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SCIENTIFIC REPORT OF EFSA

Report on the PPR Stakeholder Workshop PROTEA

Pesticide Emissions from Protected Crop Systems:

Are these emissions different from those in the open field?[1]

European Food Safety Authority[2]

European Food Safety Authority (EFSA), Parma, Italy

ABSTRACT

EFSA's PPR Panel held a workshop on the development of a new Guidance Document (GD) on Emissions of Plant Protection Products (PPPs) from Protected Crop Systems (e.g. greenhouses and crops grown under cover) in Parma on 17-19 November 2009. The workshop aimed at collecting feedback from EFSA's stakeholders (Member States, agrochemical industry representatives, consulting companies, growers' associations and others) during the development process. The workshop programme comprised an information session to update the audience on the ongoing developments on the first workshop day. The second workshop day was dedicated to working in break-out groups on specific related topics, and the third workshop day focused on presenting and discussing the outcome of the break-out groups. The present report summarises the stakeholder views collected during the workshop by the workshop's rapporteurs.

KEY WORDS

Protected crops; covered crops; greenhouses; emission of pesticides; plant protection products; risk assessment;

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2 Correspondence: ppr@efsa.europa.eu

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SUMMARY

EFSA's PPR Panel held a workshop on the development of a new Guidance Document (GD) on Emissions of Plant Protection Products (PPPs) from Protected Crop Systems (e.g. greenhouses and crops grown under cover) in Parma on 17-19 November 2009. The workshop aimed at collecting feedback from EFSA's stakeholders (Member States, agrochemical industry representatives, consulting companies, growers' associations and others) during the development process.
A total of 55 participants from 20 different countries representing the above-mentioned stakeholder groups (plus representatives of EFSA's PPR Panel and EFSA scientific officers) attended the workshop. The workshop programme comprised an information session to update the participants on the ongoing developments on the first workshop day. The second workshop day was dedicated to working in break-out groups on specific related topics, and the third workshop day focused on presenting and discussing the outcome of the break-out groups. The present report summarises the stakeholder views collected during the workshop by the workshop's rapporteurs.

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BACKGROUND

Several active ingredients have been listed in Annex I to Directive 91/414/EEC with reference to use in greenhouses. Currently, there is no definition that demarcates the emission of a protected crop application from the emission of a field application, neither is there agreement on the definitions of individual protected/covered crop systems like a specific type of greenhouse.
A number of Member States have expressed interest in development of guidance in this area. Therefore, the Scientific Panel on Plant Protection Products and their Residues (PPR Panel) of EFSA has been asked to develop an inventory of protected crop systems and emissions from these systems to relevant environmental compartments, and to provide guidance on the importance of emission routes including the circumstances under which they are relevant.

The aim of the Working Group (WG) of the PPR Panel is to develop

1. A scoping document containing an overview / inventory of covered cropping systems;
2. Guidance on the importance of emission routes including the circumstances under which they are relevant.

During the development of the new Guidance Document (GD), there are several steps where stakeholders are involved. One opportunity was the public consultation via EFSA's webpage, which was held to collect comments on the project plan. A report on the outcome of this consultation was published on the EFSA webpage[3]. The next step was the stakeholder workshop, which is discussed in this report.

TERMS OF REFERENCE

The PROTEA workshop had two major objectives: the first was to inform stakeholders on the ongoing process and current development of the new GD on Emissions from Protected Crops, the second and main objective was to collect feedback from EFSA's stakeholders (Member States, agrochemical industry representatives, consulting companies, growers' associations and others) during the development process. The current report compiles the collected stakeholder views.

[3] The report on the public consultation is available at http://www.efsa.europa.eu/EFSA/efsa_locale-1178620753812_1211902588223.htm

ACKNOWLEDGMENTS

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- The rapporteurs of the PROTEA workshop for their contributions to this report: Adi Cornelese, Francisco Egea, Richard Glass, Bernhard Gottesbüren, Andreas Huber, Jérôme Laville, Jonas Östgren, and Tycho Vermeulen;
- EFSA's PPR Panel experts and external experts for their crucial input in the organisation of this workshop, the presentations given, and the chairing of the break-out groups and plenary sessions: Jos Boesten, Ettore Capri, James Garratt, Oriol Magrans, Olaf Mosbach-Schulz, Laura Padovani, Alberto Pardossi, Lidia Sas-Paszt, Cecilia Stanghellini, Ton Van der Linden;
- EFSA's PRAPeR, AMU and PPR colleagues for their input and support, especially to Oriol Magrans and Laura Padovani (PRAPeR), Olaf Mosbach-Schulz (AMU), as well as Stephanie Bopp, and Mark Egsmose (PPR);
- All participants of this workshop for the valuable discussions.

DISCLAIMER

This report summarises stakeholders' views collected during the PROTEA workshop and does not necessarily reflect the opinion of EFSA, the PPR Panel or the PPR Working Group on Emissions from Protected Crops. The collected comments and recommendations will be considered during the further work of the WG on Emissions from Protected Crops.

1. Introduction and Objectives

Several active ingredients have been listed in Annex I to Directive 91/414/EEC with reference to use in greenhouses. Currently, there is no definition that demarcates the emission of a protected crop application from the emission of a field application, neither is there agreement on the definitions of individual protected/covered crop systems like a specific type of greenhouse.

A number of Member States have expressed interest in development of guidance in this area. Therefore, the Scientific Panel on Plant Protection Products and their Residues (PPR Panel) of EFSA has been asked to develop an inventory of protected crop systems and emissions from these systems to relevant environmental compartments, and to provide guidance on the importance of emission routes including the circumstances under which they are relevant.

The aim of the Working Group (WG) of the PPR Panel is to develop:

1. A scoping document containing an overview / inventory of covered cropping systems;

2. Guidance on the importance of emission routes including the circumstances under which they are relevant.

In order to involve stakeholders and to consider their feedback on this activity, EFSA's PPR Panel held a workshop on the development of a new Guidance Document (GD) on Emissions of Plant Protection Products (PPPs) from Protected Crop Systems (e.g. greenhouses and crops grown under cover) in Parma on 17-19 November 2009.

Participants were invited to register via a dedicated online form on the EFSA webpage from 12th May 2009 to 10th August 2009. A total of 80 candidates expressed their interest in participating. Participants were selected based on their expertise in the scientific field (Risk Assessment of PPPs and experience with protected crop systems), ensuring a balance between representatives of Member State (MS) regulatory authorities, private organisations (e.g. agrochemical industry representatives and consulting companies, associations), and academia, as well as a geographical balance. A total of 55 participants from 20 different countries representing the above-mentioned stakeholder groups plus representatives of EFSA's PPR Panel, and EFSA scientific officers attended the workshop (Figure 1).

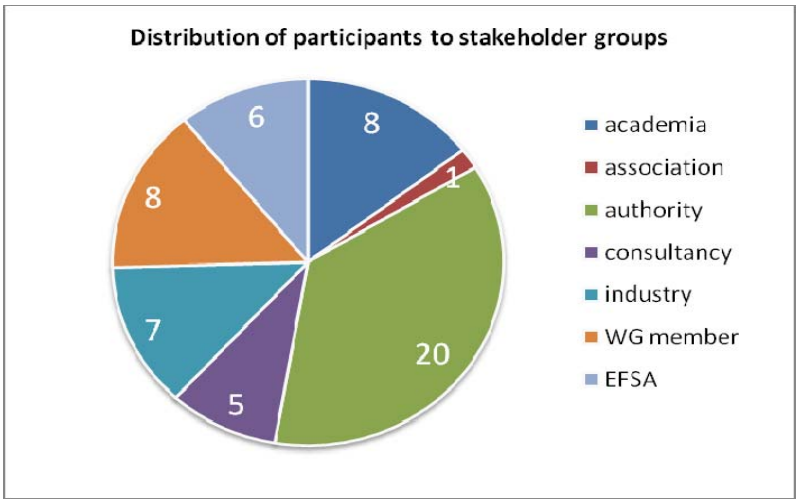

Figure 1: Number of participants of different stakeholder groups (academia, association, MS regulatory authorities, consultancies, industry, members of the EFSA Working Groups on Emissions from Protected Crops (WG members) and EFSA staff (AMU, PPR, PRAPeR).

The major aims of the PROTEA workshop were:

1) to inform stakeholders about on-going activities regarding the new GD for Emissions of PPPs from Protected Crops currently under development;
2) to collect feedback from stakeholders.

The workshop started with overview presentations about the current status of EFSA's PPR Panel activities, the new regulation for placing PPPs on the market, more detailed presentations on the ongoing development of the new GD, and an overview on the programme of the workshop (please refer to Appendix A: workshop programme). In the evening, three parallel break-out group sessions took place in order to actively involve all participants.

The second workshop day started again with more detailed presentations, introducing the following discussions in three parallel break-out groups:

- Group 1: Protected Crop Structures and Risk Assessment
- Group 2: Ranking of Emissions
- Group 3: Management Practices and Innovations

Two rapporteurs were assigned to each break-out group (one from a MS institution and one from another stakeholder group), who summarised the discussions and documented the comments and stakeholder views for this report. In the evening of the second day, all participants met for a short summary feedback by the chairs of the break-out group.

On the last workshop day, the rapporteurs of the break-out groups reported back in detail to all the participants. This was followed by a plenary discussion to collect stakeholders' overall feedback on proposals for the new guidance. Two additional rapporteurs were appointed for this session.

The conclusions of the break-out groups and the plenary discussion are summarised in the following sections. These summaries were prepared by the respective rapporteurs and sent out for peer review to all workshop participants before publication.

2. Summary of break-out group and plenary discussions

2.1. Break-out group 1: Protection structures and Risk Assessment

Chairs: Laura Padovani, Mark Egsmose

Rapporteurs: Jérôme Laville, Tycho Vermeulen

2.1.1. Introduction

This session was based on two presentations by EFSA PPR WG members: "Short overview on the classification of protected crop structures and growing systems" and "Data Collection on Protected Crop Structures". In the first presentation, the WG's proposal for classification of protected crop structures and the relevant parameters to be considered were introduced. In the second presentation, EFSA's activity on gathering data for the distribution and types of protected crop structures used throughout Europe was shown. A data collection was performed in 2009 for all 27 EU Member States. Related reports are available on the EFSA webpage[4]. A second data collection to fill data gaps in the so far developed data base was started in December 2009.

[4] http://www.efsa.europa.eu/en/scdocs/scdoc/32e.htm and http://www.efsa.europa.eu/en/scdocs/scdoc/31e.htm

The main aims of this break-out group were to find out whether some important types of structures relevant in certain MS were overlooked, and to discuss the WG proposal for structure classification and its use for characterising emissions with stakeholders.

2.1.2. Summary of Discussion

The general approach to evaluating different structures in terms of their emissions were discussed as well as needs of Rapporteur Member states for clarity in definitions. The discussions lead to a number of recommendations for further focus of the Working Group, and thoughts on application in the evaluation process.

2.1.2.1. Recommendations to the WG – definitions and further focus

- Understand emission routes for their combinations of Structure and Application Method, where some structure aspects would be: soil/soil less, monoculture/multiculture, recirculation/non-recirculation, cover/tunnel/glass. Emissions were seen to be influenced mainly by the structure and the application method.

- Condensate scenarios based on relevance to emission drivers with a clear user-view.

    - The water flow is seen as the main emission driver. PPP's will dissolve easily and will therefore emit with water flows.

    - The user-view should lead to a limited number of systems – now Glasshouse, Field and Indoor. For example one or two levels of covering and recirculating systems.

- Define levels of ranking – Field (worst case)>Cover>Tunnel>Glass (soil bound). The tiered approach can consider exposure routes as a % of exposure compared to the field use. Calculations with a range of water management strategies (irrigation frequencies, timing and volumes) as well as monitoring data should lead to insight regarding whether this approach is acceptable. In some case, pollution "hot spots" can be considered as the main source of soil exposure.

- Applications in temporarily covered systems should primarily be considered by whether the crop is covered at the moment of application or not. Later damping off or washing off seems covered by using an evaluation tool based on the open field situation, where the covering only impacts drift (see comment above). The applicants have to indicate clearly on the GAP and on the label the stage (BBCH) of the plants and describe the covered situation (yes or no), when PPP treatment is applied.

- A different approach may be needed for recirculating systems since emissions to surface water could be seen as Point-source emissions, and therefore are of a different nature than emissions from soil bound application.

- Consider substrate as waste, only if substrate is containing pesticides at the end of the crop production.

- Use established methods and models, in particular the FOCUS models for ground- and surface water.

- Is it possible to include aspects of application in covered crops in GAP- tables?

- Is the current legal definition of glasshouse structures sufficient for the purpose of emission evaluation?

- The Working Group should be aware of consistency in terminology all through the risk assessment scheme (incl. ecotoxicological and human risks) and use established terms and methods as much as possible.

- It should be clarified that the term “emission” in this project is used as a technical term signifying the transfer of a compound over a boundary (the structure above the soil and 1 m of soil are taken as system boundaries) and not in the sense it is used in other legislation, i.e. Directive 2003/4 (public access to environmental information) or the Aarhus convention.

2.1.2.2. Recommendations to the WG – application in the evaluation process

- The Working Group should link the pairs of cover-structures/application techniques/substrates with the models and leave flexibility to MS to include the new and local specific technology, local conditions, management and practices. This would allow MSs to include aspects like new technology of end of pipe techniques, higher levels of recirculation and waste water treatment in their evaluation.

- EU-level risk assessment determines one safe use, and with that the Tier-level (example – safety only on the level of Tunnel).

- EU-level risk assessment should point out conditions and areas of risk which must be considered by Member States. This is necessary in order to develop consistency in the assessment throughout Member States.

- Limit possible extra requirements for product data

- Stay up-to-date with development of technology in relation to emission.

- Keep the basic model simple.

- Model has to integrate actual technologies in a realistic case, and not a compilation of different technologies in an unrealistic cover-structure.

2.1.2.3. General recommendations

- Collect all the experience done in other MSs and validation of the output in a workshop. Involvement of the Risk Manager for discussing the mitigation options.

- Experience can be very unevenly distributed among MSs.

- Validate the used models with monitoring data from MSs (emission data).

- User friendly for the applicants and assessors.

2.1.3. Conclusion

Further development of the risk assessment requires a combined effort on:

- Developing definitions consistent with other regulatory frameworks.

- Developing user friendly assessment structures by:
    - Understanding exposure routes leading to a tiered approach, if possible considering covering as % exposure of the open field application.
    - Understanding exposure routes from recirculating systems.
    - Limiting the number of system definitions.
- Developing new and/or amending existing assessment tools that leave flexibility for MSs to include local conditions, practices and new technologies.
- Cooperation with MSs to develop the required tools and gather emission data, and to assist towards effective use of the new evaluation aspects in all member states.

2.2. Break-out group 2: Ranking of emissions

Chairs: James Garratt, Stephanie Bopp

Rapporteurs: Adi Cornelese, Bernhard Gottesbüren

2.2.1. Introduction

The basis for discussion in this break-out group were two presentations introducing the EFSA WG's approach for characterising, clustering and ranking of emissions: "Short overview on emissions and clustering" and "Factors influencing emissions". In the first presentation, definitions used in the WG as well as boundary conditions for emissions and general considerations were shown. In the second presentation, more details on influencing factors to be considered when clustering and ranking emissions were introduced.

The break-out group gave feedback on presented restriction tables used for clustering and ranking of emissions using relevant combinations of structures, PPP application types, and cultivation systems.

2.2.2. Summary of Discussion

The workgroup discussed questions related to the expectations from future guidance (1) and the prioritisation of receptors to be considered for different types of protected crops (2).

1 What do stakeholders expect from the future guidance regarding assessment of emissions from protected crops?
– consider problems that stakeholders had so far with protected crop issues –

2 Is there agreement on selected receptors / priorities?
Are there any relevant parameters that were not considered by the WG so far?

The discussion in the group focused on the requirements for additional guidance for different environmental compartments and the options to combine scenarios for different types of covered crop systems that were identified in the inventory made by EFSA. The various receptors were considered separately.

Up till now in RA there are well developed approaches for field uses and there is little for protected crops. And something in between is already felt as being helpful.

Groundwater:
Risk from indoor uses for emission to groundwater was accepted as being usually lower than from outdoor uses. However, on the one hand higher irrigation volumes are expected in some cases but on the other hand the evapotranspiration will be different in greenhouses, so a balanced scenario development will be necessary to address these aspects.

Special exposure patterns due to drip/band treatment can be commonly expected for some types of structure. This can result in localised high concentration in soil adjacent to areas without treatment and the areal average for leaching to groundwater and the potentially higher risk for leaching was discussed. The group concluded that averaging per field seems to be acceptable to address the issue.

Soil:
The break-out group was of the opinion that:

- Soils in greenhouses can hardly be considered similar to field soils, (ref. physical treatments like sterilization) and therefore they are more similar to substrates. For non permanent structures like plastic tunnels that are established on open fields this will be different (LT, PS, NS, SH, WT).
- Removal of soil / substrate from greenhouses is considered as disposal of solid waste. Solid substrates were excluded from the remit of the WG.
- If solids are stored outside, emissions by evaporation may occur. This will not be considered.
- As very few problems occur with PEC_{soil} (outdoor) it may make no sense to spend too much effort on specifics for greenhouse soils. If an outdoor assessment for a substance results in an acceptable risk there is no reason to assume any differently for the use in protected crops.
- If a substance is for indoor use only the relevance of a risk assessment for soil may be doubted, as in permanent systems the soils can hardly be considered similar to field soils.

Surface water:
Reasons for notifiers to choose “greenhouse uses only” for the submission, usually result from not passing the risk assessment for outdoor uses. In the current review process of substances in the EU exposure of surface water as a result of use of PPP in protected cropping systems (more or less closed systems) is considered to be lower than from outdoor uses, however it is clear that is it not negligible.

The break-out group noted as an example for emission scenarios for surface water in MS risk assessments:

Germany: Deposition from greenhouses and warehouse uses (after volatilisation) are included in the German exposure assessment procedure. Basis for the German scheme are experimental studies that are also used in the FOCUS Air report to propose exposure values from greenhouses.

Sewage treatment plants:
Although it was a request to the PROTEA working group to include STP it was unclear if emissions to sewage treatment plants are part of 91/414 or of other legislations. It was furthermore unclear if the risk to the STP itself (data requirement for the ecotoxicology) or the exposure of surface water after STP treatment was meant. The latter is part of the biocides assessment but not of the PPP assessment under 91/414. A need for clarification by EFSA was identified.

Recommendations:
With respect to the question “What do stakeholders expect from the future guidance regarding assessment of emissions from protected crops?“ the break-out group recommends that the WG shall not deliver a pick list of all possibilities. Stakeholders (regulators and notifiers) want clear guidance on a limited number of key issues otherwise it is not clear enough for practical regulatory business.

The break-out group expects that the WG restricts itself to realistic worst case routes of exposure and not numerous possibilities. As an example it was mentioned that the GAP tables of intended uses don't distinguish between a lot of the protected crop systems that are identified by the WG.

If some specific protected crop scenarios are not different from open field scenarios, then they shall be combined.

With respect to the assessment scheme the break-out group states that compound properties shall have an impact on the risk assessment, these should be included in the scheme.

Since there is another working group planned to develop scenarios this WG shall state how many scenarios are needed for an assessment on EU level and define the problem for the next group, working on scenarios.

The break-out group recommends starting to identify the key indoor uses and develop scenarios for them in order to satisfy regulatory demands (not all scientific issues will be solvable in the lifetime of the WG).

With regard to the question of identifying safe uses, reflecting "reasonable" areas of use in the EU, the break-out groups noted that useful scenario locations, e.g. Almeria (Spain), or Dutch glasshouses can be picked up as a start.

With respect to the prioritisation and allocation of the relevancy of receptors for different protected systems the break-out group concluded:

A distinction can be made between the different types of protected cropping systems that are identified by the WG:

GH: glasshouse; WT: walk-in tunnel; SH: shade house; LT: low tunnel; PS: plastic shelter; NS: net shelter

Receptor groundwater:

The irrigation situation is important for potential risk to groundwater for protected crops. Water excess is the key for downward transport. For only a few compounds the greenhouse use is the only representative use authorised. These are "usually" pesticides for which under outdoor conditions the concern is primarily with surface water but occasionally also with groundwater.

If the soils under the greenhouses are drained the potential for groundwater exposure cannot be eliminated. There will be a reduction in downward transport to the groundwater level below the drain level, but not a complete elimination of leaching potential.

The potential for deposition of volatilised pesticide outside of the system shall be considered as a potential source for groundwater contamination as well, although the amounts that reach the soil outside the structure are expected to be much lower.

Groundwater monitoring data on pesticides that are likely to come from protected crops shall be interpreted in a similar way to monitoring results from outdoor applications considering the known problems with the interpretation of such monitoring results (e.g. excluding point sources).

The group asked if there are any national GW monitoring programmes in different EU member states and if there are any findings of pesticides that are applied only in GH.

With respect to interception values the break-out group concluded that with drip irrigation there is no crop interception. If the spray application is downward it can be expected that the FOCUSgw values are applicable and separate interception values for protected crop systems are not required.

Receptor air:

With respect to the discussion on Air itself as a receptor (or victim) or as a transport medium towards the receiving compartments (soil, surface water), which is relevant in scenario development, the FOCUS Air report was mentioned.

FOCUS Air considers air as transport medium towards deposition onto soil and surface waters.

Inside the GH and WT it is more of an issue for other risk assessments (Operator, worker re-entry).

For deposition outside the GH and WT, the FOCUS Air guideline could be considered as a starting point.

In addition, ventilation needs to be considered as well as temperature conditions (temperature, temperature gradients). Temperature and temperature gradients are potentially important but we do not know the regulatory implications.

Action:
- collect data on mass balance of pesticides in air in greenhouses under different boundary conditions
- link to investigations on exposure of operators and bystanders.

Receptor surface water:

Water as transport medium towards receptor compartments

Water that exits the greenhouse can enter the soil and surface water receptor compartments (e.g. results from Norwegian project on emissions from greenhouses to surface/drainage water). Surface water is considered the most important receptor that needs scenario development. The exposure routes are most probably different from field situations for (semi-)permanent structures.

Towards surface water:

- discharge: only applicable to GH.

- runoff: for structures other than GH, run-off maybe relevant, and should be considered in the same way as field situation in FOCUSsw.

- rinse water: rinse water from cleaning activities is considered a biocide application by the break-out group.

- uncontrolled condensation: not as relevant as other emission routes; it does not require further consideration for surface water (maybe relevant for soil, but soil inside the GH/WT is not seen as an important receptor that requires separate RA scenarios).

- controlled condensation: condensation is collected in the recirculation system or in a separate collection tank. Discharge from tank / discharge from controlled condensation collection results in different amount of pesticides.

Statement: These two last routes are not likely to appear at the same time.

- Spray drift: proposal for spray drift as exposure route. Spray drift is a relevant exposure route to surface water for a number of systems. We can use the justification from FOCUS Air that if spray

drift is reduced, deposition after volatilisation becomes relatively more important and needs to be considered.

2.2.3. Conclusion

Groundwater assessment:

For the emission to groundwater, it is usually accepted that the risk is lower than for outdoor uses.

Proposal for groundwater considering different structures:

GH (high tech) –> no groundwater assessment required

LT, PS, NS, WT, SH -> open field FOCUSgw-scenarios

The key driving factor for a potential for leaching is water excess: it can be assumed that for the low tech plastics and also for the shaded structures, more or less the same rainfall (+ irrigation) may reach the soil surface and therefore leaching calculated with FOCUSgw-scenarios can be seen as applicable or as the worst case. However, for some pesticides without a registered outdoor use, a covered crop scenario will be necessary as a higher tier. For EU level it should be kept simple and more generalised in order to leave the possibility of carrying out a case-by-case specific approach at MS level.

Action: collect data on typical irrigation volumes for the same crops that are protected vs. outdoors, to make sure that the outdoor scenarios are the worst case with respect to leaching. The same data should be used to justify a no-groundwater assessment for GH.

Soil risk assessment:

Soils in glasshouses can hardly be considered similar to field soils, as they are more similar to substrates due to physical treatments (e.g. sterilisation, heating, mechanical treatment like mixing, addition of substrate).

This may be different for non-permanent structures. These can be considered comparable to field soil. As there are generally few problems with PEC_{soil} (outdoor) it may make no sense to spend much effort on specific scenarios for greenhouse soils.

Removal of soil/substrate from greenhouses is considered as solid waste. Solid substrates were excluded from the remit of the workgroup.

Air:
Air can be considered as a receptor or as a transport medium. Considering air as a receptor, it appears that the air inside the greenhouse is relevant. This is more an issue for other risk assessments (operator, worker re-entry).

FOCUS Air considers air as a transport medium towards deposition onto soil and surface waters. The guidance provided by the FOCUS Air group should not be disregarded. For deposition outside the structure, the FOCUS Air guideline can be considered as a starting point. Additionally, ventilation needs to be considered as well as temperature conditions (temperature, temperature gradients). This needs further consideration.

Action: collect data on mass balance of pesticides in air in greenhouses and adjacent to greenhouses under different boundary conditions – link to investigations on exposure of operators and bystanders.

Surface water:

Proposal for exposure routes to surface water

Spray drift

GH –> direct spray drift unlikely

LT, PS, NS, SH -> use outdoor spray drift values for field crops as a first approach.

WT -> unclear, probably reduced spray drift, but extent of that reduction is unclear.

Run-off

GH (permanent WT) run-off is not relevant for exposure to surface water.

LT, PS, NS, SH can be considered to be identical to field situation as a first approach.

Action: collect data on spray drift emission for those systems (WT) that have permanent openings.

Discharge

Discharge to surface water via a tank (hydroponics system) is only applicable to GH.

Controlled condensation may lead to discharge of condensation water either via a tank or directly to surface water. These are in principle the same exposure routes but with different amounts of pesticides. Controlled discharge is only relevant for GH and maybe WT if these are more or less closed systems and therefore comparable to GH.

Uncontrolled condensation is not as relevant to surface water exposure as the other emission routes and does not require further consideration for surface water.

Rinse water from cleaning activities of the structure is considered to belong to biocide risk assessment approach.

2.3. Break-out group 3: Management Practices and Innovations

Chairs: Lidia Sas-Paszt, Walter Steurbaut

Rapporteurs: Richard Glass, Francisco Egea

2.3.1. Introduction

The discussion in this break-out group was related to all different presentations showing details of structures and considerations of relevance for characterising emissions. However, the presentation dedicated especially to this group was on "Management practices in protected crop systems" giving examples on how, for instance, ventilation or use of irrigation water of a different quality can influence the occurrence of emissions.

The major aim of this break-out group was to discuss the extent to which current innovations and management practices could be used to reduce emissions from protected crop systems.

2.3.2. Summary of Discussion

The following four questions were given to the break-out group to start the discussion:

Q1 What management practices can be performed to reduce emissions from protected crops and in what type of structures/protected crops are these measures most relevant?

Q2 Are the proposed reductions of emissions applicable to all pesticides (e.g. active substances with a long or short DT_{50})?

Q3 What are the easiest/most cost-effective priority measures that can be taken in order to reduce emissions from covered crops?

Q4 How is it possible to manage covered crops in Europe in a safe and environmentally sustainable way?

The group was asked to consider if any further questions should be considered, and think about prioritising the list.

At the beginning of the discussion, some points of clarification were requested by members of the group, relating to important points regarding the relative risks from enclosed and open field crops. The subject area for discussion was considered to be very broad and really needed to consider factors which were being discussed in Break-out Group 1 (Protection structures and Risk Assessment), in terms of the effect on structure on the feasible management practices and subsequent risk. Also the subject of Break-out Group 2 (Ranking of emissions) was key in considering the need for management practices based on the relative importance of each of the emission routes and receptors.

The following points were agreed for consideration as part of the discussion.

- Which types of covered crops can be managed for controlling emissions to air?
- Covered crops are not necessarily a bigger problem than open field crops.
- Less spray drift from enclosed crop than open field crop.

2.3.2.1. What are the problems and how can they be managed

The group started the discussion, responding to Questions 1 and 2 together, but broke this down into smaller sections by considering the receptors, which were identified as

A. Air

B. Soil

C. Surface water

D. Groundwater

Initially a range of comments were made by the break-out group in considering management practices and for what type of structures or crops these could be applied. The nature of the structure also had a bearing on the type of crop which was grown and the availability of management practices to the grower. There is a big difference between tunnels, shelters and greenhouses, with so-called high-tech greenhouses having a wide range of sophisticated management practices not available to growers with more simple structures.

A. Air

Particularly for the emissions to air, there was agreement that covered crops are not necessarily a bigger problem than open field crops. Some members expressed an opinion that air pollution from protected structures is being seen as priority for EU policy, although it is not the only factor to be considered. Questions were raised about the availability of data for emissions from greenhouses and the validity of these data. Members acknowledged that, compared to open field data, there were very few data sets for emissions of PPPs from protected structures, i.e. the amount of data for pesticides in the air.

The FOCUS Air methodology used for PPP registration was mentioned, as well as whether the drift from protected structures was considered the same as in the open field and whether the volatilisation models were appropriate for both types of cropping systems.

In considering the application technique for PPPs, application experts within the group recognised that this was a critical factor which needed to be addressed. Many application techniques in protected structures involve the use of nozzles and pressures which generate smaller droplets than would be used for open field structures. The timing of the application is easier to control in protected structures, and needs to be done with respect to timing and rates of ventilation. Comments were made about the need to consider the dissipation time rather than half-life, and also the effect of volatilisation of PPPs from the crops.

Greater vapour release was more likely in protected structures than in the open field, mainly due to the temperature but also related to different ambient conditions compared to the open field and therefore the activity of PPPs and absorption by crops is likely to be different.

A summary of the most important management practices is given below:

- Ventilation
- Restrict the opening of the structure (time)
- Reduce recirculation inside the structure

- Application technique (use large droplets where possible)
- Droplet size with different techniques (spraying to fogging)
- Nozzle selection (BCPC spray quality – very fine, fine, medium, coarse)
- Spray pressure
- Upward or downward
- Use of adjuvants (e.g. effect on surface tension)
- Timing of application and ventilation
- Cooler times of day when greenhouse closed (Is this always possible in places such as Almeria?)

B. Soil

The soil receptor was seen to be important for protected structures, though less important than the air receptor. The group agreed that as a receptor for risk assessment the top 1 metre is not considered, and that in reality the receptor under the protected structure is the groundwater.

In term of the importance of drift, the group considered this to be less important for protected structures than with the open field situation, although this would depend on the type of structure and the application technique used.

Run-off of condensation from the structure was seen to be important as this was likely to contain PPP residues; it therefore needs to be managed, although the nature of the structure would influence this as structures are variable, and the relative areas of walls and roofs may be important, together with the relative humidity inside the structure – which can be controlled in some circumstances.

Crop type and crop density which influence leaf area index (soil coverage) are factors that influence the amount of PPP reaching the soil. Soil coverings were mentioned as possible measures which could be used to protect soil surface. Growing systems such as pot or box systems may also be useful management measures.

The application technique, in particular the application volume, is an important factor, as spray to run-off techniques would result in PPP reaching the soil.

C. Surface water

In considering the surface water as a receptor, the group spent much of the time discussing the differences between hydroponics systems, i.e. closed vs open loop systems

The quality of water used for closed loop systems i.e. content of ions such as chloride, nitrate etc., was very important, as the use of good quality water reduced the need for discharge. Some members of the group considered that some restriction in the use of PPPs could be made based on the water quality, and this could be a label requirement for registration. The time between application and discharge is important (half-life of a.s. in water) and needs to be managed carefully and considered as part of the flushing programme. Discharge of waste water from flushing closed systems therefore requires consideration, as does the method of disposal. Treatment of waste water, e.g. bioremediation, is important to reduce PPP residues entering groundwater. Some members considered that point source pollution needed further consideration, not just from discharges of waste water.

Soil applied PPPs were seen as an obvious source of soil contamination, and possible surface water, with drip irrigation, was seen as the most cost-effective way of PPP delivery for many growing systems. In dry environments such as Almeria (Spain), the losses of PPP from the soil were negligible if not zero, due to the dry soil and low annual rainfall.

D. Groundwater

For PPP registration the group agreed that the PPP concentration at 1 m depth is considered, therefore there is an obvious need to avoid excessive irrigation by the use of appropriate strategies and techniques.

Where necessary, the use of soil drainage systems would prevent ground water contamination. Soil properties would also play an important role, although it was acknowledged as difficult to manage and should therefore be a matter for consideration regarding the risk of contamination. Some members of the group mentioned possible measures to manage the soil type in protected structures, e.g. PUF as a soil improver, soil cover (mulching).

Protected structures allowed scope for management of water inputs, compared to the open field which was open to the weather and rainfall. Control of irrigation was seen as being critical by the group.

2.3.2.2. Economics and sustainability

After considering the various factors which affect PPP residues in the various receptors, the group discussed which of these were the most cost effective and whether they are possible to follow in an environmentally sustainable way in Europe.

Good ventilation systems are required to vent greenhouses, but are also needed for optimum crop growth; therefore there are economic benefits to the grower from installing or maintaining such systems.

Well maintained structures would prevent losses to air from the greenhouse, but would also reduce residue hot spots with fogging thereby giving a more even and effective treatment. There would also be economic benefits from more effective heating/cooling in well maintained structures.

Channels to collect condensation would prevent PPP reaching the soil, but were not seen as having an economic benefit to the grower. However the use of materials which stimulates film forming rather than drops would benefit the grower, as it would prevent the dripping of condensation onto the crop, which often encourages fungal pathogens.

Changing the use of application techniques with larger droplets would prevent losses to air in particular, but may reduce efficacy for contact PPPs or crops with dense foliage, so this was seen as potentially having a negative economic effect.

The collection and treatment of waste water was seen as having cost implications for the grower, in terms of storage, but the use of available water disinfection technologies (e.g. UV) to break down PPPs could be beneficial in reducing the need for storage of large volumes.

The group considered the overall best available practice and technology, cost effectiveness and sustainability. Many of the group considered that there should be an inventory of what technology and management practices exist.

2.3.3. Conclusion

The overall conclusion of the group was that in general terms the risk to the environmental compartments group from PPPs was lower with crops in protected structures than with crops in open fields. In some circumstances risks may be similar, but when comparing a crop grown in an open field with the same crop grown in a protected structure the group did not consider that the protected structure would be the worst case.

In terms of management options, the consensus of the group was that this very much depended on the type of structure. There are management options available to the grower to reduce emissions and it was felt that these are often followed by a number of growers because they also had concomitant economic benefits.

However, this does not necessarily signify that actions aimed at reducing PPP emissions are not being followed because there is no economic benefit.

The group summarised their findings in a table by considering the most important factors to be managed related to the receptor types and structure types.

	SHELTER	**WALK-IN PLASTIC TUNNEL**	**GREENHOUSE** **Low** **High**
AIR	Application same as field (aprox)	Application Drop size	Opening Timing of application and opening Drop size
SOIL	Same as field (approx) Drift		Collect condensation
SURFACE WATER	Same as field (approx)	Reduce discharge (Bio) remediation Water quality	Reduce discharge (Bio) remediation Water quality
GROUND WATER	Same as field (approx)	Soil properties Water supply Surface drainage growth stage of crop LAI, interception Surface drainage	Soil properties Water supply Surface drainage growth stage of crop LAI, interception

2.4. Plenary Discussion to collect stakeholders' views on the proposals presented by the EFSA Working Group for the development of the new guidance document on emissions from protected crops

Chairs: Ettore Capri, Mark Egsmose

Rapporteurs: Jonas Östgren, Andreas Huber

2.4.1. Introduction

In order to link together the different aspects in the three break-out groups, a common plenary discussion was held on the last day. The plenary also discussed some further proposals by the EFSA WG on how the new guidance document could help in assessing emissions from protected crops.

2.4.2. Summary of Discussion

The plenary session started with a short presentation by Ton van der Linden who presented some conclusions of the PPR working group and the respective hypothesis on the need for a risk assessment of emissions from greenhouses. The presentation served as a thought-starter and gave the subsequent discussion a specific structure. After a general discussion on the relevance of the problem, the plenary discussed each of the main statements made in the presentation.

General discussion on the relevance of the problem

Some participants asked the working group members if there was already an indication on the total number of scenarios that might be expected in the future. At this stage the working group felt that there are still a large number of possible scenarios for each receptor since only a preliminary clustering was undertaken so far. The goal should be however to group similar combinations of factors as far as possible to come up with a reasonable number of scenarios in the end. These scenarios should be added to the existing set of scenarios for outdoor uses.

Concern was raised in the plenary that the working group only presented modelling results to support the claim that greenhouse emissions are not appropriately considered in current regulatory risk assessments. The working group did not present any experimental data that confirmed these modelling results. As a consequence it is unclear whether the effort of producing a large number of new simulation scenarios is really justified. Members of the working group replied that there are some measured data available from hydroponic systems in the Netherlands however the experiments were not designed to validate simulation results.

Another important aspect in the general discussion was the role of management practices. It was mentioned that most emissions from greenhouses are related to management practices (e.g. discharge, waste disposal procedures) and should therefore not be included in regulatory risk assessments. Although it is generally acknowledged that such emissions occur, it is questionable whether these emissions are really related to pesticide properties or are rather a result of certain management practices. If emissions can be controlled by a change of management practices they should be regulated on the basis of other directives such as e.g. waste disposal, but not in the framework of pesticide authorisations. Since emissions from greenhouses look similar to discharges from manufacturing systems a proposal was made to investigate how these emissions are dealt with in the manufacturing area. Greenhouse systems might be even regarded as manufacturing facilities, therefore it would be logical to regulate these emissions in line with manufacturing sites.

The question on relevance of discharge due to management practices was considered relevant by several stakeholders. It was noted that there is no good compilation of management practices in the Member States. It was also mentioned that many farmers are aware of the problematic nature of some

practices, but nevertheless in many regions nothing is done about that problem. It was nevertheless noted that some Member States already developed action plans on the reduction of emissions from greenhouses.

The key problem with greenhouse uses is that there is a huge variety of management practices therefore it might be useful to give only general guidance to Member States on how to deal with the issue. In the light of the many different combinations of factors it would not make sense to create an overly detailed EU guidance that attempts to consider all possible practices and greenhouse structures. The general guidance document should nevertheless ensure that the regulatory risk assessment is comparable between Member States.

Specific discussion on the conclusions of the PPR working group on emissions from protected crops

After the initial discussion the plenary focused on the key conclusions of the PPR working group. The respective conclusions were presented by Ton van der Linden in the thought-starter at the beginning of the plenary session.

Hypothesis 1: Simulations demonstrate that emissions from greenhouse occur

It was felt that the statement is too strong in view of the fact that it is only based on simulation data. There was a general feeling that more experimental data is needed to substantiate this hypothesis because modelled results depend mostly on selected input parameters. A slightly different set of input parameters might have provided a different result. The usual procedure to demonstrate the validity of a hypothesis is to run simulations, validate the simulation results with measured data and then conclude that emissions are significant. The Working Group has only made the first step and it is difficult to conclude if the statement is correct or not.

Hypothesis 2: Emission routes are different to those in open field applications

Clarification is needed if this statement only applies to high-tech systems (i.e. closed structures mostly described as greenhouses or glasshouses). With reference to the discussion in the break-out groups it was proposed that low-tech structures (e.g. shelters, low tunnels etc.) are not actually that different from open field uses in terms of possible emissions.

Hypothesis 3: Currently used emission factors (in % of applied substance) ignore the variability of protected cropping systems and thus do not reflect potential worst-case conditions

In most PRAPeR meetings, drift losses from greenhouses were considered on the basis that 0.1% of applied substances are instantaneously lost by drift or other routes. This appears to be the current practice also in the national authorisation procedure in some Member States. The issue might not be related to the exact value that is used in the assessment. The problem is rather that these emissions are variable and therefore should not be assessed by means of a constant value.

There was a question of clarification regarding why the factor of 0.1% is no longer considered valid by the working group. The answer was that the factor was based on measurements from the 1980's and 90's. A Dutch working group recently concluded that the value does not cover all use conditions and proposed a change of the respective risk assessment procedure for specific production systems. It has not yet been decided if the value of 0.1% will be changed in the Dutch national authorisation procedure.

It was noted that the FOCUS Air report proposes exposure values from greenhouses based on measured values modelling results (0.05 % for volatile compounds applied with high volumes of water, 0.2 % for application with ultra low volume). These proposed emission values may be considered in future.

Hypothesis 4: Model and scenario development is necessary for greenhouse uses

Some stakeholders expressed the wish that any new model or scenario should be implemented into the existing models and tools. The discussions in break-out groups concluded, however, that no new models or scenarios are needed to assess emissions from low tech structures (low tunnels, shade houses, net houses, plastic shelters). Therefore the respective uses could be assessed on the basis of existing field scenarios. Most low tech structures do not have lateral solid walls and for this reason drift should be comparable to field uses. The use of outdoor scenarios represents a worst-case assessment since it is likely that drift is reduced to a certain extent by these structures. In any case there is a very low likelihood that emissions by drift are higher than in open fields or orchards. The similarity of many low-tech protected crop systems with field crops was accepted by the majority of the speakers. However, in this respect it was also mentioned that some sort of tool for higher tier assessment is necessary when open field scenarios result in an unacceptable exposure for a compound that is only used in protected systems or when crop protection can be used as a mitigation measure.

Real high tech glasshouses can probably only be found in certain areas or Member States such as the Netherlands. For that reason the special case of high-tech, permanent greenhouses could be considered as a Member State issue in the framework of the pesticide evaluation for Annex I listing. Some speakers challenged the perception that high tech greenhouses are only found in the Netherlands.

The scale of the assessment was considered to be an important aspect. The current assessment usually only considers the field scale. Greenhouses might have a larger landscape impact. This point was not further discussed. A concern was made that if the concept of field scale assessments is changed for greenhouses then it is also necessary to rethink open field assessments.

One important deliverable of the working group was to group protected structures. At the end of the plenary discussion a point was made that this grouping to date does not reflect any regulatory category. The Working Group should be aware that it proposes only groups that can later be implemented in regulatory decision making.

2.4.3. Conclusion

Stakeholders generally appreciated the work of the working group, in particular the effort around the characterisation and classification of protected crop structures. The discussions in the break-out groups about high-tech and low-tech structures revealed several similarities between some protected cropping systems and open field uses. These similarities could help to reduce the number of factor combinations that need to be considered in future improvements of regulatory risk assessments.

There was however a feeling that it is too early to conclude whether a completely new assessment method for greenhouse uses is needed. The Working Group did not provide enough monitoring or experimental data that gave evidence of a problem in major greenhouse areas. The validation of the simulated emission percentages was considered a key task for the future.

Unlike applications in open fields, some emissions from greenhouses, like losses through sewage systems, are driven by management practices and thus independent from pesticide properties. For that reason it was recommended to consider the use of existing regulations, for e.g. manufacturing sites, to regulate this type of emissions.

INCORPORATION OF COMMENTS

The comments and different stakeholders' views collected during the workshop will be discussed in the EFSA WG on emissions from protected crops and will be considered further for the development of the new Guidance Document. Suggestions and stakeholders' views discussed at the workshop were very appropriate and of high value for the PPR Panel and the Working Group on emissions from protected crops. EFSA thanks all stakeholders for their contributions.

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APPENDICES

A. PROTEA WORKSHOP PROGRAMME

FIRST WORKSHOP DAY (17 NOVEMBER 2009)

Presentations in Plenary

14:00-14:10	Official Workshop Opening: Welcome Address
14:10-14:25	Feedback from EFSA on Work with Guidance Documents *Mark Egsmose, EFSA PPR*
14:25-14:40	The new Regulation concerning the placing of plant protection products on the market *Herman Fontier, EFSA PRAPeR*
14:40-15:00	Overview of protected crop issues *Ettore Capri*
15:00-15:20	Need of an EU environmental risk assessment scheme for protected crops *Oriol Magrans, EFSA PRAPeR*
15:50-16:10	Work process of the EFSA WG on Emissions from protected crops *Stephanie Bopp, EFSA PPR*
16:10-16:25	Short overview on the classification of protected crop structures and growing systems *Alberto Pardossi*
16:25-16:40	Short overview on emissions and clustering *Ton van der Linden*
16:40-16:50	Introduction to break-out groups and evening programme *Stephanie Bopp, Mark Egsmose, EFSA PPR*
17:00-18:00	Start of break-out groups to collect and prioritise questions for the 2nd day

SECOND WORKSHOP DAY (18 NOVEMBER 2009)

Presentations in plenary and discussions in break-out groups

Group 1 Protected Crop Structures and Risk Assessment

Group 2 Ranking of emissions

Group 3 Management practices in protected crops and Innovations

9:00-9:30	Data Collection on Protected Crop Structures (Olaf Mosbach-Schulz)		
9:30-10:00	Factors influencing emissions (Ton van der Linden)		
10:00-10:20	Management practices in protected crop systems (Cecilia Stanghellini)		
10:45-12:30	**Group 1: Protected Crop Structures and RA** *Chairs: Laura Padovani and Mark Egsmose Rapporteurs: Jérôme Laville, Tycho Vermeulen,*	**Group 2: Ranking of emissions** *Chairs: James Garratt and Stephanie Bopp Rapporteurs: Adi Cornelese, Bernhard Gottesbüren*	**Group 3: Management Practices and Innovations** *Chairs: Lidia Sas-Paszt and Walter Steurbaut Rapporteurs: Richard Glass, Francisco Egea*
14:00-15:30	continuation of discussions	continuation of discussions	continuation of discussions
15:30-16:30	prepare presentations for feedback to entire group	prepare presentations for feedback to entire group	prepare presentations for feedback to entire group
17:00-17:20	Joint meeting of all Participants *Chair: Ettore Capri* Chairs report briefly back from break-out groups		
17:20-17:30	Short overview on evening programme and next day (PPR)		

THIRD WORKSHOP DAY (19 NOVEMBER 2009)

Reporting back from break-out groups and plenary discussion

Chairs: Jos Boesten, Stephanie Bopp

9:00-9:10	Introduction to the programme of the day
9:10-9:25	Feedback from Group 1 (by Rapporteurs)
9:25-9:40	Feedback from Group 2 (by Rapporteurs)
9:40-9:55	Feedback from Group 3 (by Rapporteurs)
9:55-10:15	Plenary Discussion on outcome of the 3 groups

Chairs: Ettore Capri, Mark Egsmose

10:45-11:00	Are stakeholders served with the proposals of the working group? *Ton van der Linden*
11:00-12:00	Plenary Discussion to collect stakeholders' feedback on proposals for the new guidance *Rapporteurs: Jonas Östgren, Andreas Huber*
12:30-12:50	Summary of the plenary discussion *by Rapporteurs*
12:50-13:00	Outlook and closing remarks *Mark Egsmose, Stephanie Bopp*

APPENDICES

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GLOSSARY AND ABBREVIATIONS

AMU unit (EFSA)	Unit on Assessment Methodology
a.s.	Active Substance
BBCH scale	Scale for phenological development stages of a plant
DegT50	Degradation half-life Term with no association to any particular type of kinetics to describe the time taken for a 50% decline in mass or concentration of a substance to occur by degradation from the environment or an environmental compartment after it has been applied to, formed in, or transferred to, an environmental compartment.
DI	Drip irrigation application
DT50	Disappearance/Dissipation half-life Term with no association to any particular type of kinetics to describe the time taken for a 50% decline in mass or concentration of a substance to occur by dissipation from the environment or an environmental compartment after it has been applied to, formed in, or transferred to, an environmental compartment.
EFSA	European Food Safety Authority
EP	European Parliament
EU	European Union
EU-27	All 27 Member States of the European Union
FOCUS	Forum for the co-ordination of pesticide fate models and their use
FogFum	Fogging and Fumigation Application
GAP	Good Agricultural Practice
GD	Guidance Document
GH	Greenhouse / Glasshouse
H	Henry Coefficient
Inj	Soil Injection Application
K_{Foc}	K_{Foc} is the Freundlich sorption constant normalised on organic carbon. It is obtained from the K_F (Freundlich sorption constant) by dividing with the %OC and then multiplying by 100. For all practical purposes it is identical to the K_{OC} (sorption constant based on organic carbon), which is derived from the K_D (sorption distribution coefficient) by dividing with the %OC and multiplying by 100. K_{FOM} and K_{OM} are defined likewise, but based on organic matter instead of organic carbon.

LAI	Leaf Area Index
LT	Low-tunnel
Mol Wt	Molecular Weight
MS	Member State
NS	Net shelter
P	Saturated vapour pressure
PEC	Predicted Environmental Concentration
P_{ow}	Octanol-water partitioning coefficient, K_{OW} is also used for this
PPP	Plant Protection Product
PPR Panel / Unit (EFSA)	Panel / Unit on Plant Protection Products and their Residues
PRAPeR Unit (EFSA)	Pesticide Risk Assessment Peer Review
PS	Plastic Shelter
RA	Risk Assessment
S	Aqueous Solubility
S+R	Cultivation system with soil with recycling
SL+R	soilless cultivation system with recycling
SH	Shade House
SnoR	Cultivation system with soil without recycling
SLnoR	soilless cultivation system without recycling
SoilAp	Soil Application
Spray	Spraying Application
STP	Sewage Treatment Plant
TWA	Time Weighted Average
WG	Working Group
WT	Walk-in tunnel