National Institute for Public Health
and the Environment
*Ministry of Health, Welfare and Sport*

# EMISSIONS OF PLANT PROTECTION PRODUCTS FROM PROTECTED CROPS TO ENVIRONMENTAL RECEPTORS

Piacenza, August / September 2011

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# Outline

1. Introduction
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3. Emissions
4. Modelling
5. Scenario development
6. Conclusions

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# Introduction

- Regulation EC 1107 / 2009:

  greenhouse' means a walk-in, static, closed place of crop production with a usually translucent outer shell, which allows controlled exchange of material and energy with the surroundings and prevents release of plant protection products into the environment
- Not certain / unknown how to assess applications of PPP in non-open-field situations / covered crops

# Introduction

- Authorisation of PPP in EU is different for covered crops
  - Not all receptors are considered
  - No specific scenarios available e.g. for leaching and unknown whether FOCUS scenarios apply (groundwater)
  - Scenario not used appropriately (emission to surface water calculated as if it were drift)
  - No model and/ no scenario available (for example for soilless cultivations)

# Introduction

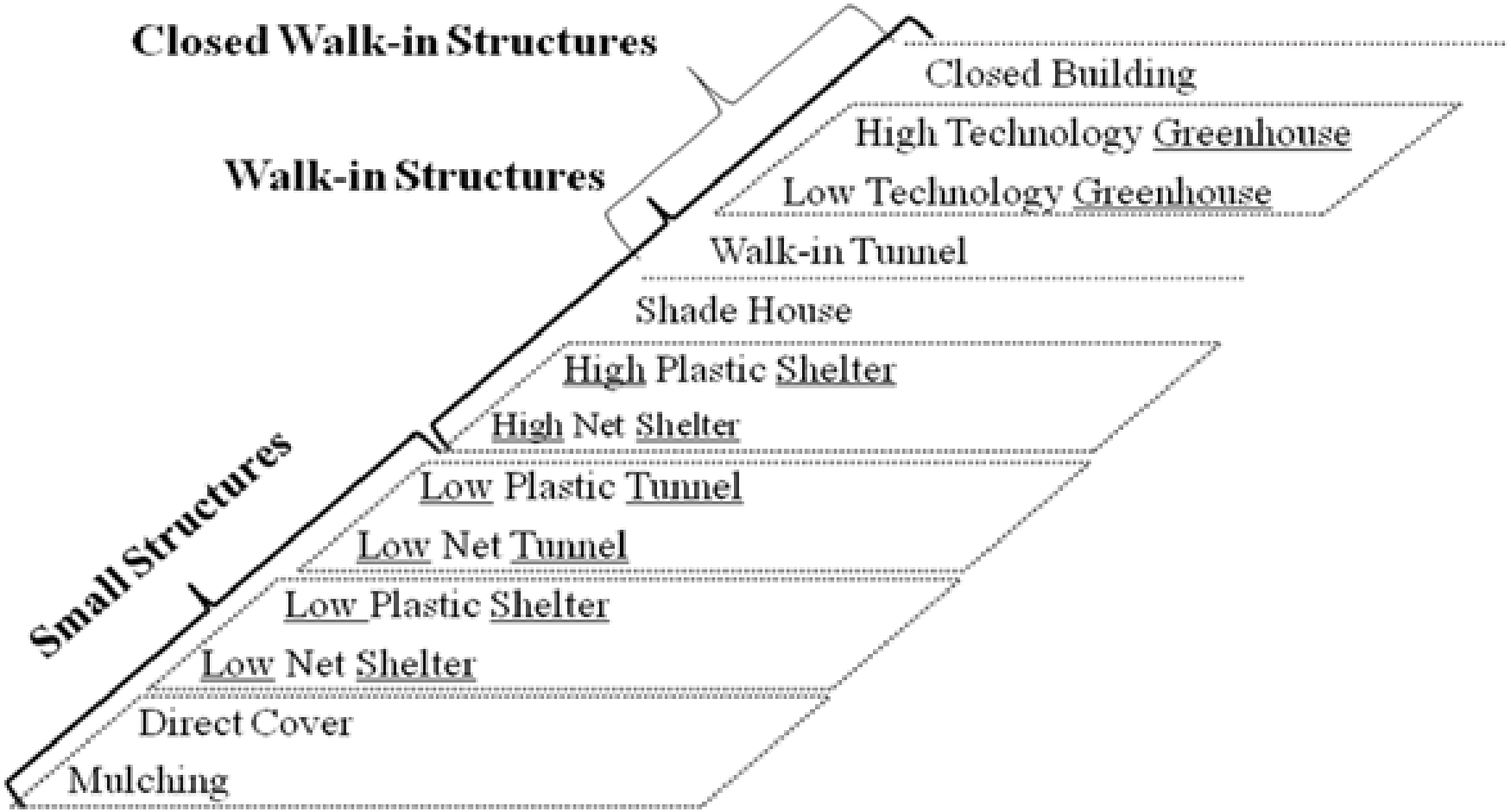
PPP do occur in environmental receptors, especially examples for surface water are available:

- In areas where covered cropping systems are concentrated (reports from the Netherlands and Sweden)
- At concentration levels sometimes above critical standards
- At concentration levels not predicted in current assessment procedures

# Introduction, EFSA working group remit

- Identify and describe system characteristics that are required to classify protected crop systems.
- Identify potential emission routes and the relevance of these for the classes of covered production systems (and under which conditions these are applicable).
- Provide the relevant information so as to enable ranking of emissions, which can serve for the development of exposure scenarios and risk assessment schemes for protected cropping systems in a following Working Group.
- Identify environmentally relevant data on land use intensity for the given types of protected cropping.
- Enable competent authorities to decide what classifications have practical use with respect to inclusion of pesticides in Annex I (Directive 91/414/EEC) and national authorisations.

# Structures, overview

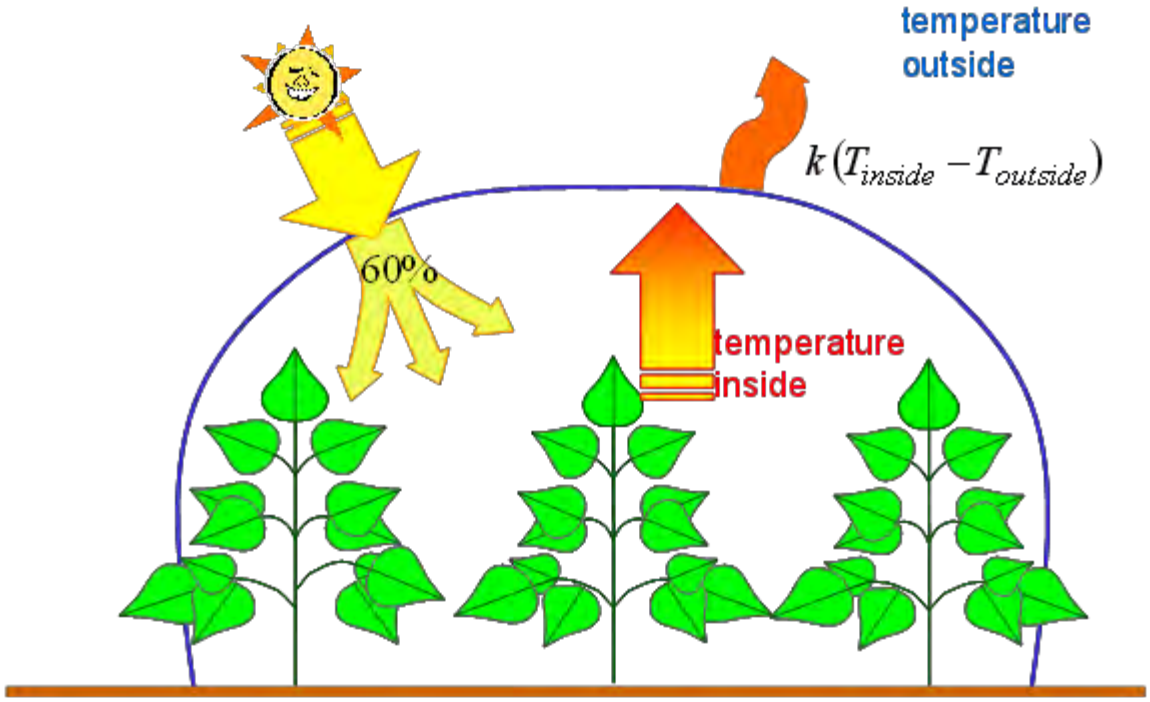


# Covered crop systems, plastic shelter

# Covered crop systems,walk-in tunnels

# Covered crop systems, greenhouse

# Emissions, to air



# Emissions, to other receptors

- Drift, when cover is not fully closed
- To groundwater / surface water, with excess irrigation (required to avoid salinisation of the system
- To (mostly) surface water, along with discharge water (discharge required to avoid too high salt levels, or other growth disturbing factors.

# Emissions

Emitted amounts will, apart from substance properties, be dependent on:

- The structure
- The cover of the structure
- Management of (the climate of) the structure, like heating and controlled ventilation
- System management approach (e.g. strategy of water supply and water discharge)

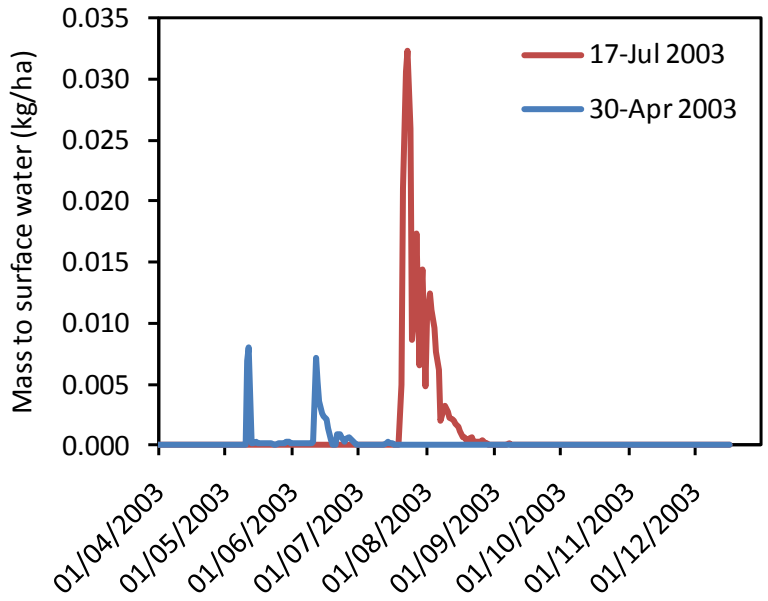
# Modelling

For appropriate assessments, a series of models, dependent on the receptor, are required to calculate:

- Crop water requirement (including excess) and inside climatic conditions within the growing environment, based on outside climatic conditions and crop management decisions
- Water distribution within the system, taking account of available water sources (rain water, tap water, groundwater, …)
- Leaching to groundwater or drainage to surface water (soil-bound systems)
- Discharge (to surface water) (soilless systems)
- Drift to surface water
- Emission to air
- Exposure / concentration in the environmental receptor

# Modelling, example

See posters for exact set-up of modelling systems, scenarios, example results and further details



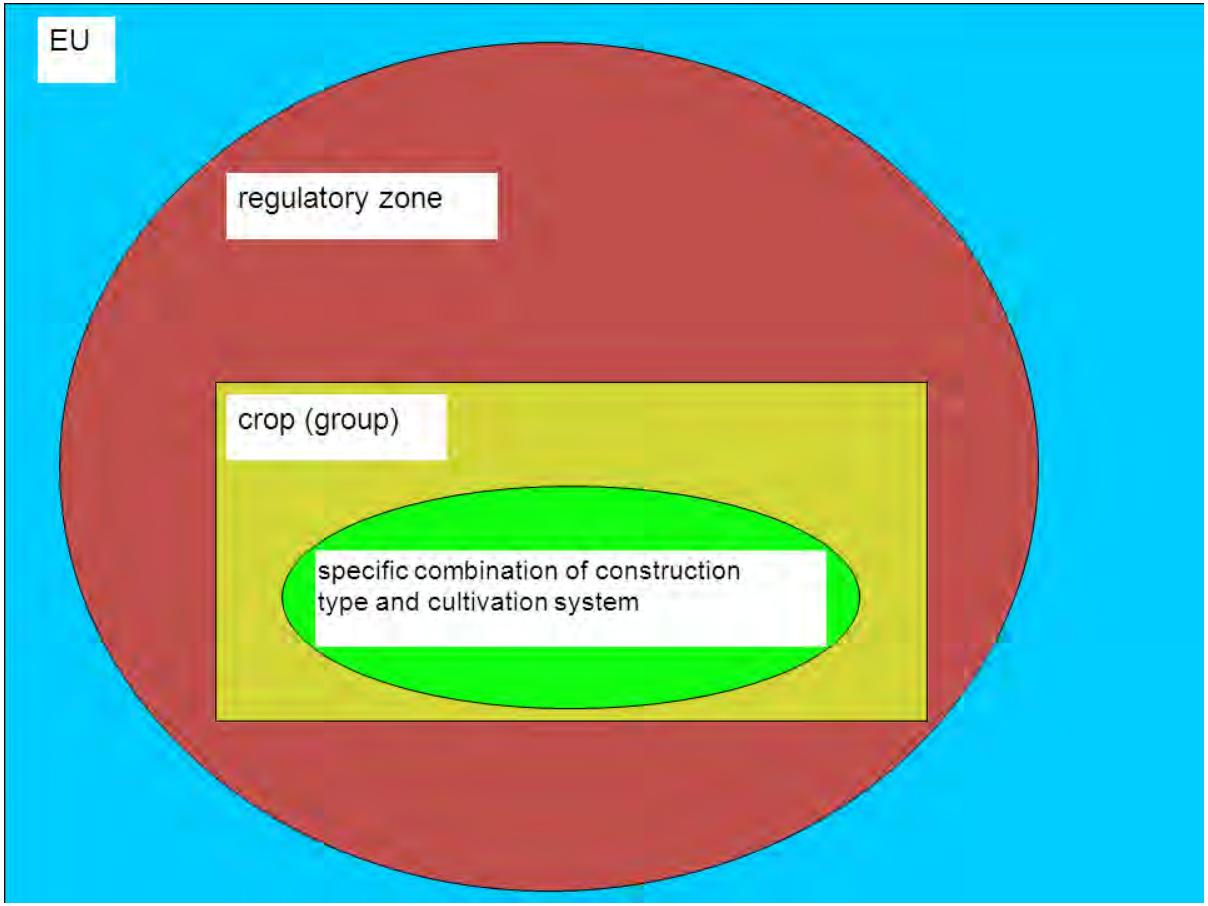

Daily mass entering surface water after application to peppers in soil-less cultivation on, 30 April 2003 or 17 July 2003 (Sodium level water source 1.8 mmol $L^{-1}$, rainwater basin 500 $m^3$)

# Scenario development

So far, no representative scenarios, for use in risk assessment at the EU level, have been derived.

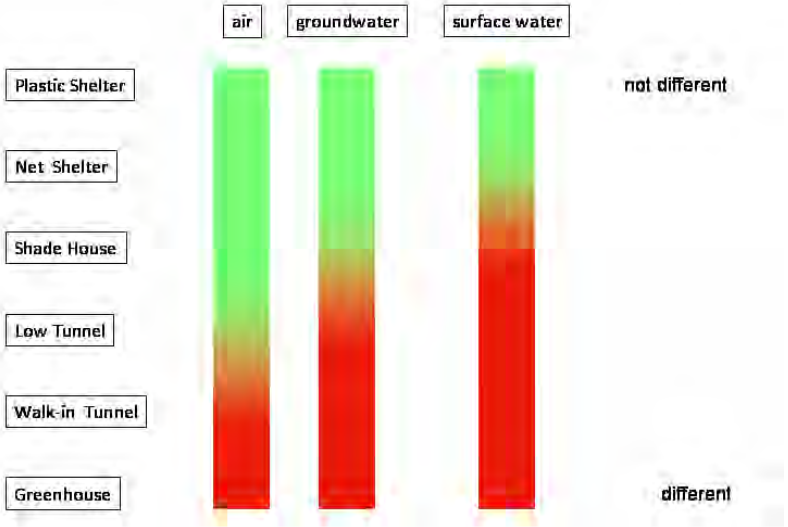
Scenario development should respect spatial and temperal aspects, so account for differences in soil, regional and temperal (outside) climatic conditions and management aspects.

# Scenario development, population



# Scenario development

Tentatively the scheme below was drawn to indicate deviation from open field. Further analyses indicate that especially greenhouses may deviate from open field.
This holds for soil-bound as well as soilless cultivation systems.



# Conclusions

Work performed so far (see also posters) has shown that:

- There is a large variety in covered cropping systems, varying from crops grown under small plastic shelters to crops grown in greenhouses.
- Emissions to environmental receptors do occur, dependent on local and climatic conditions and substance properties.
- Emissions from covered crops to environmental receptors may differ from those from open field to some extent.
- Emissions from soil-bound systems in closed walk-in structures to groundwater and surface water, i.e. leaching and drainage, may be lower, dependent on water supply (irrigation excess) and temperature.

# Conclusions (cont.) and recommendations

- Also emissions from soilless cultivation systems may occur. There is no equivalent open field system.

It is recommended that, with priority, risk assessment methodology is developed for greenhouse cultivation systems, both soil-bound and soilless. The development should include:

- Coupling of appropriate models, from crops growth models up to emissions models and exposure models for the environmental receptors.
- Adaption and improverment of the models, where appropriate.
- Derivation of appropriate scenarios, taking account of variability in environmental and climatic conditions with respect to both space and time, for example according to the approach taken by the EFSA soil persistence working group

# More details

Posters (presented at Symposium)

- Beulke et al.
- Holterman et al.
- Mosbach-Schultz et al.
- Van Beinum et al.
- Vermeulen et al.

Publications

- Opinions and technical reports from EFSA 2009 and later
- Vermeulen et al. 2010
- Kreuger et al. 2010

# Thank you