



Better Training for Safer Food *Initiative*

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**Towards a sustainable
use of plant protection
products:**

**“Safe Use - Measures
to minimize risks to
humans”**

Safe Use Measures to minimize risks to humans

Presentation outline:

- A. Minimizing operator exposure *via* appropriate use of specific personal protective equipment (PPE) and application practices
- B. Safe working practices for storing, transporting, handling and mixing of PPPs
- C. Safe disposal of empty packaging and of surplus of PPPs

A. Mitigation measures to minimize operator exposure

- ❖ Use of specific personal protective equipment (PPE)



- ❖ Consider specific application practices

Operator and worker pesticide exposure

Operators and workers are exposed to pesticides during their standard working activities



What is PPE?

- Any device or appliance designed to be **worn** or **held** by an individual for **protection** against one or more health and safety **hazards**
- Depending on the hazard potential PPE is intended to protect against, PPE is divided into 3 categories:

Directive 89/686/EEC

PPE category I:

to protect against mechanical actions, cleaning materials of weak action and easily reversible health effects

PPE category II:

products which do not fall into category I & III

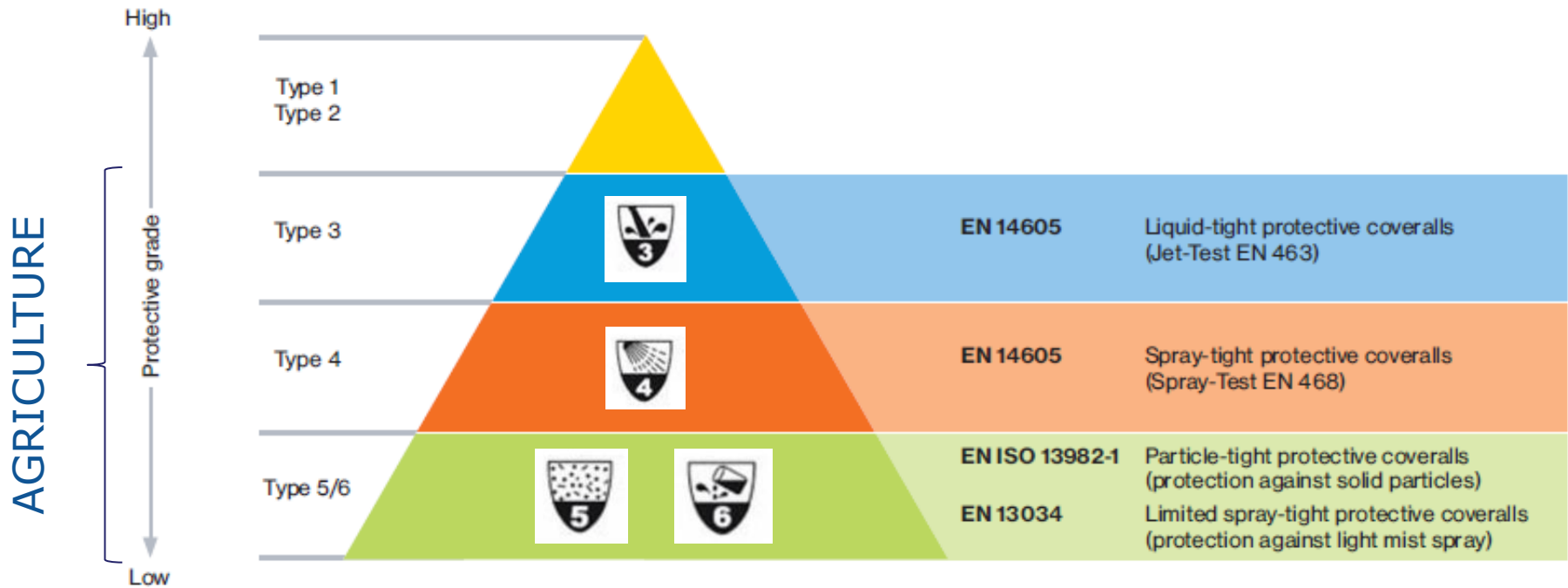
PPE category III:

to protect against risks which may seriously or irreversibly harm health



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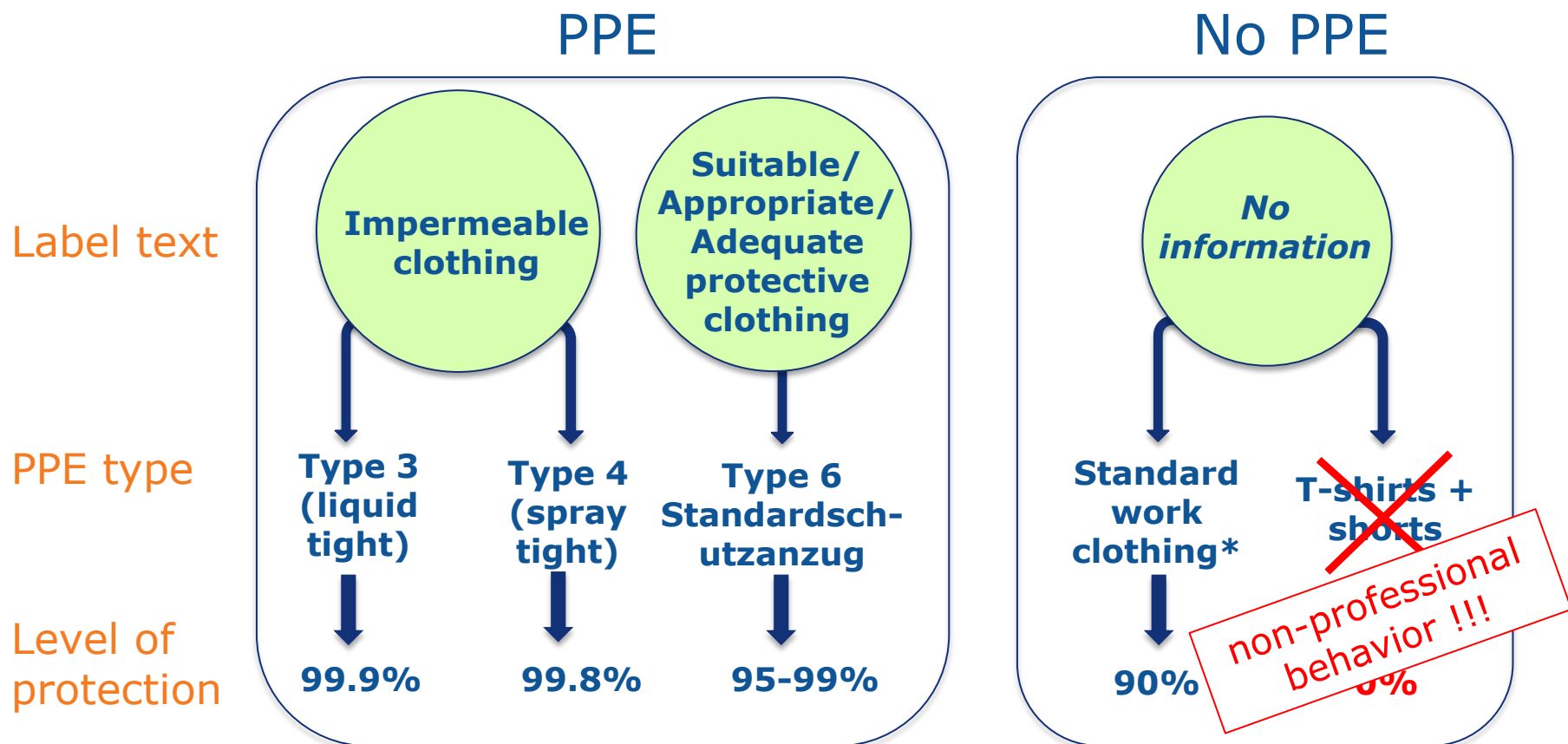
PPE category III



Performance & Properties of PPE defined by:

- CEN – European Committee for Standardisation
- ISO – International Organisation for Standardisation

Protective clothing overview



* shoes, socks, long-sleeved shirt, and long trousers

Protective gloves overview

CHEMICAL RESISTANT DISPOSABLE GLOVES (NITRILE)

- For concentrated pesticides e.g. M/L:
 - multiple-use gloves
 - exposure ↓ : > 99% (EFSA calculator)
- For diluted pesticides e.g. application, nozzle repair
 - single-use gloves
 - exposure ↓ : > 99% (EFSA calculator)



?



?



Protective Dust/Mist/Vapour mask



Disposable dust /mist mask
(FFP: Filtering Face Piece)
Reduction of exposure by an
Assigned Protection Factor (APF):

- FFP1: 4x
- FFP2: 10x (normally used)
- FFP3: 20x

**Reduction of exposure in risk
assessments: 90%. ***



Reusable dust /mist/vapour mask
Against organic vapour (A1, A2, A3)
+ dust/mist (P1, P2, P3)

- A2P3 (normally used)

**Reduction of exposure in risk
assessments: 90%. ***

Additional protective PPE

Rubber boots



Rubber boots - the legs of protective coveralls should be worn outside the boots.

Face shields



Visors help reduce the chance of drops or spillages of the product coming into direct contact with the skin and eyes

Specific application practices as a technological means of minimizing operator exposure

I. Greenhouse mechanical applications



'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.**

Greenhouse automatic application



Autofog Automatic Chemical Application

- Automatic spray produces ultra-fine cloud of droplets
- 👍 Lower amount of PPP required to control pests
- 👍 Operator exposed only during mixing/loading
- 👎 Longer worker re-entry periods due to increased airborne concentration of spray mist

II. Outdoor mechanical applications



Enclosed cab tractor

Enclosed Cab Filtration Systems:

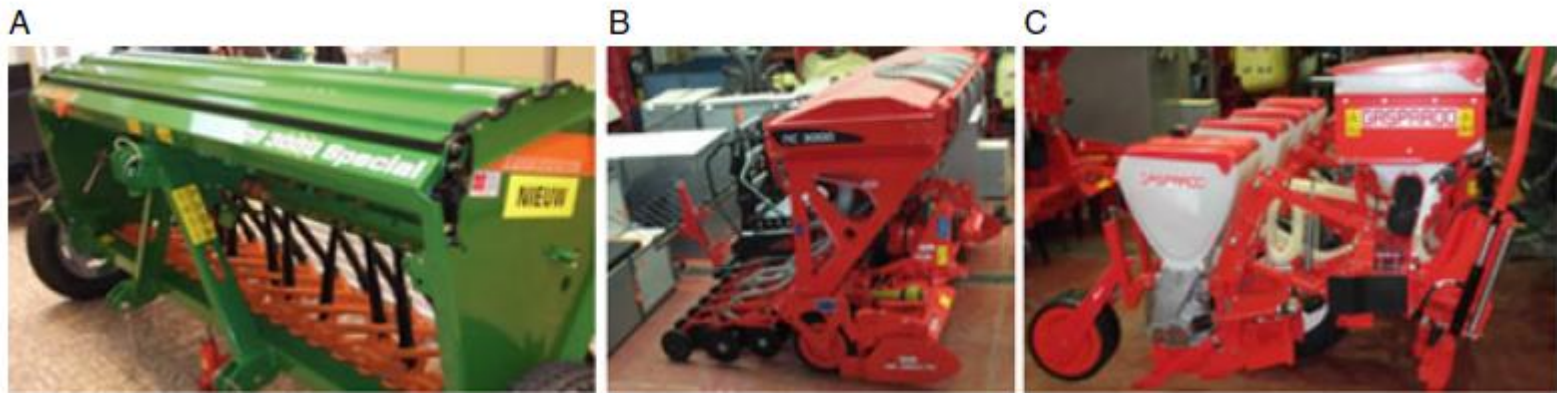
- 👍 Cab aerated / filtered during application

Proposed practices:

- keep clean gloves in the cab in case it is necessary to repair the application equipment (e.g. unblocking nozzles)
- close the sprayer nozzles when turning the tractor at the end of rows

III. Seed treatment

The process of applying fungicidal and/or insecticidal seed-dressing products onto various types of seed as a protective coating to create a 'protective zone' of active ingredient in the soil against soilborne pathogens and insects.



Advantages of seed treatment

- substance applied directly to the seed
- reduced soil surface exposure by 90%
- protection from seedling emergence time up to growing season
- application in a closed system - the preparation is pumped directly from the container into the closed machine
- closed transport to an automatic packing machine

Heubach dustmeter

Measures the amount of airborne dust that could be generated from a powder or granule under normal handling conditions in the factory environment



Other principles & strategies

- Prevent the spray reaching areas other than the crop being treated. Take special care with watercourses or springs and leave an untreated zone around them (buffer zone);
- Drift reduction strategy eg low drift nozzles
- Consider replacing more hazardous PPPs with ones more friendly to man, animals and the environment

B. Safe working practices for storing, transporting, handling and mixing of PPPs



I. Storage of PPPs

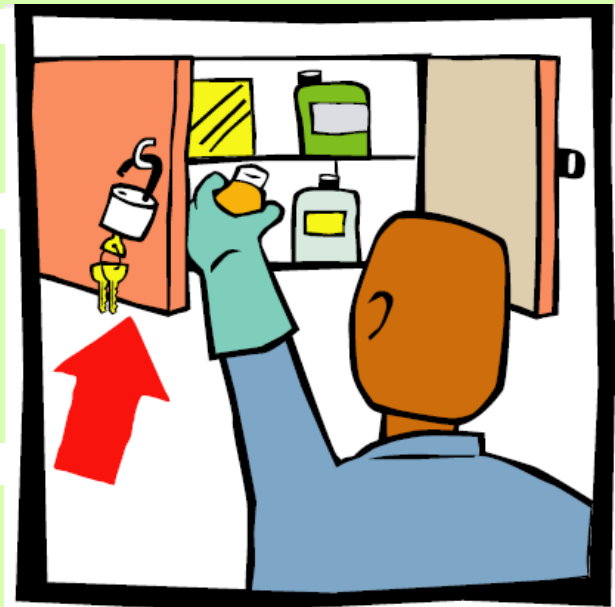
1. Read the product label for specific storage information

2. Store pesticides in locked cabinets with 'no access' sign

3. Always store pesticides in their original containers with their tops tightly closed

4. Never store pesticides in any food or drink containers

5. Never store pesticides in cabinets near food, potable water, animal feed, medical supplies, protective clothing, seed, fertilizers, or gasoline

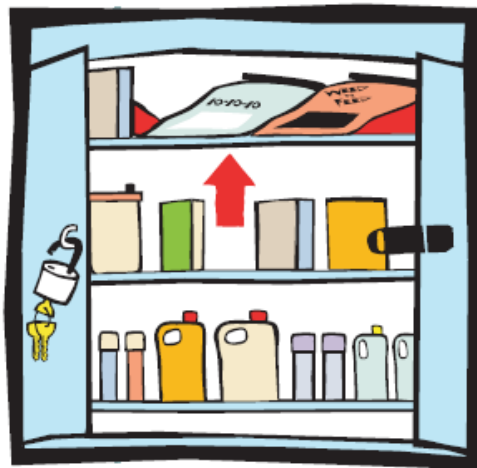


KEEP OUT OF REACH OF CHILDREN

Storage of PPPs

6. Keep pesticides stored in cool, dry, and well-lit areas

7. Store dry pesticides above liquid pesticides



8. Never store pesticides in application equipment

9. Keep emergency numbers handy

10. Use aerated cabins for large quantities

II. Safe transporting of PPPs

Governed by legislation and general rules on transport of hazardous goods by road

Consider instructions in PSDS



Safe transporting of PPPs

- Avoid transporting spray mix
- In case you cannot avoid travelling with a sprayer tank full of spray mixture check that:
 - sprayer cap is securely closed,
 - there are no leaking tubes, &
 - the level of the mixture will not cause it to slop over
- In the event of an accident:
 - take precautions to ensure that there is no spillage of PPPs, and if there is, control any effects
 - seek assistance from the fire service, informing them of the nature of the products

III. Minimise exposure during spray mixture preparation

- Follow label instructions for appropriate PPE
- Use water-soluble bags when possible
- Carefully select location for preparation of spray mixture:
 - Prepare spray mix directly in the sprayer tank ✓
 - Close to PPPs storage places



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C. Safe disposal of empty packaging and of surplus of PPPs



Wastes from the use of PPPs

Materials that come into contact with the product as commercially available or with the diluted formulation, e.g.

- washings of spraying equipment,
- PPE (eg plastic gloves, overalls, etc.)
- PPP containers

Wastes from the use of PPPs are considered toxic and dangerous and should be managed accordingly.

Cleaning and maintaining PPE

- Keep pesticide-contaminated PPE away from other clothing or laundry and wash it separately.
- If PPE will be reused, clean it before each day of reuse according to the instructions from the PPE manufacturer unless the pesticide labeling specifies other requirements. If there are no instructions or requirements, wash PPE thoroughly in detergent and hot water.
- Thoroughly dry the clean PPE before it is stored or put it in a well-ventilated place to dry.
- Store clean PPE separately from personal clothing and away from pesticide-contaminated areas.

Guidelines on Management Options for Empty Pesticide Containers

- **FAO / WHO Guidelines on Management Options for Empty Pesticide Containers (2008)**
 - a) Read the Label
 - b) Cleaning containers (3 standard rinsing options):
 - triple rinsing
 - pressure rinsing
 - integrated pressure rinsing
 - c) Disposal at the place of use

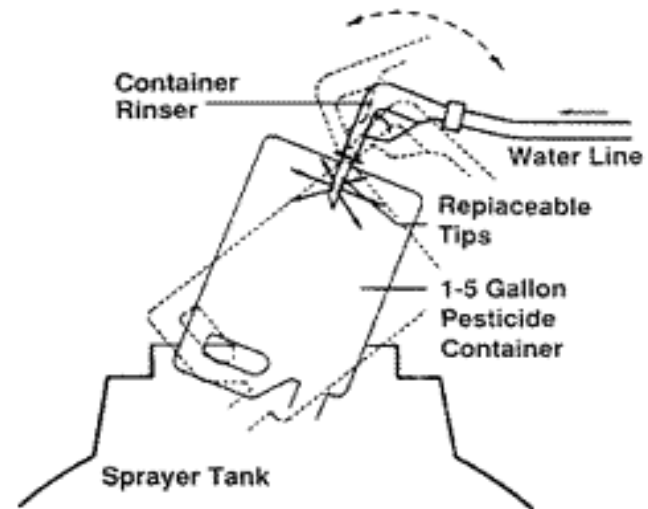
a) Triple rinsing



[Pictures copyrighted by Bayer CropSciences]

- a.** fill the container $\frac{1}{4}$ full with water;
- b.** securely re-close cap;
- c.** shake, rotate and invert the container or tip container on its side and roll it back and forth for 30 sec;
- d.** empty the rinsate into application equipment or a mix tank or store rinsate for later use or disposal

b) Pressure rinsing



[copyrighted by the North Dakota State University Agriculture and University Extension]

- uses water under pressure (typically 3 bar) in the form of a static or rotating spray jet and valve
- the jets of water hit the internal surfaces of the container removing and dissolving the pesticide residues.

c) Integrated rinsing



[copyrighted by Bayer CropSciences]

- incorporates the rinsing process directly into large scale tractor-mounted spraying equipment
- the most efficient & quicker method of rinsing containers and provides a high level of operator safety
- rinse by using water under pressure (of typically three to five bar)

Concentration limits for classification of empty packaging as 'non-hazardous'

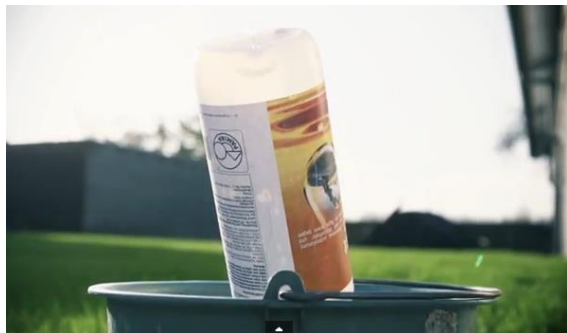
- < 0.1% for all pesticides [FAO/WHO, 2008]
- Concentration Limits (CL) depending on the type of hazard [Regulation (EC) 1272/2008]

Examples:

Category of danger	CL
Category 1A or 1B carcinogen/mutagen	< 0.1%
Category 1A or 1B reproductive toxicant	< 0.3%
Category 2 carcinogen/mutagen	< 1%
Category 2 reproductive toxicant	< 3%
Specific Target Organ Toxicant	< 10%

Disposal at the place of use

- FAO/WHO recommend that the practice of disposal of pesticide packaging at the place of use by burying or burning be prohibited.
- Recommended procedure:
 1. Let the empty container drain & dry
 2. Puncture or crush the container to prevent re-use
 3. Recycle empty container



What about liquid wastes following PPP use?

- Surplus of spray liquid: Not expected in the frame of IPM practices !!!
- Washings of spraying equipment??? = liquid waste

1. 

Spray the first set of tank washings onto the target crop ensuring the maximum dose is not exceeded.

2.

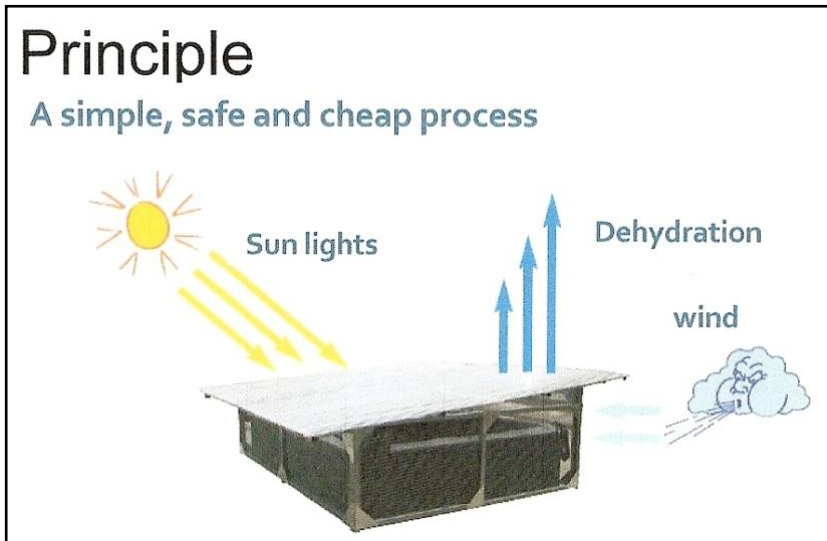
Treat liquid waste by:

- a. Concentration
- b. Degradation

Liquid waste treatment:

a) by concentration

Example: Concentration by natural evaporation



Heliosecc® system developed to manage liquid waste



Solid residue is treated as toxic material

Liquid waste treatment:

b) by degradation

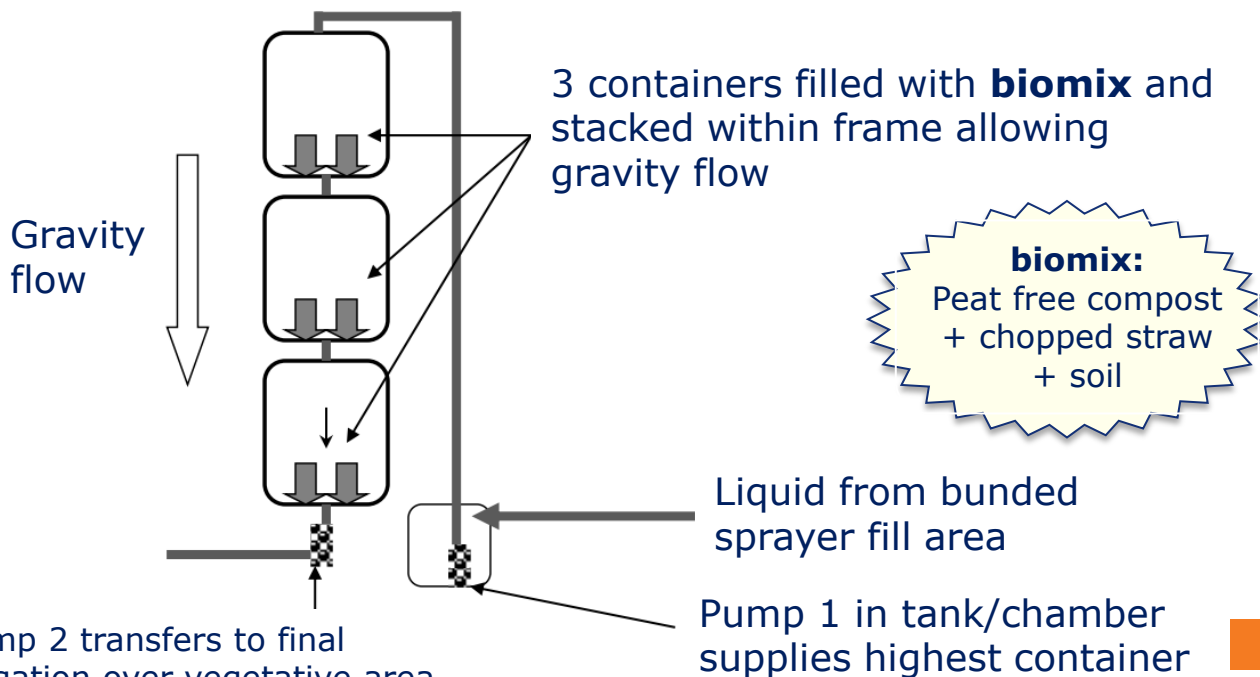
Example: Biological degradation & filtration



A BIOFILTER

Pump 2 transfers to final irrigation over vegetative area

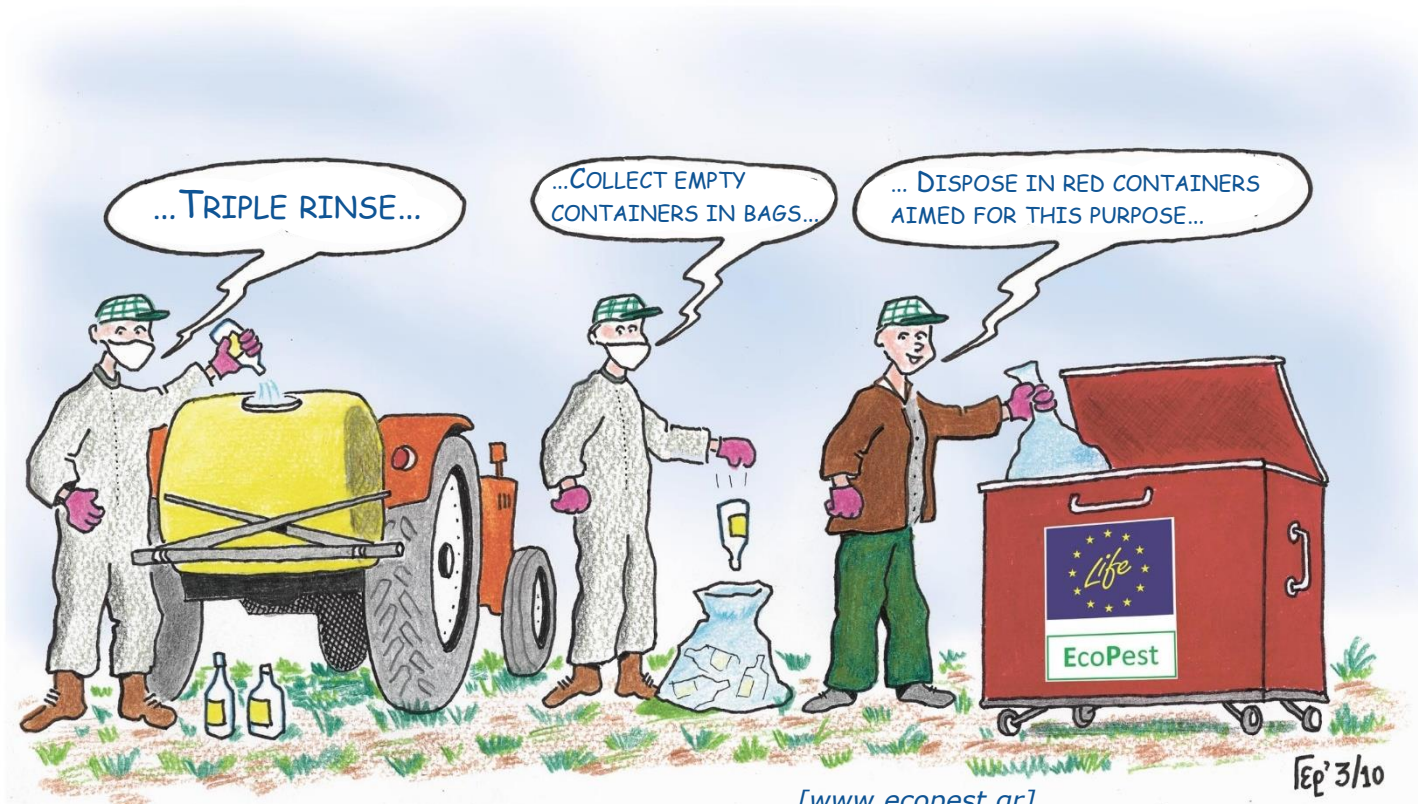
Biofilter



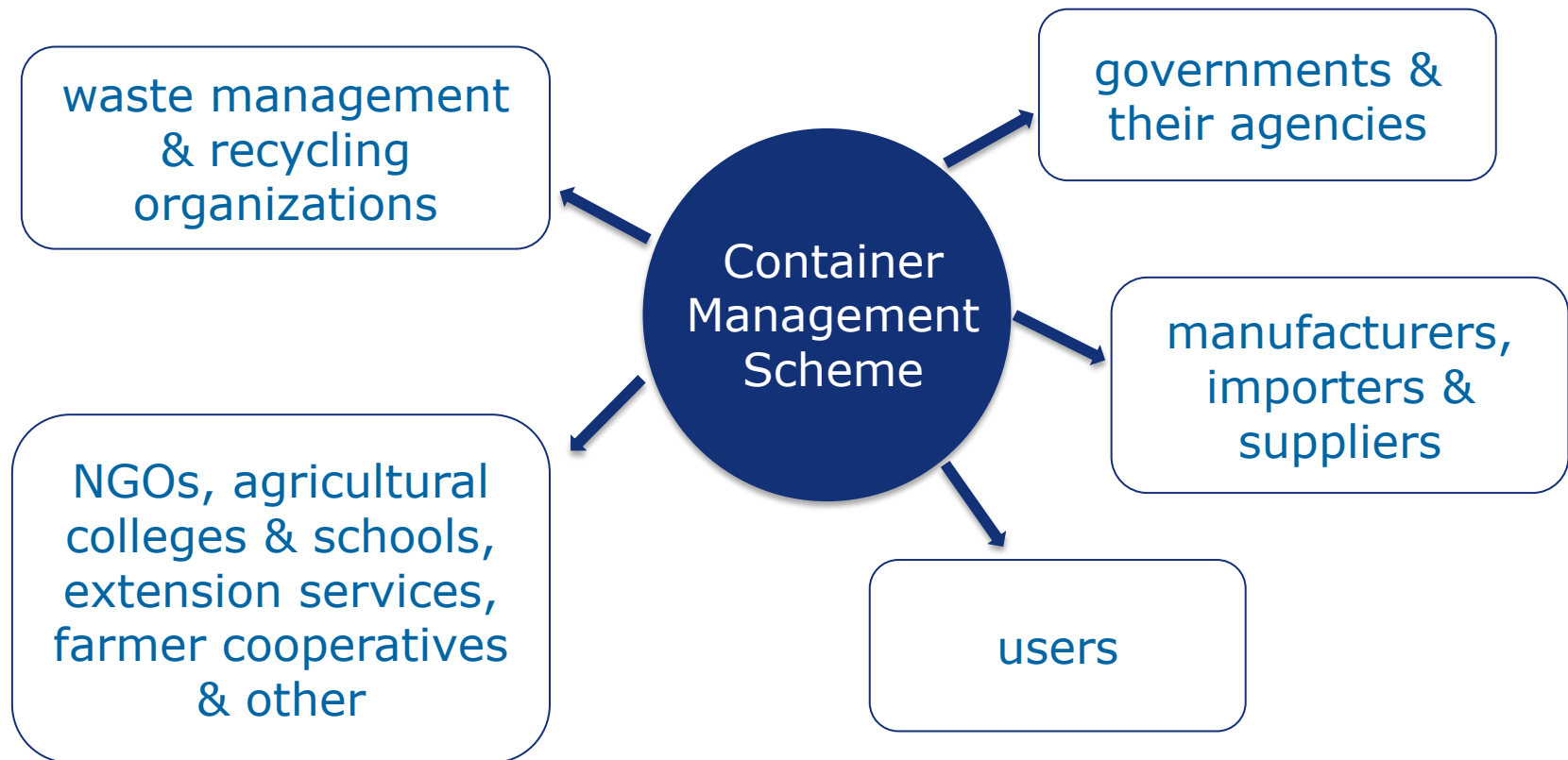


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Experience from EcoPest



Who is involved in a successful container management scheme?



Monitoring of Sustainability

We can help each other...



Consider ***Sustainable Development Indicators*** to:

- identify trends that are, or are not, sustainable, trends that pose severe or irreversible threats to our future quality of life
- develop a framework to bring the economic, social and environmental aspects of society together, emphasizing the links between them

The TOPPS Project

**Train Operators to prevent Pollution from Point Sources
[LIFE05 ENV/B/000510]**

- Objective:

Development of European Best Management Practices through training and **awareness raising** of PPP users (mainly farmers) directly.

- Results:

- brochures translated in 15 languages;
- publication of 400 articles, of which 300 disseminated in the farm press media reaching 10 million professional users;
- development of an extensive network of PPP experts;
- training to over 4 000 farmers and 1 500 advisors; and
- presentations at 65 fairs and field days (visited by an estimated 2.7 million visitors) and numerous conferences.

Useful background reading & related links

- Regulation 2009/1107/EC concerning the placing of PPPs on the market
- Directive 2009/127/EC dealing with machinery for pesticide application
- Directive 2009/128/EC establishing a framework for Community action to achieve the sustainable use of pesticides
- Directive 89/686/EEC on personal protective equipment
- OpenTEA (Open Training and Education Association) <http://www.opentea.eu/en/e-training/courses/>
- FAO/WHO (May 2008). International Code of Conduct on the Distribution and Use of Pesticides. Guidelines on Management Options for Empty Pesticide Containers
- *Pest Manag Sci 2013; 69: 564–575*
- https://www.youtube.com/watch?feature=player_detailpage&v=Xp3m15Rpwpc
- <http://www.epa.gov/oppfead1/safety/workers/protective-equipment.html>
- www.ecpa.eu
- www.Ecopest.gr
- <http://www.topps-life.org>



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