services	Food + feed	NO	when mildew is gone, parasite goes away (dies off)
	Raw materials	NO	
	Fresh water	NO	we believe it doesn't survive in water
	Medicinal resources	NO	
Regulating services	Local climate and air quality	NO / Small	
	Carbon sequestration and storage	NO	
	Moderation of extreme events	NO	
	Waste-water treatment	NO	
	Erosion prevention and maintenance of soil fertility	NO	
	Pollination	NO	
	Biological control	NO	
Habitat or supporting services	Habitats for species	NO	
	Maintenance of genetic diversity	NO	
Cultural services	Recreation and mental and physical health	NO	
	Tourism	NO	
	Aesthetic appreciation and inspiration for culture, art and design	NO	
	Spiritual experience and sense of place	NO	

SCENARIO 5: Spraying microorganisms (generalist) as biological control, Outdoor or Field use

Spray application of a generalist **microorganism** in a variety of crops to control soil borne fungal diseases. The mode of action is by competition with the "pest". **Frequency:** up to 6 applications per year (at least 3 weeks intervals)

Considering the scenario just described, which ecosystem services could be negatively affected by the use of this pesticide?

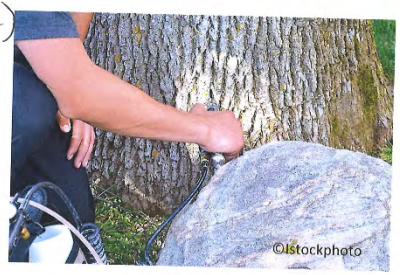
Ecosystem services list		NO /small/medium/strong effects	Why? Please state the reasons behind
Provisioning services	Food	No	
	Raw materials	No	
	Fresh water	No	Quality might be affected, but not quantity of water.
	Medicinal resources	No	
Regulating services	Local climate and air quality	NO	
	Carbon sequestration and storage	No → small	It can influence microbial community.
	Moderation of extreme events	No	
	Waste-water treatment	No	
	Erosion prevention and maintenance of soil fertility	No → small	It can influence soil fertility
	Pollination	No → small	No information about microorganism, no small effects can occure.
	Biological control	small	Dependant on species present equilibrium.
Habitat or supporting services	Habitats for species	small	Soil habitats.
	Maintenance of genetic diversity	small	species complex can be impacted.
Cultural services	Recreation and mental and physical health	No	
	Tourism	No	
	Aesthetic appreciation and inspiration for culture, art and design	No	
	Spiritual experience and sense of place	No	

SCENARIO 6: Targeted liquid application of an insecticide, Outdoor or Field use

Line Leave (DLC)
Table 6

Closed system of **tree injection** with a xylem/ phloem mobile **insecticide** for use on forest-trees, Christmas-trees, seed cone nurseries/orchards, and ornamental trees. The aim is to control phloem-feeding insects.

Frequency: one application (late summer or autumn).



Considering the scenario just described, which ecosystem services could be negatively affected by the use of this pesticide?

Ecosystem services list		NO /small/medium/strong effects	Why? Please state the reasons behind
Provisioning services	Food	No	
	Raw materials	No	
	Fresh water	No	
	Medicinal resources	No	
Regulating services	Local climate and air quality	No	
	Carbon sequestration and storage	No	
	Moderation of extreme events	No	
	Waste-water treatment	No	
	Erosion prevention and maintenance of soil fertility	Yes: small	fallen leaves containing residues may affect soil organisms and or soil fertility by decomposition
	Pollination	Yes: small to ~~medium~~	Depending on the tree type, and persistence of the active substance. late summer application causes risk mitigation (no flowering)
	Biological control	Yes: small to medium	Biodiversity is disrupted.
Habitat or supporting services	Habitats for species	Yes: ~~medium~~ small	Effect on food insects
	Maintenance of genetic diversity	Yes: small to med.	Biodiversity is disrupted
Cultural services	Recreation and mental and physical health	Yes: small	Areas might be closed.
	Tourism	No	
	Aesthetic appreciation and inspiration for culture, art and design	No	
	Spiritual experience and sense of place	No	

SCENARIO 7: Granular insecticides application Outdoor or field use

Table 7
Day 2
Isabella

Insecticide granules applied in the seedbed at the sowing of vegetables crops, such as cabbages or carrots to protect against early-season insect pests such as Cabbage Stem Flea Beetles, Cabbage Flea Beetles, Cabbage Root Fly.

Considering the scenario just described, which ecosystem services could be negatively affected by the use of this pesticide?

Ecosystem services list		NO /small/medium/strong effects	Why? Please state the reasons behind
Provisioning services	Food	small - medium	because of dust drift - difficult in general as we lack info. e.g. is it systemic? soil type?
	Raw materials	small	maybe residues in compost
	Fresh water	strong	leaching
	Medicinal resources	small	could have an effect over time (plants next to the field)
Regulating services	Local climate and air quality	small	effect through dust-drift on fungi (very hypothetical)
	Carbon sequestration and storage	(no - small) ? ?	we need to think if it has an effect on the overall soil quality; it might effect the capacity of soil to store carbon
	Moderation of extreme events	no	
	Waste-water treatment	small	in case of applying
	Erosion prevention and maintenance of soil fertility	small - medium	effect on overall soil quality
	Pollination	medium (strong)	dust drift - systemic
	Biological control	strong	
Habitat or supporting services	Habitats for species	strong	
	Maintenance of genetic diversity	strong	
Cultural services	Recreation and mental and physical health	S- M-ST	?
	Tourism		birds - secondary poisoning
	Aesthetic appreciation and inspiration for culture, art and design		local and traditional knowledge on insect control gets lost
	Spiritual experience and sense of place		

CONSOLIDATED VERSION

Vanessa

SCENARIO 8 : Soil treatment and sterilization with a fumigant gas, Outdoor or field use

Soil is treated with a **fumigating gas injected** and incorporated in the soil at a depth of 25 cm, followed by sealing of the soil with heavy roller and covering with a gas-tight plastic cover for a period of 48 hours. After the treatment, the crops are planted: vegetables, small fruit crops (tomatoes, berries), field grown nursery/ornamental crops, and forestry nursery crops.

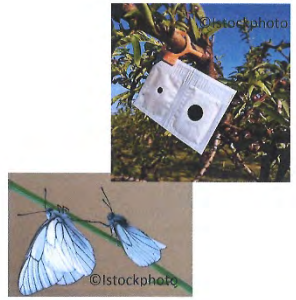
'Pests': nematodes considered as quarantine pests (e.g. Root Knot nematods, strawberry spring dwarf nematods, Golden nematods). Indirectly this soil treatment also controls weeds and soil-borne plant pathogens.

Considering the scenario just described, which ecosystem services could be negatively affected by the use of this pesticide?

Ecosystem services list		NO /small/medium/strong effects	Why? Please state the reasons behind
Provisioning services	Food	5 depends, 1 strong	- definition of food interpreted differently
	Raw materials	5 depends, 1 strong	// // // //
	Fresh water	5 small medium, 1 strong	
	Medicinal resources	4 depends / medium 1 strong	
Regulating services	Local climate and air quality	Small to strong	
	Carbon sequestration and storage	STRONG	
	Moderation of extreme events	Small to spring	
	Waste-water treatment	2 strong 3 NO 2 small	
	Erosion prevention and maintenance of soil fertility	STRONG	
	Pollination	STRONG (at landscape level)	
	Biological control	STRONG	
Habitat or supporting services	Habitats for species	Medium to Strong	
	Maintenance of genetic diversity	STRONG	
Cultural services	Recreation and mental and physical health	STRONG 1 NO 2 depends	
	Tourism	1 STRONG 5 NO 2 depends	
	Aesthetic appreciation and inspiration for culture, art and design	1 STRONG 5 No 2 depends	
	Spiritual experience and sense of place	1 STRONG 5 No 2 depends	

Katarina Gyos

SCENARIO 9: Pheromones applied via passive dispensers, Outdoor or Field use



Passive dispensers are manually distributed in the field and can be removed before harvest. The pheromone is highly volatile and rapidly dissipates in the air.

The arthropod pheromone is also naturally produced by females of an insect pest, in order to attract the males of the same species (species specific). Because there is more pheromone in the air than naturally occurring, the success rate of the males to find the females is reduced (males get confused and are not able to find the females). Hence, females lay no eggs, and the population of the pest is reduced (the reproductive cycle of one species is disrupted) to levels which do not trigger further crop protection needs. **Pest:** chewing insects (Lepidoptera) **Crop**: vineyards and other crops. **Frequency:** One application per year. The dispensers are placed in the crop before start of the male flight.

Considering the scenario just described, which ecosystem services could be negatively affected by the use of this pesticide?

Ecosystem services list		NO /small/medium/strong effects	Why? Please state the reasons behind
Provisioning services	Food	No	* refere to "biological control"
	Raw materials	No	
	Fresh water	No	
	Medicinal resources	No	
Regulating services	Local climate and air quality	No	
	Carbon sequestration and storage	No	
	Moderation of extreme events	No	
	Waste-water treatment	No	
	Erosion prevention and maintenance of soil fertility	No	
	Pollination	No	(Note: if the targeted species is a pollinating insect, it may have an effect, you need to consult experts on the targeted species)
	Biological control	small	insects as food for other species
Habitat or supporting services	Habitats for species	No	
	Maintenance of genetic diversity	small	targeting a specific species lif cycle may lead to loss of genetic diversity
Cultural services	Recreation and mental and physical health	No	
	Tourism	No	
	Aesthetic appreciation and inspiration for culture, art and design	No	(Note: for some people they may have an aesthetic value, but for the farmers they will not).
	Spiritual experience and sense of place	No	

Jose Luis

SCENARIO 10: Storage room treatment with a plant growth regulator, Indoor Application

Table 10

A storage room (closed) with apples is treated with a vapour releasing product **(gas) of plant growth regulator**, which controls the maturation of stored fruits and vegetables. Application lasts two hours. Treatment room is kept closed following treatment for 2 days. Ventilation of the storage room after treatment is needed.*

Frequency: one treatment just after storage of the freshly harvested apples.

**Art 3.28 "post-harvest treatment means treatment of plants or plant products after harvest in an isolated space where no run-off is possible, eg. in a warehouse.*

Considering the scenario just described, which ecosystem services could be negatively affected by the use of this pesticide?

Assuming a negligible exposure to the surrounding environt (except for ventilation)

Ecosystem services list		NO /small/medium/strong effects	Why? Please state the reasons behind
Provisioning services	Food	NO	
	Raw materials	NO	
	Fresh water	NO	Quality of water is not properly addressed by the description of the ES
	Medicinal resources	NO	
Regulating services	Local climate and air quality	NO	We are missing the impact of the resident.
	Carbon sequestration and storage	NO	
	Moderation of extreme events	NO	
	Waste-water treatment	NO	
	Erosion prevention and maintenance of soil fertility	NO	
	Pollination	NO	
	Biological control	NO	
Habitat or supporting services	Habitats for species	NO	
	Maintenance of genetic diversity	NO	
Cultural services	Recreation and mental and physical health	NO	
	Tourism	NO	
	Aesthetic appreciation and inspiration for culture, art and design	NO	
	Spiritual experience and sense of place	NO	

SCENARIO 11: Greenhouse application of fungicide

FINAL CONSOLIDATED TEMPLATE
Steffen

Use of **fungicide** for the control of cucumber downy mildew disease in permanent greenhouse*. Application is just before first disease symptoms are observed. **Frequency:** one to two applications with an interval of 10 days.

*Art 3.27. "greenhouse" 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 PPPs into the environment.

presumption: fully closed system (water is purified, no opening of windows)
waste is disposed/collected & not released to ecosyst

Considering the scenario just described, which ecosystem services could be negatively affected by the use of this pesticide?

Ecosystem services list		NO /small/medium/strong effects	Why? Please state the reasons behind
Provisioning services	Food	NO	MRL excluded from discussion
	Raw materials	SMALL	compost of treated plant material ⇒ microbial resistance / ability of MO to adapt
	Fresh water	NO	closed system
	Medicinal resources	NO	
Regulating services	Local climate and air quality	NO	
	Carbon sequestration and storage	NO	
	Moderation of extreme events	NO	
	Waste-water treatment	small	In case that waste water is purified by semi-natural treatment facility
	Erosion prevention and maintenance of soil fertility	No	
	Pollination	No	cucumis not pollinator-dependent / one glasshouse = one crop
	Biological control	small	impact on beneficial in glasshouse
Habitat or supporting services	Habitats for species	no	
	Maintenance of genetic diversity	NO	
Cultural services	Recreation and mental and physical health	NO	
	Tourism	NO	
	Aesthetic appreciation and inspiration for culture, art and design	NO	
	Spiritual experience and sense of place	NO	

SCENARIO 12: Off-field installation of Rodenticide Baits to protect crops in the area

(CONSOLIDATED)
Steve Norman.

Baits are installed close to vole tunnels (underground) and renewed on a regular basis until no further consumption of the bait can be observed.

'Pests': voles in the proximity of any crop.

Considering the scenario just described, which ecosystem services could be negatively affected by the use of this pesticide?

Ecosystem services list		NO /small/medium/strong effects	Why? Please state the reasons behind
Provisioning services	Food	NO (STRONG)	DEPENDING ON THE INTERPRETATION OF FOOD (RODENTS AS FOOD FOR OTHER ANIMALS)
	Raw materials	NO	
	Fresh water	NO	
	Medicinal resources	NO	
Regulating services	Local climate and air quality	NO	
	Carbon sequestration and storage	NO	
	Moderation of extreme events	NO	
	Waste-water treatment	NO	
	Erosion prevention and maintenance of soil fertility	NO	
	Pollination	NO	
	Biological control	STRONG	E.G. BIRDS OF PREY FEEDING ON "CONTAMINATED" RODENTS
Habitat or supporting services	Habitats for species	? (SEE FIRST LINE)	UNCLEAR TO WHAT EXTENT FOOD FOR WILD ANIMALS IS INCLUDED HERE OR IN THE FIRST LINE. EITHER HERE OR THERE STRONG EFFECT ARE EXPECTED IN RELATION TO THIS ISSUE (POISONING AND FOOD DEPLETION)
	Maintenance of genetic diversity	MEDIUM TO STRONG	MAINLY EFFECTS ON FOOD CHAIN (BIRDS OF PREY)
Cultural services	Recreation and mental and physical health	SMALL	MAINLY DUE TO VISUAL IMPACTS OF BAITS THEMSELVES
	Tourism	STRONG	MAIN IMPACT WOULD BE THE LOSS/REDUCTION OF BIRDS OF PREY (SECONDARY IMPACTS)
	Aesthetic appreciation and inspiration for culture, art and design	" "	" "
	Spiritual experience and sense of place	" "	" "

Annex 9: Notes on the "wall space"

- How much of that we talked about (biodiversity loss) systems is from the use of pesticides and how much is from agricultural in general?
- Discussion of the application scenarios revealed regulators have little any idea of:
  - What application technology is appropriate for risk assessment, especially a realistic work case example
  - The huge advances in application technology to reduce risk since 1980. (Codified in standards requested by the EC underpin MS/ SUD)
- Uncertainties in the definitions: Maybe create a more tangible definitions tailored for PPP ERA without reinventing the whole? (and provide explanations)
- Progress done: The ES is generally accepted as a good concept to establish SPGs. But revise the use of TEEB definitions. And host discussions on the exercise
- Include/Consider alternative practices to pesticides use (preventive): crop rotation, cover crops, resistant varieties.
- Why are positive effects not considered to enable decision-making? Yes already at the SPGs stage.
- Multiple applications of products/year/field with several activities have to be considered. Otherwise, the risk assessment has no sense.
- Goal is the improvement of the current situation → no need for further "complex" goals.
- What are the "lessons learned" from the last 30 years? How to incorporate this knowledge into the new "protection goals"?
- It should be considered which number/amount of pesticides will be required for production in future! If there is no alternative, this should be considered for the protection goals/risk assessment.
- Although risk mitigation is not in scope adequate/practical risk assessment is needed to provide a baseline from which risk mitigation can be assessed.
- We need to develop landscape specific environmental scenarios for ERA that incorporate agronomic practices, exposure scenarios, ecological scenarios.
- We missed water quality. It is not an ES of its own?
- New approach should be able to address main pressures on biodiversity/ecosystems! E.g. interruption of food web? → contribution of PPP to decline insects/farm land birds.
- Experts on ethics should have been invited!
- The ES approach is interesting but doesn't address the problem of "unacceptable risk"
- Some observers coming from social sciences would have been interesting
- An impact assessment should have been worked out for a well defined example
- Alternative framework concepts should have been considered in a first step
- Impact assessment should be performed before establishment of the ES approach for the risk assessment.
- Landscape scale: infield –off field?

- To incorporate indirect effects we need to combine ERA guidance on NTA, soil organisms, plants birds and mammals. How to do that?
- How do we ensure that the value of intrinsic properties of biodiversity is not lost in this process?
- ES for who? Human well-being or other species well-being?
- ES at which scale? Field/local/landscape? Depending on the scale will we accept different effects in term of duration/intensity?
- A more holistic approach is required- especially in considering how risk can be considered in practice (operator training, equipment, meteorology and topography?
- If we ban all pesticides today and stop using them all together tomorrow, will that stop biodiversity loss?
- Carry out an assessment on the impact of pesticides on biodiversity. What went wrong?
- Need for development of methodologies to evaluate the impact/ effects on cultural services.
- Three levels of decision are urgent:
  - If at all yes/no
  - If yes, how certain?
  - If yes, how severe? Independent of uncertainty
  - I am not sure how these exercises help the work of the risk assessors: I would have liked to have conversations about the REAL protection goals: which are the most sensible species we should test and how, should we develop new protocols?
- If you are talking about ES and pollination, you need to address more realistic scenarios and take into account the cocktail effect- not only two time spraying insecticide.
- The scenarios are far too broad to allow realistic risk assessment, including worst case. Use equipment meeting EN ISC harmonised standards in risk assessment.
- Discussions should not cause risk-exportation " Global approach is needed"
- Not clear the comparison between the level of effects of the different lines. "Small" in food, for example may be "less small" than a "small" in biological control.
- I feel that experts are being requested to solve political issues.
- What is the roadmap for SPGs for NTA/Soil/NTP? → Will this group work on those?
- To put more weight on functional endpoints compared to structural is not considered appropriate.
- Food security consideration
- Economic consideration
- Why were positive effects not allowed in the case study exercise? Without the positive effects the ES approach is dismissed.
- What is the difference between this and the last two workshops?
- There are other factors that influence biodiversity (industry, housing, infrastructure, roads, etc) How are they being addressed?

- In the group work, we looked at very concrete examples. Is this how the approach should be used? What about the large scale effects of the PPs? Moreover, will it take into account effects of mixture toxicity?
- Is there any other options or method (s) to select SPGs?
- Trade offs
- The exercise should not be a cost-benefit analysis. No trade-offs should be considered cause PPP is just one alternative for pest control otherwise RA needs to star considering alternatives approaches as well.
- Why we are focusing only on humans while we are here to take action to protect biodiversity?
- Positive impacts
- I worry in this workshop and some scenarios we think to broad i.e. all agriculture instead of PP and 1107/2009 → related.
- How will this system affect the risk assessment?
- Should seed dispersal be a regulating service?
- Should comparative risk assessment be a discipline in its own? RA of tillage vs. RA of herbicide.
- If the EFSA method is adopted, who will be in charge of choosing the relevant ES? What would be the role of MS?
- It is worth pursuing the ES approach and addressing the challenges because it permits a holistic assessment of pressures on ecosystems and comparison/combination of various approaches (e.g tillage, landscape management with PP) rather than considering PPP alone.
- Is it unclear how the approach will be used?
  - Will it be used to "double check" if we support the ES?
  - Or will it be used to define what to protect and which organisms should be included in the RA.
  - Or will it be sued to provide a list of specific protection goals, elaborate the content/meaning of the specific protection goals?
- SPGs based on protection of ES should not be confused with the protection of ecosystems/biodiversity. ("Guys doing the job", "motor behind", ecological status/ecosystem conditions)→ to ensure provision of ES in long/term complement approach with focus on ecosystem conditions (integrity) where necessary (see WFD approach!)
- Switch to ES as base for the definition of the SPGs is a fundamental change. It should be clear that a holist views means also that all relevant sectoral policies should be included in discussion→ consistency.
- Coherence in the EU policies is necessary. (e.g. Guidance on integrating ES in decision-making)
- Clarify how existing legally binding protection targets are included in your approach. (e.g. ecological status in the WFD, restoring structural ? biodiversity, conserving bird species, CBD, birds Directive)

- Benchmarking protection level should not be on ES but rather on ecosystem, integrity/good-ecological statues.
- Sometimes ES covers very different things. E.g: micro local climate and air condition. Are these indirect effects? PPP can affect micro/local climate because less vegetation→ higher temperature. Air quality can be affected for the direct toxicity?
- Information on the process:
  - What is the objective of these three workshops in the close future (reports, suggestions of the method etc.?)
  - What is the time plan for this? (actually I would like to happen know what is supposed to happen in the coming 12 months)
- EFSA method: How is this suggested method differing from the "EU guidance on integrating ecosystems and their services onto decision-making"? (by DG Environment) (Staff Working Document (2019) 305 final) Will they be used together to one suggestion+
- Information of this workshop: Adequate information a bit earlier.
  - Sent out the 12 scenarios beforehand.
  - Better information when having the initial presentations (name, affiliation, etc)
  - Participants list with email addresses.
- We have gained a lot of experience working with the current system for ERA of PPP. We should use that experience and improve what we already have. Include sensitive species, realistic scenarios (multiple stressors). This should be done in parallel with the SPGs.
- The brainstorming to identify potentially affected ES is fine, but I wonder whether for a final documentation of the definition? of the SPGs if wouldn't be more transparent to separate step 1:
  - Considering the application scenarios, which might be exposed? In crop, close to crop, larger scale (landscape)?
  - What are the ES provided by the potentially exposed habitats/organisms?
- If choice of ES classification scheme determines what we are looking on there is something wrong in the approach to define SPGs → be flexible when defining ES! If not all obvious problems of PPP applications are covered by existing/ predefined set of ES define missing ES:
  - E.g. MA→ no habitat maintenance
  - TEEB→ Habitat maintenance as ES → problem of food web effects covered.
- During the review of the scenarios for horizontal or vertical application, it was not clear which level of application should be considered. E.g. it will be lower impact on most environmental services of drift reduction technology will be used e.g. 95% reduction new sprayer vs. 40 years old mounted?
- Do not embalm pesticide equipment technologies on labels. Web-based (app accessible) advice is desirable as technology is changing rapidly- particularly with precision farming which current risk assessment does not deal with at all
- State of art of application technology must be considered when doing the assessment.
  - How we spray/apply is crucial?

  - More sensibility during the risk assessment.
  - Since 2009 there is a significant change in technology.
- I am not clear if the aim is to create a X or checklist: If a product has the intended effect (e.g. fungicide) and it is applied in an application scenario Y, then the following SPGs have to be considered in ERA? Or should there be a list of SPGs potentially affected by PPP, and then after the exposure assessment for a specific a.s. or product and its mode of action, you decide on the ecotox data needed and take the related SPGs.
- Input from colleagues working with biodiversity and threatened species and habitats:
  - ES as a criteria is itself not enough to ensure sufficient protection of biodiversity. Taking into account only ES will not be sufficient, partly because of the limit perspective and because of methodological challenges in the interface between ES and biodiversity. You can also approach it from two angels; both the diversity (species, habitats, ecosystem functions) and the ES (provisioning, regulating, supporting, cultural). This will ensure a broad review of possible consequences, and will ensure that different parts of natural resources base will be evaluated. You would ensure in the second round that you do not double count services.
  - Another comment: what you will decide is the criteria (? ES) also depends on the actual goal. An ES based management do not ensure less environmental impact, but will ensure a societal maximum exploitation of the ecosystem rather than protect the nature. You accept destroying the environment as long as it does not affect community interest. Such a management base on really high unrealistic demand on the society knowledge of complex how the ecosystem works