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# Training Manual: Occupational Pesticide Exposure & Health and Safe & Responsible Handling of Pesticides

With courtesy of veg IMPACT a program financed by The Netherlands' Government

Edwin van der Maden  
Irene Koomen



**WAGENINGEN UR**  
*For quality of life*

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# Training Manual

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### **Abstract**

Pesticides are commonly used in the horticulture sector. While emphasis is often on the correct and efficient application of pesticides, the risk associated with application of pesticides receives less attention. Those working with pesticides need to know about occupational pesticide exposure and health risks, both for themselves as well as people living in the vicinity of places where pesticides are used.

The Practical Training Centre Horticulture Kenya (PTC Horticulture) offers hands-on trainings to the horticultural sector. This manual is developed for PTC Horticulture and is about the safe and responsible use of pesticides – a guide for trainers who have to deliver trainings on 'Occupational Pesticide Exposure & Health' and 'Safe & Responsible Handling of Pesticides'. This manual guides the trainers through the material, provides background and tips to the content and gives suggestions for practical assignments.

Keywords: horticulture, Kenya, occupational health, pesticide exposure, training manual

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# Contents

<b>Background</b>	<b>5</b>
<b>1 Notes to the Trainer using this Manual</b>	<b>6</b>
<b>2 Module A: Occupational Pesticide Exposure &amp; Health</b>	<b>8</b>
2.1 Introduction	8
2.2 Basics of Pesticides	10
2.3 Pesticides & Exposure	13
2.4 Pesticides & Health	18
<b>3 Module B: Safe &amp; Responsible Handling of Pesticides</b>	<b>22</b>
3.1 Introduction	22
3.2 Pesticide Labels	23
3.3 Personal Protection	26
3.4 Personal Hygiene	30
3.5 Disposal of Pesticide Waste	31
3.6 Storage of Pesticides	33
<b>4 Poisoning Centres Kenya</b>	<b>34</b>
<b>5 Further Resources</b>	<b>35</b>

# Background

Pesticides are commonly used in the horticulture sector. While emphasis is often on the correct and efficient application of pesticides, the risk associated with application of pesticides receives less attention. Those working with pesticides need to know about occupational pesticide exposure and health risks, both for themselves as well as people living in the vicinity of places where pesticides are used.

The Practical Training Centre Horticulture Kenya (PTC Horticulture)<sup>1</sup> offers hands-on trainings to the horticultural sector. This PTC Horticulture manual is about the safe and responsible use of pesticides – a guide for trainers who have to deliver trainings on ‘Occupational Pesticide Exposure & Health’ and ‘Safe & Responsible Handling of Pesticides’. The intended trainees are all those who apply pesticides, advise on pesticides and those working in the health sector.

This manual guides the trainers through the material, provides background and tips to the content and gives suggestions for practical assignments.

The development of this manual and the accompanying modules is part of the NUFFIC-Niche project “Development and improvement of demand-driven horticulture training to contribute effectively to commercialization, including value addition, quality improvement and extension services”, funded by the Government of the Netherlands.

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<sup>1</sup> <http://www.hort-hub.info.ke>

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# 1 Notes to the Trainer using this Manual

## *Purpose*

This training manual is aimed at trainers of the Practical Training Centre Horticulture, Thika and is designed to guide the trainer in the facilitation process of providing the training to (a variety of) participants (e.g. famers, field labourers, health and agricultural extension officers).

This training manual is a supplement to the modules 'Occupational Pesticide Exposure & Health' and 'Safe & Responsible Handling of Pesticides' PowerPoint presentations, of which the PowerPoint slides are shown in this manual.

## *Design*

This manual consists of two modules divided into several sections:

Module A: 'Occupational Pesticide Exposure & Health' Heading 3

1. Introduction
2. Basics of Pesticides
3. Pesticides & Exposure
4. Pesticides & Health

Module B: 'Safe & Responsible Handling of Pesticides'

1. Pesticide Labels
2. Personal Protection
3. Personal Hygiene
4. Disposal of Pesticide Waste
5. Storage of Pesticides

In this manual the training modules are explained with reference to the accompanying PowerPoint slides. The information presented in the PowerPoint slides is explained, additional information is provided for clarification, and illustrations and techniques are given to help you to inform the participants on the risk of occupational pesticide exposure and to train them on how to responsibly handle pesticides and to protect themselves, their family and the environment from the risks of being exposed to pesticides.

At the beginning of each section the specific learning objectives are given.

## *Suggestions for using the training manual*

- The PowerPoint presentation 'Occupational Pesticide Exposure & Health' and 'Safe & Responsible Handling of Pesticides', accompanying this training manual, serves as a (general) basis for the training and can be adapted to the needs of the participants and the experience of the trainer;
- The modules and the training in general can be lengthened or shortened depending on the level of knowledge and expertise of the participants;
- Several of the questions in the PowerPoint could also be replaced by short buzz exercises (short discussion with a neighbour about the question) or, if time permits, be replaced by interactive assignments. Some suggestions for interactive assignments are provided in grey suggestion boxes;
- Whichever changes or adaptations the trainer decides to make to the training modules and materials, please keep the focus on the mission: to train participants on why and how to protect themselves, their family and the environment from risks of being exposed to pesticides.

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### *How to start?*

You can start the training by welcoming everyone, thanking them that they found the time to attend this training, conduct a short 'getting-to-know-each-other' exercise, and ask a few simple questions to break the ice and get acquainted with the group, e.g.:

- Has anyone attended a training or workshop on pesticides before?
- What kind of topics (related to pesticides) do you expect to be discussed today?
- What kind of topics (related to pesticides) would you like to talk about today? What are the questions or issues you struggle with?
- Is there anything else you feel is relevant to share / say before we start the training?

Explain to the participants that this training has an interactive and participatory character and that they are invited to actively participate. During the training they will be asked questions and will be asked to do short assignments or exercises.

### *Building trust and commitment*

Building trust is very important to successfully deliver the message. Participants should have trust in the trainer in order to believe the information provided and take to heart the advice the trainer is giving them. Some tips to help you build trust are:

- Be on time and prepare the room, creating an inviting atmosphere when participants arrive;
- Dress appropriately;
- Introduce yourself as a person who wants to share and learn, not as a person who knows everything and has only come to teach or inform others;
- Listen carefully to the participants and give them the opportunity to talk. Do not judge;
- Be open and honest about the reason for your visit and how the participants and the entire community will benefit from the training. Share with them why this topic is important to you and any (personal) stories you have about being affected by pesticide poisoning;
- Keep your promises (e.g. stop on time, give people the break you promised them, etc.). If you cannot, explain to the group the reasons;
- Act on facts, not on assumptions (e.g. check their level of knowledge on pesticides, do not assume they do not know);
- Seek positive solutions for adverse circumstances;
- Be self-reflective, learn from experiences. Critically evaluate your own performance as a trainer, or ask for feedback from colleagues and participants;
- Acknowledge when you are wrong, we all make mistakes;
- Use a sense of humour. Humour can make your training more effective as people will enjoy the learning process;
- Be flexible, but keep your focus on the task: to train participants on why and how to protect themselves, their family and the environment from risks of being exposed to pesticides.



# 2 Module A: Occupational Pesticide Exposure & Health

## 2.1 Introduction

### Learning Objectives

After this section participants:

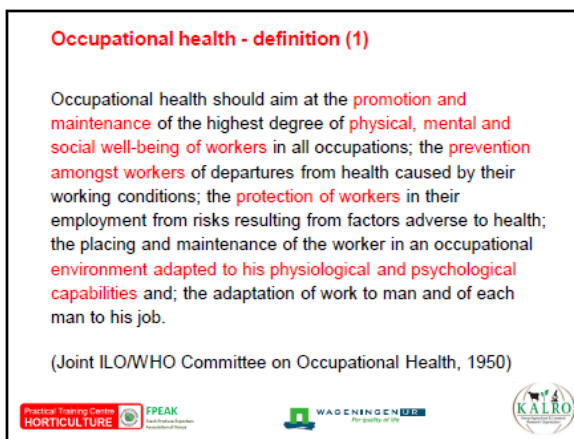
- Understand what is occupation health;
- Know what topics are covered within occupational health;
- Understand the importance of occupational health in relation to pesticides.

Start the training with asking the participants if they know what occupational health is (**Slide 1**). Give the participants the opportunity to reply to this question or ask some of the participants to answer the question. Continue with **Slide 2** and **Slide 3** providing them with two definitions of occupational health, thereby emphasizing the highlighted words in the definitions.



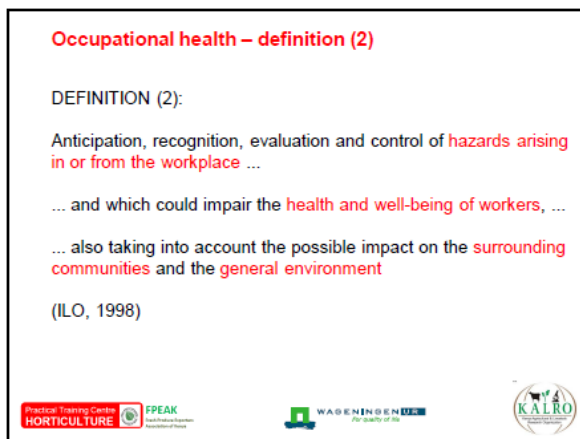
Slide 1 features a large red question mark icon on the left. To its right, the text "What is occupational health?" is written in red. At the bottom of the slide, there are four logos: "Practical Training Centre HORTICULTURE", "EPEAK", "WAGENINGEN", and "KALRO".

Slide 1



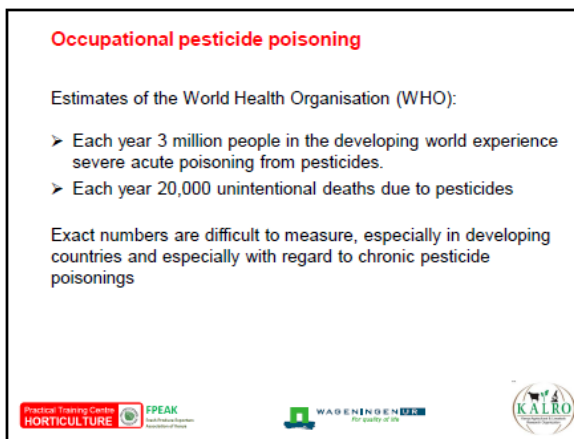
Slide 2 is titled "Occupational health - definition (1)" in red. The main text is in black, with several words highlighted in red: "promotion and maintenance", "physical, mental and social well-being of workers", "prevention amongst workers", "protection of workers", "environment adapted to his physiological and psychological capabilities", and "adaptation of work to man". At the bottom, it cites "(Joint ILO/WHO Committee on Occupational Health, 1950)". The same four logos as Slide 1 are at the bottom.

Slide 2



Slide 3 is titled "Occupational health - definition (2)" in red. It starts with "DEFINITION (2):" followed by "Anticipation, recognition, evaluation and control of hazards arising in or from the workplace ...". The words "in or from the workplace" are highlighted in red. Below this, it says "... and which could impair the health and well-being of workers, ..." and "... also taking into account the possible impact on the surrounding communities and the general environment". The words "surrounding communities" and "general environment" are highlighted in red. It ends with "(ILO, 1998)". The same four logos as Slide 1 are at the bottom.

Slide 3



Slide 4 is titled "Occupational pesticide poisoning" in red. It starts with "Estimates of the World Health Organisation (WHO):" followed by two bullet points: "➤ Each year 3 million people in the developing world experience severe acute poisoning from pesticides." and "➤ Each year 20,000 unintentional deaths due to pesticides". Below this, it says "Exact numbers are difficult to measure, especially in developing countries and especially with regard to chronic pesticide poisonings". The same four logos as Slide 1 are at the bottom.

Slide 4

Next, give the participants some background figures on occupational pesticide poisoning to demonstrate the importance of the topic (**Slide 4**).


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With the next slide (**Slide 5**) ask the participants why they think the occupational pesticide exposure & health topic is important. Give the participants the opportunity to come up with some reasons or ask some of the participants to give some reasons. After that, some of the reasons you can add are, e.g.:

- Prevention is better than cure;
- Pesticides are dangerous poisons / chemicals; which ask for proper knowledge on using and applying them;
- With incorrect knowledge about pesticides you are not only putting yourself at risk, but also people and the environment around you;
- Good knowledge on safe use practices can greatly reduce the risks associated with the use of pesticides;
- Good pesticide practices will reduce production costs and improve product quality!

**Importance of occupational health & pesticides**

- Prevention is better than cure!
- Pesticides are dangerous poisons / chemicals, which ask for proper knowledge on using and applying them
- With incorrect knowledge about pesticides you are not only putting yourself at risk, but also the people and environment around you
- Good knowledge on safe use practices can greatly reduce the risks associated with pesticides
- Good pesticide practices will reduce production costs and improve product quality!



**Slide 5**

## 2.2 Basics of Pesticides

### Learning Objectives

After this section participants:

- Understand what are pesticides and what they are used for;
- Realize that pesticides are poison and can be harmful to humans;
- Realize that pesticides are also used at home;
- Can name the different types of pesticides and know which ones are most toxic to humans;
- Know pesticides come in different forms.

Start this section by asking the participants what are pesticides and why pesticides affect human health (**Slide 6**) Give the participants the opportunity to reply to this question or ask some of the participants to answer the question. Continue with giving the answer to the question by explaining (**Slide 7**):

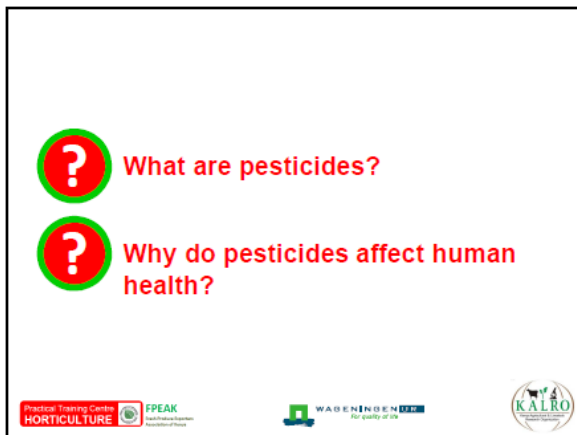
Pesticides are chemicals used to: 1) Kill, repel or control pests to protect crops before and after harvest; 2) Destroy weeds or prevent their growth; 3) Preserve plant products. While pesticides may help control unwanted pests, they can also be harmful to people, animals and the environment. Sometimes it is very hard to see or smell the pesticides. However, just because you cannot see or smell them, it does not mean the chemicals are not still there.

Pesticides are not medicines, but are dangerous chemicals: Pesticides are poison!

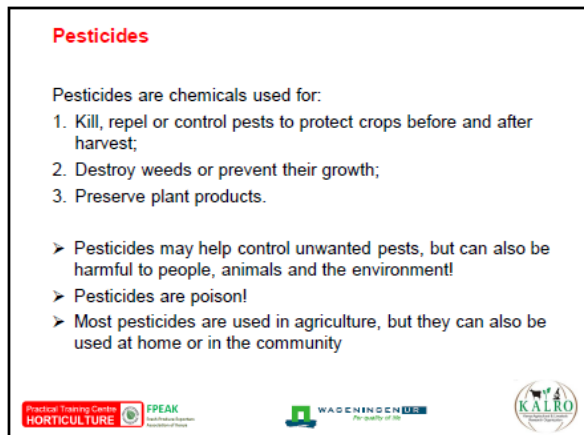
Most pesticides are used in agriculture, but they can also be used at home or in the community.

Examples are:

- Cockroach sprays
- Mosquito sprays and coils
- Rat poison
- Flea and tick sprays & powders



Slide 6



Slide 7

To illustrate that pesticides can also be harmful to humans explain with (**Slide 8**) that pesticides work by interfering with essential biological mechanisms in the pest, that pests are living organisms, just like humans and thus pesticides can also affect biological processes in the human body. Use the pictures in (**Slide 8**) to emphasize this. These pictures illustrate and show that the digestive system (left) and the nerve system (right) are similar both for insects and humans.

**Pesticides affecting human health**

- Pesticides work by disturbing and interfering with essential biological mechanism
- Pesticides affect or interfere with similar biological mechanisms in the human body (especially insecticides)

Logos: Practical Training Centre HORTICULTURE, FPEAK, WAGENINGUR, KALRO

**Slide 8**

In the next slides explain the main three types of pesticides: 1) Insecticides (**Slide 9**), 2) Herbicides (**Slide 10**), and 3) Fungicides (**Slide 11**). For each pesticide type some examples of (categories of) pesticides are given.

Emphasize with insecticides that these are the most harmful to humans, because they can directly affect biological processes in the human body. Most insecticides are cholinesterase inhibitors, working against undesirable insects by interfering with, or 'inhibiting' cholinesterase. Cholinesterase is one of many important enzymes needed for the proper functioning of the nervous systems of insects, but also of humans, and can thus also be poisonous, or toxic, to humans. Overexposure can result in cholinesterase inhibition (i.e. pesticides combine with acetylcholinesterase at nerve endings in the brain and nervous system, allowing for acetylcholine to build up, while protective levels of the cholinesterase enzyme decrease), which can lead to pesticide poisoning.

**Type of pesticides - insecticides**

- To kill or control insects
- Organochlorines, Organophosphates, Carbamates & Pyrethroids
- Have high toxicity to humans and are the most harmful types, because they affect similar biological systems
- Cholinesterase inhibitors affect both insect and the human nervous system
- Short & long term effects!

Logos: Practical Training Centre HORTICULTURE, FPEAK, WAGENINGUR, KALRO

**Slide 9**

**Type of pesticides - herbicides**

- To kill or control weeds
- Paraquat, Atrazine, Glyphosate ("Round-Up")
- Have lower toxicity to humans and are less harmful types, because they interfere with biological systems in plants
- However they can still cause serious damage to humans.

Logos: Practical Training Centre HORTICULTURE, FPEAK, WAGENINGUR, KALRO

**Slide 10**

Some signs and symptoms of pesticide poisoning from cholinesterase inhibition, depending of the severity of poisoning, are:

- *Mild poisoning*: tiredness, weakness, dizziness, nausea and blurred vision;
- *Moderate poisoning*: headache, sweating, tearing, drooling, vomiting, tunnel vision, and twitching;
- *Severe poisoning*: abdominal cramps, urinating, diarrhoea, muscular tremors, staggering gait, pinpoint pupils, hypotension (abnormally low blood pressure), slow heartbeat, breathing difficulty.


However, keep in mind that certain signs or symptoms can also be caused by other factors. Section 4. 'Pesticides & Health' elaborates in more detail on signs and symptoms of pesticide poisoning.

Although insecticides are the most harmful to human, also herbicides and fungicides can be highly harmful to humans, as they indirectly affect human health and are still poisons.

With the next slide, explain that pesticides come in different forms (powders, granules and liquids) and that there are different ways of preparing them before you can apply them to the crop (dissolve in water, dilute with water, or use them directly) (**Slide 12**). The abbreviations in the right column give the pesticide formulation codes used, by which you can identify the pesticide's form. Note here that powders are dangerous during preparing pesticide mixtures, because they can be easily inhaled. With liquids there is the higher danger of spilling and absorption through the skin.

**Type of pesticides - fungicides**


- To control plant diseases, fungi and moulds
- Sulphur, Thiocarbamate
- Have lower toxicity to humans and are less harmful types
- However they can still cause serious damage to humans.



**Slide 11**

**Type of pesticides – powder vs. liquid**

		<u>Pesticide Formulation Code</u>
➤ Dry – Sprayable	<ul style="list-style-type: none"> <li>▪ WP – Wettable powders</li> <li>▪ WG / WDG – Water dispersible granule</li> </ul>	
➤ Liquid – Sprayable	<ul style="list-style-type: none"> <li>▪ SL – Soluble Concentrate</li> <li>▪ SC – Suspension Concentrate</li> <li>▪ EC – Emulsifiable Concentrate</li> <li>▪ ME – Microemulsion</li> <li>▪ OD – Oil Dispersion</li> <li>▪ CS – Microencapsulated Particles</li> </ul>	
➤ Dry – Spreadable Granule	<ul style="list-style-type: none"> <li>▪ GR – Soil applied Granule</li> </ul>	



**Slide 12**

### Suggestion for interactive assignment (slide 9-11): Pesticide Types

Requisites:

- Coloured paper cards
- Masking tape
- Pictures of pests and diseases
- Flipchart & markers

1. Put three paper cards on the wall with the words: Insecticide, Herbicide, Fungicide.
2. Prepare some pictures of (results of) pest and diseases of vegetables.
3. Each participant is asked to pick one of the pictures, and is asked to stick it under the right category.
4. The facilitator evaluates or summarizes the results of participants. If there are any mismatches mismatch results, ask other participants to review.

Explain to the participants that it is important to be able to recognize which pest or disease is present in your crop, so you can choose the right pesticide type for control.

## 2.3 Pesticides & Exposure

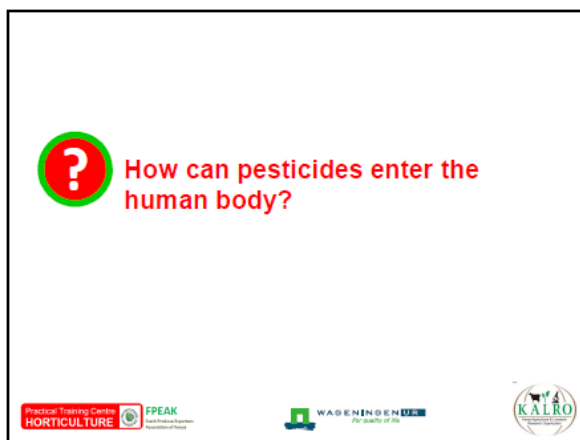
### Learning Objectives

After this section participants:

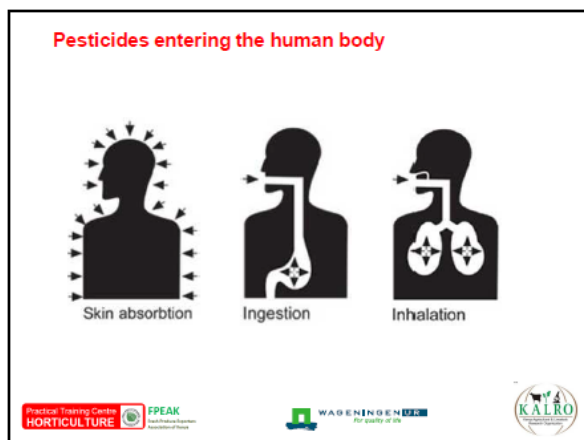
- Can name the three ways pesticides can enter the human body;
- Understand that skin absorption is the most common exposure route for pesticides;
- Can explain the difference between direct and indirect exposure to pesticides;
- Can name what persons can be exposed to pesticides and can explain how they can be exposed;
- Know that you do not always realize that you are being exposed to pesticides;
- Can explain what determines the extent of pesticide health risk;
- Understand the concepts of exposure, dose, time and toxicity.

Start this section with asking the participants how they think pesticides can enter the human body (**Slide 13**). Give the participants the opportunity to reply to this question or ask some of the participants to answer the question. Continue with giving the answer to the question by using **Slide 14**. Pesticides can enter the body in three ways:

- *Skin absorption*: when the skin gets in contact with a pesticide, it will be absorbed through the pores of the skin and in that way can pass into the bloodstream;
- *Ingestion*: pesticides swallowed accidentally (e.g. if food, cigarettes or hands contaminated with pesticides) enter the stomach, can do damage to the digestive system and can also pass into the blood stream this way;
- *Inhalation*: through breathing of air contaminated (e.g. dust, from powder pesticides when preparing mixtures; or mist, from spraying pesticides) pesticides enter the lungs, can do damage to the respiratory system and can also pass into the blood stream this way.



Slide 13



Slide 14

Explain that skin absorption is the most common exposure route of pesticides entering the human body (**Slide 15**). Especially pesticides can easily enter the body through body parts that have thinner skin. These parts are indicated in the body map picture in Slide 12 with red circles. The other picture in Slide 12 shows the three ways how a pesticide can enter the body through the skin:

- Through the sweat gland;
- Through the skin cells;
- Through the hair follicle.

**Skin absorption**

➤ Skin absorption is the most common type of exposure!

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**Slide 15**

Then ask the participants what persons can be exposed to pesticides and how they can be exposed, and what could be the difference between direct and indirect exposure to pesticides (**Slide 16**). Give the participants the opportunity to reply to the questions or ask some of the participants to answer the question. Alternatively let the participants first buzz in pairs for a few minutes

**What people are being exposed to pesticides and how?**

**What is the difference between direct and indirect exposure?**

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**Slide 16**

Suggestion for interactive assignment (Slide 15): Skin Absorption

Requisites:

- Spray bottle with menthol solution (A);
- Spray bottle with water (B).

1. Invite three volunteers.
2. Ask them to put their hands out.
3. Spray the right hand with bottle A and left hand with bottle B.
4. Ask them if they share what they feel different between the left hand and the right hand.

Explain to the participants that different liquids and solutions also have different absorption rates, e.g. menthol or alcohol is easier to be absorbed by the skin than water. The same counts for pesticides.

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## Suggestion for interactive assignment (Slide 15): Pesticide Exposure

Requisites:

- Coloured paper cards;
- Masking tape;
- Flipchart & markers.

1. Divide the participants in small groups.
2. Ask the participants to draw situations / examples of where and how people can be exposed to pesticides. Additionally you can ask the participants to indicate if the situation / example is direct or indirect exposure.
3. Each group share their findings plenary.
4. Continue with Slides 17 and 18.

Continue with giving the answer to the question by using **Slides 17** and **Slide 18**. There are different groups of people who can be exposed to pesticides. Make a clear difference between direct exposure (persons who are aware of the fact that they are being exposed to pesticides) and indirect exposure (persons who might not be aware of the fact that they are being exposed to pesticides):

- *Occupational pesticide users (direct exposure)*: These are persons who directly handle pesticides, e.g. perform tasks in preparation for an application (mix a pesticide with water and load it into the knapsack) and application of the pesticide (operating a knapsack and spraying the pesticide onto the crop), through which they are directly exposed to pesticides. This also includes persons who work in the field during or shortly after spraying (e.g. female labourers weeding during or after spraying);
- *Families of occupational pesticide users (indirect exposure)*: First of all, family members can be exposed to pesticides, which are improperly stored at home (e.g. in the kitchen), and through which other things (food, kitchenware, floor, walls) can get contaminated. Besides that, family members can get indirectly exposed to pesticide when an occupational pesticide user goes home after work and brings home residues of pesticides on his body, clothing and equipment (when this person does not bath himself after work, does not remove his work clothing and brings his equipment home). Family members who will have personal contact with exposed individuals, or his contaminated clothing or equipment, are indirectly exposed to pesticides. Pesticide residues can also be transferred from persons to the house (furniture, floor, walls, doorknobs);
- *Bystanders (indirect exposure)*: These are persons who are near the field when pesticides are being applied to the crop and are exposed to the spray drift. Bystanders can also be family members or neighbours / residents;
- *Residents (indirect exposure)*: These are persons who live close to fields or in areas where pesticides are being used and applied. They can indirectly be exposed to the spray drift (even around their house) and besides that to residues that get into the environment (water, soil) and into the food they consume. Children playing around the house and maybe in or near the fields can also be exposed to pesticides (e.g. playing with empty containers laying around, or playing in a field that has just been sprayed).

Make clear that you do not always realize that you are being exposed to pesticides!

To clarify the difference between direct and indirect exposure, you can use a the practical example of cigarette smoke:


You can be exposed to cigarette smoke in two ways:

- *Directly*: you are smoking a cigarette yourself and you are well aware that you are being exposed to cigarette smoke, inhaling the cigarette smoke into your lungs, which might cause lung cancer.
- *Indirectly*: although you are not a smoker, you can still be exposed to cigarette smoke when somebody else is smoking a cigarette and you are standing close. In that case you might not always be aware that your inhaling smoke of a cigarette into your lungs when somebody else is smoking. However, breathing in other people's smoke might also cause lung cancer.



**People being exposed to pesticides (1)**

- Occupational pesticide users (direct)
  - Handling and applying pesticides
  - Working in field during or shortly after spraying
- Families of occupational pesticide users (indirect)
  - Pesticides stored at home
  - Residues brought home
  - Handling clothes with pesticide residues
- Bystanders (indirect)
  - Spray drift




**Slide 17**

**People being exposed to pesticides (2)**

- Residents (indirect)
  - Spray drift
  - Residues in environment
  - Contaminated food or drinking water

People do not always realize that they are being exposed to pesticides!



**Slide 18**

Continue with **Slide 19** explaining what determines the extent of pesticide health risk by using the following formula:

$$\text{PESTICIDE HEALTH RISK} = \text{EXPOSURE} \times \text{TOXICITY}$$

Then explain what determines the extent of exposure to pesticides. The exposure impact on the human body is related to three factors:

- *Dose*: the amount of the pesticide;
- *Time*: the length of time exposed to the pesticide;
- *Type*: the type of exposure.

The relation between dose and time is called the Dose-Time Relationship, i.e. the damage pesticides can do to humans depends on the dose or the amount of pesticide a person has been exposed to and the time or duration of this exposure.

Besides the dose and time, also the type of exposure is important, i.e. through skin, ingestion or inhalation.

Continue with explaining the concept of toxicity (**Slide 20**):

- Toxicity is a measure of how poisonous a pesticide is to people or the environment;
- Not all pesticides are the same and some are more toxic than others. The toxicity differs per type of pesticide (mostly determined by the active ingredient of the pesticide);
- If you want to know how toxic a pesticide is, you can read that on the label. Mostly the classification of the World Health Organisation (WHO) is used, categorizing a pesticide in one of the hazard categories (this will be explained in more detail in 'Module B, Section 2 'Pesticide Labels').


**Extent of exposure to pesticides (1)**

**PESTICIDE HEALTH RISK = EXPOSURE x TOXICITY**

**Exposure**

Exposure impact on the human body is related to:

- Amount of pesticide exposure (dose)
- Length of pesticide exposure (time)
- Type of exposure (skin, ingestion, inhalation)





**Slide 19**

**Extent of exposure to pesticides (2)**

**Toxicity**

- Toxicity is a measure of how poisonous a pesticide is to people or the environment
- Not all pesticides are the same and some are more toxic than others
- WHO toxicity classification:
  - Class Ia : extremely hazardous
  - Class Ib : highly hazardous
  - Class II : moderate hazardous
  - Class III : slightly hazardous
  - Class U : unlikely to be hazardous

**Slide 20**

---

To clarify the interrelated factors of dose, time and type, you can use practical example(s), depending on what your participants might find appropriate. Ask the participants to reflect on the example given before answering with the underlying explanation.

- *Alcohol:*
  - Consider how a person would feel drinking three beers in an hour. Now, consider how a person would feel drinking three beers in the course of a day;
    - Drinking three beers in an hour will likely make a person feel dizzy and less coordinated. Drinking three beers over the course of a day would not have the same effect as drinking three beers in an hour. In this case, the dosage (three beers) is the same, but the course of time (one hour vs. one day) is different.
  - Consider how person would feel drinking one litre of beer in an hour. Now consider how a person would feel drinking one litre of whiskey in an hour;
    - Drinking one litre of whiskey in an hour will likely make a person feel more dizzy and less coordinated than drinking one litre of beer. Drinking one litre of beer in an hour would not have the same effect as drinking one litre of whiskey in an hour. In this case the course of time (one hour) is the same, but the type of alcohol (beer vs. whiskey) is different.
- *Smoking:*
  - Consider how a person would feel smoking three cigarettes in an hour. Now, consider how a person would feel smoking three cigarettes in the course of a day;
    - Smoking three cigarettes over the course of a day would not have the same effect as smoking three cigarettes in an hour. In this case, the dosage (three cigarettes) is the same, but the course of time (one hour vs. one day) is different.
  - Consider how person would feel smoking three cigarettes an hour. Now consider how a person would feel smoking three cigars in an hour;
    - Smoking three cigarettes in an hour would not have the same effect as smoking three cigars in an hour. In this case the course of time (one hour) is the same, but the type of smoke (cigarette vs. cigar) is different.

## 2.4 Pesticides & Health

### Learning Objectives

After this section participants:

- Understand that certain signs or symptoms can indicate that a person has been exposed to pesticides;
- Understand and can explain the difference between acute and chronic health effects;
- Realize that you can also be exposed to pesticides without even knowing or noticing it;
- Are able to name and recognize several signs and symptoms of acute pesticide poisoning;
- Realize that signs and symptoms of acute pesticide poisoning can also be caused by other factors;
- Are able to name and recognize several signs and symptoms of severe acute pesticide poisoning;
- Can name several chronic health effects;
- Realize and can explain that a pesticide can have different effects on people based on age, sex and other characteristics;
- Know that children, elderly people and (pregnant) women are most vulnerable to pesticides;
- Can come up with ways to reduce pesticide health risks.

Start this section with asking the participants how you can tell that someone has been exposed to pesticides (**Slide 21**). Give the participants the opportunity to reply to this question or ask some of the participants to answer the question. Alternatively let the participants first buzz in pairs for a few minutes. In the following slide (**Slide 22**) explain that certain signs or symptoms can indicate that a person has been exposed to pesticides. However, these signs and symptoms do not always have to occur: persons can also be exposed to pesticides without they even know or notice it.

Explain that there is a difference between:

- *Acute health effects (acute toxicity)*: implies the occurring of adverse health effects immediately or within 24 hours after exposure to a pesticide. Mostly occurs when a large dose of pesticide has entered the body at once;
- *Chronic health effects (long term / chronic toxicity)*: implies health problems over time that may arise from repeated or prolonged exposure to smaller doses of pesticide.

**?** How can you tell if someone has been exposed to pesticides?

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**Slide 21**

**Signs & symptoms**

- When a person has been exposed to pesticides, he/she can have one or more signs or symptoms
- These signs and symptoms do not always have to occur: a persons can be exposed to pesticides without they even know or notice
- Sign and symptoms are especially immediate observable in case of acute poisoning; chronic poisoning is no immediate visible
  - Acute: adverse health effects immediate or within 24 hours after exposure to a (large dose of) pesticide
  - Chronic: health effects that may arise over time from repeated or prolonged exposure to smaller doses of pesticide

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**Slide 22**

Continue with asking the participants if they could name signs and symptoms that may be caused by acute pesticide poisoning (**Slide 23**). Give the participants the opportunity to reply to this question or ask some of the participants to answer the question. Alternatively let the participants first buzz in pairs for a few minutes. You can also use a flipchart to draw or write down the answers of the participants. You can use the next slide (**Slide 24**) to verify their answers and provide the answer to the question. Also ask the participants to share any own experiences with acute pesticide poisoning

(Have they experienced themselves? Or from somebody close to them? Or maybe they have heard stories about it within the community?). Let the participants share their experiences and stories plenary with the group.

**Can you name signs and symptoms that may be caused by acute pesticide poisoning?**

**Any own experiences?**

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Slide 23

**Signs & symptoms of potential acute poisoning**

**Pin-point pupils:** (Diagram of eyes)

**Nose and mouth:** runny nose, drooling

**Chest and lungs:** pain, breathing problems, coughing

**Stomach:** pain, diarrhea, nausea, and vomiting

**Head and eyes:** headaches, vision problems, small pupils in the eyes, tears

**Legs and arms:** muscle cramps or pains, twitching

**Hands:** damage to fingernails, numbness and tingling in fingers

**Other general signs of pesticide poisoning are:** Confusion, weakness, trouble walking, trouble concentrating, muscle twitching, restlessness and anxiety, bad dreams and trouble sleeping

**Skin:** itching, rashes, bumps, redness, blisters, burning, sweating too much

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Slide 24

Also tell the participants that it is important to realize that many of the signs and symptoms may also be caused by diseases, working conditions (i.e. headache can also come from working in the field when it is hot and the worker is exposed to sun with insufficient intake of water), other chemicals, or environmental conditions. So when a sign or system is observed this does not directly imply that a person has been exposed to a pesticide. However, when a person has been working with pesticides and one of the signs or symptoms occurs, keep in mind that this may be a case of pesticide poisoning!

With **Slide 25** explain that there are also signs and symptoms that indicate severe acute poisoning, for which direct action needs to be undertaken. Name and discuss these symptoms with the group. When a person has been working with pesticides and he inhaled or swallowed a pesticide or has spilled pesticide on his body, and any of these signs and symptoms are observed or occur, take action immediately!

**Signs & symptoms of severe acute poisoning**

- > Inability to breathe
- > Chemical burns on skin
- > Vomiting
- > Unconsciousness
- > Loss of control over bladder and bowels
- > Loss of reflexes
- > Uncontrollable muscle twitching
- > Blue lips and fingernails
- > Shaking

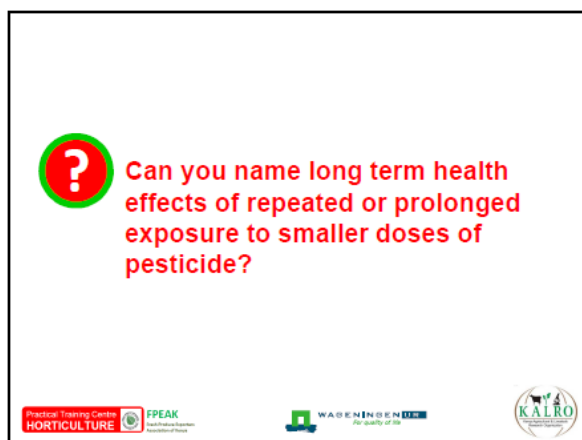
Severe poisoning can seriously injure or even cause death!  
Take action immediately! Seek medical attention!

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Slide 25

Continue with asking the participants if they could name long term health effects of repeated or prolonged exposure to smaller doses of pesticides (**Slide 26**). Give the participants the opportunity to reply to this question or ask some of the participants to answer the question. You can also use a flipchart to draw or write down the answers of the participants. In next slide (**Slide 27**) explain in more detail about the occurrence of chronic health effects of pesticide exposure and verify the answers of the participants with the examples given in the slide. Chronic health effects usually reveal themselves only after a longer period of repeated or prolonged exposure to smaller doses of pesticide. Initially you notice nothing, but then suddenly you get certain symptoms and become sick. However, at that point it is mostly too late, as the damage is already done. And even then these symptoms can

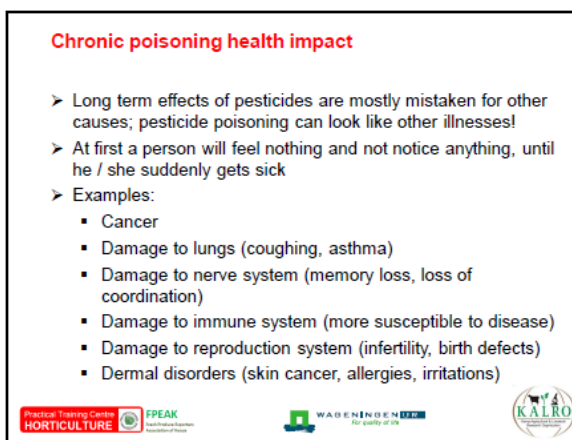
be mistaken for other causes or can be identified as other illnesses. Furthermore, you might not even know or noticed that someone is being poisoned, as signs and symptoms of repeated or prolonged exposure to smaller doses of pesticide will develop slowly and will only be become apparent over a longer period of time. Maybe the participants have experiences themselves, or from somebody close to them, or maybe heard stories about it within the community?



**Can you name long term health effects of repeated or prolonged exposure to smaller doses of pesticide?**

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**Slide 26**



**Chronic poisoning health impact**

- Long term effects of pesticides are mostly mistaken for other causes; pesticide poisoning can look like other illnesses!
- At first a person will feel nothing and not notice anything, until he / she suddenly gets sick
- Examples:
  - Cancer
  - Damage to lungs (coughing, asthma)
  - Damage to nerve system (memory loss, loss of coordination)
  - Damage to immune system (more susceptible to disease)
  - Damage to reproduction system (infertility, birth defects)
  - Dermal disorders (skin cancer, allergies, irritations)

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**Slide 27**


In the next slide (**Slide 28**) explaining that a pesticide can have different effects on people depending on certain characteristics like e.g. age, sex, weight, pregnancy, health status, nutrition status.

Children, elderly people and (pregnant) women are most vulnerable to pesticides! Some examples of facts to substantiate this are:

- *Children:* 1) their internal organs are still developing and maturing, pesticides can disturb this development process; 2) in relation to their body weight, infants and children eat and drink more than adults, possibly increasing their exposure to pesticides in food and water; 3) certain behaviour, such as playing on floors or putting objects in their mouths, increase a child's exposure to pesticides.
- *Elderly people:* 1) our skin becomes thinner as we age and thus pesticides enter more quickly through the skin of older adults and may cause an older person to absorb more of a pesticide compared to a younger person; 2) the ability of the heart to move blood around the body declines as we age, which reduces the blood flow to the liver and kidneys and decreases the size of these organs, which slows the break down and removal of pesticides from the body; 3) the body stores many pesticides in fat before they are removed from the body by the liver or kidneys, people tend to gain body fat and lose lean muscle as they age and thus pesticides can more easily accumulate in the body
- *Pregnant women:* 1) during pregnancy the baby's brain, nervous system, and organs are developing rapidly and can be more sensitive to the toxic effects of pesticides, which can lead to birth defects, and e.g. low birth weight, mental and motor delay and reduced IQ; 2) after giving birth pesticide residues in breast milk can be transferred to the baby when breastfeeding.

**Type of person health impact**

- Pesticides can have different effects on people depending on certain characteristics, e.g. age, sex, weight, pregnancy, health status, nutrition status
- Children, elderly people and (pregnant) women are most vulnerable to pesticides



**Slide 28**


Also note that preconception pesticide exposure of either the mother or father may have an effect on reproductive outcome and offspring and it can possibly reduce both male and female fertility!

To conclude this module finish with asking the participants if they can think of ways to reduce pesticide health risks (**Slide 29**). Give the participants the opportunity to reply to this question or ask some of the participants to answer the question. Alternatively let the participants first buzz in pairs for a few minutes.


Additionally you can provide them with the following reminder:

$$\text{PESTICIDE HEALTH RISK} = \text{TOXICITY} \times \text{EXPOSURE}$$

Continue with explaining that if you take a look at the 'formula' you can either reduce TOXICITY, or reduce EXPOSURE, or both in order to reduce pesticide health risk for a person. Check with the participants if the solutions they came up with also fall within one of these two 'categories' and then also provide them with some examples (**Slide 30**).



**How can pesticide health risks be reduced?**




**Slide 29**

**Reducing pesticide health risks**

Remember!

$$\text{PESTICIDE HEALTH RISK} = \text{EXPOSURE} \times \text{TOXICITY}$$

- Reduce EXPOSURE for example:
  - avoid contact as much as possible
  - protect yourself
  - use less pesticides
- Reduce TOXICITY for example:
  - use less toxic pesticides



**Slide 30**

# 3 Module B: Safe & Responsible Handling of Pesticides

## 3.1 Introduction

### Learning Objectives

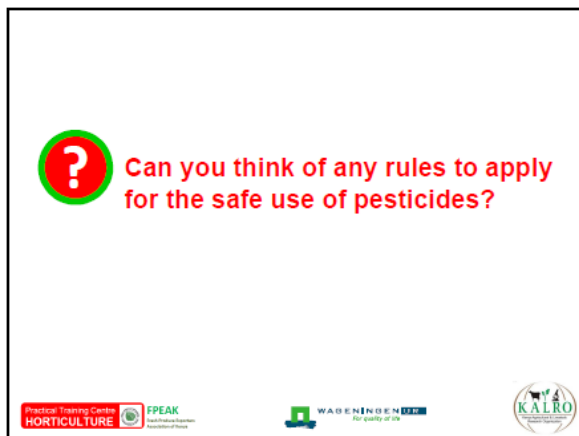
After this section participants:

- Can name the 5 golden rules for safe use of pesticides.

Start this section with asking the participants if they could think of any rules to apply for the safe use of pesticides (**Slide 31**). Give the participants the opportunity to reply to this question or ask some of the participants to answer the question. Alternatively let the participants first buzz in pairs for a few minutes. You can write the answers of the participants on a flipchart. Continue with giving the answer to the question by using **Slide 32** and present the 5 golden rules for safe use of pesticides:

1. Before using any crop protection product, always read the label and make sure you understand and follow all safety needs.
2. Handle crop protection products carefully at all times to avoid contact or contamination.
3. Use appropriate protective clothing as last line of defence and not to become careless and increase exposure risks.
4. Practice good personal hygiene.
5. Maintain sprayers well, fixing, for example, any leaks before starting an application.

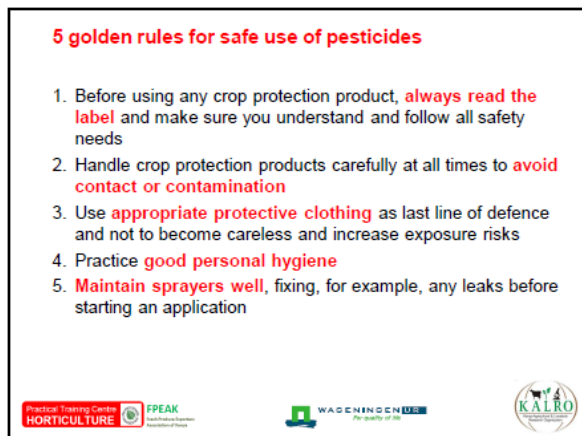
Tell the participants that information around these 5 golden rules will be discussed in more detail in the following sections of this module.



**?** Can you think of any rules to apply for the safe use of pesticides?

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Slide 31



**5 golden rules for safe use of pesticides**

1. Before using any crop protection product, **always read the label** and make sure you understand and follow all safety needs
2. Handle crop protection products carefully at all times to **avoid contact or contamination**
3. Use **appropriate protective clothing** as last line of defence and not to become careless and increase exposure risks
4. Practice **good personal hygiene**
5. **Maintain sprayers well**, fixing, for example, any leaks before starting an application

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Slide 32

## 3.2 Pesticide Labels

### Learning Objectives

After this module participants:

- Understand the difference between the trade name and the name of the active ingredient of a pesticide;
- Can name what kind information can be found on the label of a pesticide product;
- Understand the information that can be found on the label of a pesticide product and know how to read and interpret the information;
- Can identify by the colour code on a pesticide label how hazardous a pesticide is;
- If there is any update from your side or pending issues that need to be taken care of, please let me know!

Start this section with explaining that a pesticide product can be named in two ways (**Slide 33**):

- According to their trade name;
- According to the name of the active ingredient.

Explain that a trade name is just a popular advertising name and a way for the pesticide manufacturers to differentiate their product from competing manufacturers (marketing). The name of the active ingredient actually provides information on the type of product and on the main ingredient of the pesticide which actually kills or controls the target pest. Although trade names of two products can be different, still the active ingredient can be the same! Take the picture of the pesticide Marshall® 250 EC as an example and ask the participants if they can tell the trade name and the active ingredient of this product (**Slide 34**). You may also note to the participants that the trade name is always very well visible on the label, however for the active ingredient you should examine the label more closely as it is mostly given in small print on the label.

**Pesticide labels**

Pesticides can be 'named' in two ways:

- Trade name
- Name of the active ingredient

The trade name is a popular marketing name

The active ingredient is the part of the pesticide that kills or controls the target pest!

Products with different trade names can still have the same active ingredient and are basically the same products!



**Slide 33**

**Pesticide labels - example**



Trade name:

- Marshall

Active ingredient:

- Carbosulfan



**Slide 34**

Continue with asking the participants if they can name what kind of (other) information can be found on a pesticide label (**Slide 35**). Give the participants the opportunity to reply to this question or ask some of the participants to answer the question. If the participants do not know the answer you can say that two of the things that we can find on the label, were already discussed, i.e. the trade name and the active ingredient. What else can be found on the label? Continue with giving the answer to the question by using **Slide 36**. The most important information items on the pesticide label are:

- Active ingredient(s);
- Recommended rates for use (dosage);
- Directions for use;
- Colour coding and warning symbols.



**?** What kind of information can be found on a pesticide label?

Slide 35

**Pesticide labels - information**

- Product name
- Active ingredient(s)
- Name & address of manufacturer
- Recommended rates for use
- Directions for use
- Directions in case of emergency
- Expiration data
- Colour coding and warning symbols

Slide 36

In the following slides more information is given on colour coding, activity & advice symbols and warning symbols.

Explain that the colour coding on the label of a pesticide indicates how hazardous / toxic a pesticide is. The classification is based on the WHO hazard classification of pesticides, which is compiled from toxicity research on rats. Each colour represents a hazard level (**Slide 37**):

- Class 1a – Red : Extremely hazardous;
- Class 1b – Red : Highly hazardous;
- Class II - Yellow : Moderate hazardous;
- Class III - Blue : Slightly hazardous;
- Class U - Green : Unlikely to be hazardous.

**Pesticide labels - colour coding**

➤ WHO classification of pesticide corresponds with colour and indicates how hazardous the pesticide is

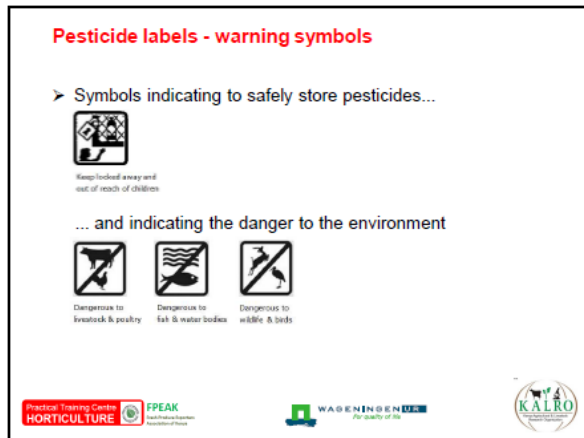
WHO Hazard Class	Information to appear on the label			Acute LD50 (rat) of formulation (mg/kg)			
	Hazard statement	Band colour	Hazard symbol	Oral		Dermal	
				Solid	Liquid	Solid	Liquid
Ia Extremely hazardous	VERY TOXIC	Red	Skull and crossbones	< 5	< 20	< 10	< 40
Ib Highly hazardous	TOXIC	Red	Skull and crossbones	5 - 50	20 - 200	20 - 100	40 - 400
II Moderately hazardous	HARMFUL	Yellow	Large X	50 - 500	200 - 2000	100 - 1000	400 - 4000
III Slightly hazardous	CAUTION	Blue		> 500	> 2000	> 1000	> 4000
Unlikely to present a hazard in normal use		Green		> 2000	> 3000		

Slide 37

Besides colour coding, the label also shows several symbols. There are activity symbols indicating when to protect yourself (mixing and application) with corresponding advice symbols showing what kind of protection measures to take (**Slide 38**). Furthermore it contains warning symbols, indicating that e.g. the pesticide should be kept locked away and out of reach of children, or can be dangerous to animals or the environment (**Slide 39**). Briefly explain the meaning of each symbol in Slides 38 and 39.

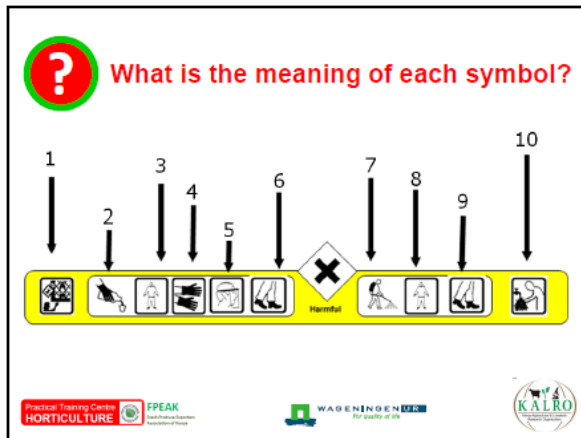


Slide 38

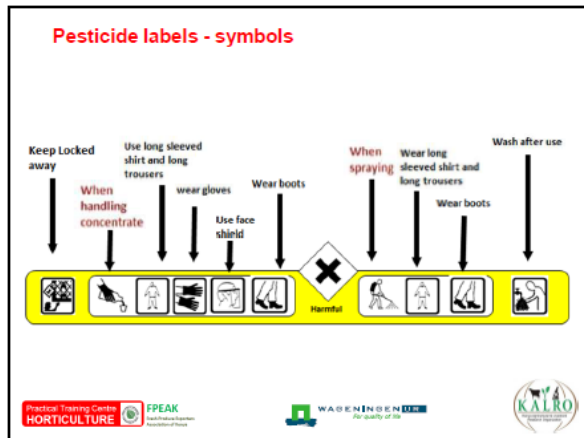


Slide 39

The next slide shows the participants an example of the symbols on a pesticide label (**Slide 40** and **Slide 41**). Ask the participants if they can tell the meaning of each symbol, in following order from number 1 to number 10. Give the participants the opportunity to reply or ask some of the participants if they now the meaning of the symbol. With each click an answer becomes visible.



Slide 40



Slide 41

To summarize and repeat the information on pesticide labels, you could continue with an assignment (see box below):

**Suggestion for interactive assignment: Reading & Understanding Pesticide Labels**

Requisites:

- Examples of pesticide labels;
- Flipchart & coloured markers;
- Masking tape.

1. Hand out several print outs of pesticide labels of different pesticide products with different colour coding.
2. Let the participants discuss in pairs for a few minutes answering the following questions: What kind of pesticide is it? What is it used for? What is the active ingredient? How hazardous is the pesticide? What are the instructions for using the pesticide? Are there any instruction for first aid in case of poisoning?
3. Ask the pairs to share plenary their findings and give a summary of the information on the label they received

To finalize this section, mention again explicitly that it is very important to always follow the instructions on the label in order to protect yourself, your surroundings and the environment and minimize the impact from pesticides.

### 3.3 Personal Protection

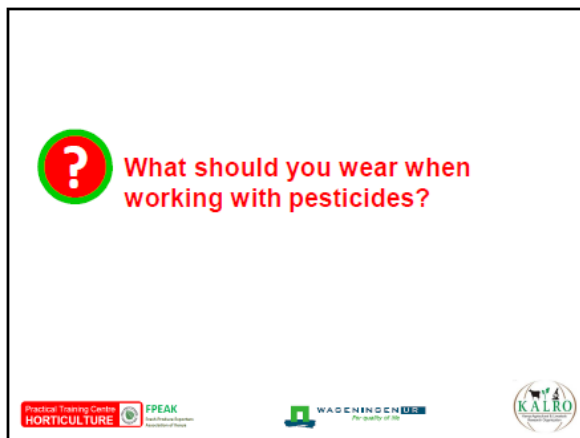
#### Learning Objectives

After this section participants:

- Know what are the (basic) protective work clothing (PWC) to wear and personal protective equipment (PPE) to use when working with pesticides;
- Know they can find on the label of a pesticide product the required protection to use when working with a pesticide;
- Know how they can protect others (family, neighbours, labourers) from being exposed to pesticides;
- Can explain the concept of Restricted Entry Interval (REI) and how to apply it.

Start this section with asking the participants what kind of clothing and / or equipment they should wear when working with pesticides (**Slide 42**). Give the participants the opportunity to reply to this question or ask some of the participants to answer the question. You can have a short plenary discussion on why they wear these kind of clothing and / or equipment.

Continue with showing **Slide 43**, showing what you should wear to fully protect yourself against pesticides. Make the remark that although this is the ideal situation, it might not always be the most practical one, e.g. considering the hot climate or expensive protection equipment.



**Slide 42**



**Slide 43**

Continue with **Slide 44**, showing what at least should be worn when working with pesticides:

- Hat: protection of head and forehead against skin absorption;
- Mask: protection of respiratory tract against inhalation exposure;
- Long sleeves: protection of arms against skin absorption and chemical burns;
- Rubber gloves: protection of hands against skin absorption and chemical burns;
- Long trousers: protection of legs against skin absorption and chemical burns;
- Rubber boots: protection of feet against skin absorption and chemical burns;
- Preferably waterproof apron: protection against skin absorption and chemical burns.

Explain to the participants that most of the protective clothing / equipment mentioned above aims to protect against skin exposure to pesticides. As we have seen before, skin absorption is the most common type of exposure, and therefore is the most important aspect to keep in mind when you are protecting yourself against pesticide exposure.

**Personal protection - what to wear at least**

- Hat
- Mask
- Long sleeved shirt
- Long sleeved trousers
- Rubber gloves
- Rubber boots
- Preferably waterproof apron



Slide 44

**Personal protection - before mixing or spraying**

➤ Always consult the pesticide label for protection requirements!



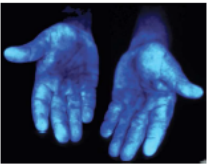

Slide 45

Note that before mixing or spraying, always the pesticide label needs to be consulted on what kind of protection to use (**Slide 45**). As we have discussed before (Section 1 'Pesticide labels') activity symbols (mixing and application) with corresponding advice symbols can be found on the label showing what kind of protection measures to take. Check with the participants if they still know the meaning of the symbols. Furthermore, also explain that not only the people who mix or apply the pesticides should use protective clothing and equipment, but also the people who work in the field during or shortly after pesticides application, as they are exposed to pesticides in the same way. Point out that it is of course always better to make sure no people are working in the field during or shortly after pesticides are applied.

With **Slide 46** explain that protective clothing may be uncomfortable, however more important, it reduces exposure to pesticides and can save your life! Furthermore, stressed upon before is the fact that skin absorption is the most common type of exposure to pesticides and poses the highest risk. So, try to cover up as much skin as possible! The picture in this slide shows the hands of a person who has been working with pesticides without using gloves. Pesticide residues on skin can be made visible by means of a black light, which appear to be present in abundances on the hands of this person (white glow in the picture).

**Personal protection**

- Protective clothing may be uncomfortable, but it can save your life!
- Exposed, unprotected skin poses highest risk when applying pesticides!




Slide 46

## Suggestion for interactive assignment (Slides 42-46): Using PPEs

Requisites:

- Water sensitive paper or Flipchart (size 2.5 cm x 7.5 cm);
- Paper clip;
- Water;
- Food colour agent;
- Knapsack sprayer;
- Bucket.

1. Put water in a bucket, add a few drops of food colour agent and mix it.
2. Load the knapsack sprayer with the colour solution .
3. Ask two volunteers to simulate spraying and weeding activities in the field.
4. Put pieces of flipchart paper or water sensitive paper on the shoulder, hands, clothes, head, back and any other parts of the body of the volunteers.
5. Start the simulation of spraying and weeding activities.
6. Ask the other participants to observe where the coloured water becomes visible on the body of both volunteers.
7. Discuss the results from this exercise and discuss the importance of using PPEs.

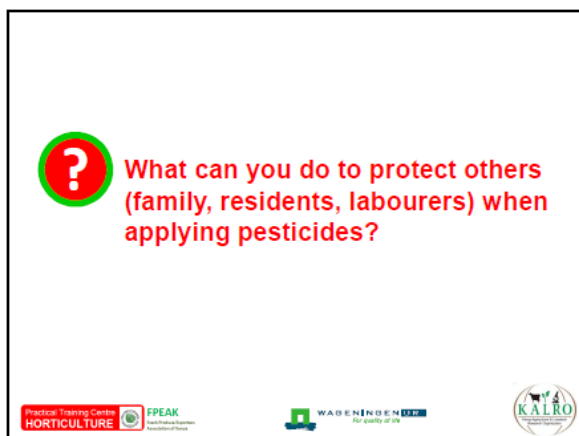
## Suggestion for interactive assignment (Slides 42-46): Dressing up

Requisites:

- Personal Protective Equipment;
- Several pesticide labels.

1. The participants are divided in small groups
2. Hand out several print outs of pesticide labels of different pesticide products
3. The participants are given the assignment to select the correct PPEs will using the pesticide product
4. One person of the group can dress up with the selected PPEs
5. The facilitator can discuss and comment on the correct choice of PPEs as well as the way it has been put on

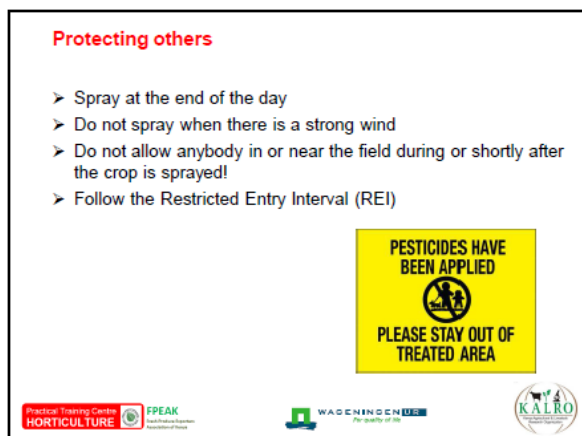
Continue with asking the participants, apart from personal protection, what they think they can do to protect others (family, neighbours, labourers) from being exposed to pesticides when applying pesticides (**Slide 47**). Give the participants the opportunity to reply to this question or ask some of the participants to answer the question. Alternatively you can let participants discuss among each other (in small groups or pairs) if they can come up with any measures for protecting others. Let the participants share their findings plenary with the group. You can also use a flipchart to write down some of the findings of the participants. Continue with **Slide 48**, showing some possible measures for protecting others.



**?** What can you do to protect others (family, residents, labourers) when applying pesticides?

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Slide 47



**Protecting others**

- Spray at the end of the day
- Do not spray when there is a strong wind
- Do not allow anybody in or near the field during or shortly after the crop is sprayed!
- Follow the Restricted Entry Interval (REI)

PESTICIDES HAVE BEEN APPLIED  
PLEASE STAY OUT OF TREATED AREA

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Slide 48

Continue with the next slide explain to the participants the concept of Restricted Entry Interval (REI) (Slide 49):

*The length of time required after spraying of pesticides, before a person can again safely enter the field without personal protective equipment*

Explain that after spraying the field it still remains dangerous to enter and that the toxicity level will only slowly decline, depending on the type of pesticide used. For this reason the field should be kept a restricted area for all persons during the time interval (REI) until it is again safe to enter. This means no workers should be in the field during or after the crop is sprayed. The length of the REI varies depending on the type of pesticide used (toxicity level) and may vary from 4 hours to 3 days.

**Restricted Entry Interval (REI)**

- The length of time required after spraying of pesticides, before a person may again enter the field without personal protective equipment (PPE).
- This means no fieldworkers in the field, during or after the crop is sprayed!
- The length of REI varies from 4 hours to 3 days, depending on the type of pesticide used

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#### Slide 49

Suggestion for interactive assignment (Slide 68-69): Restricted Entry Interval

Requisites:

- Room fragrance or deodorant spray.
1. Spray the room with room fragrance or deodorant spray before the participants enter the room.
  2. Then, ask the participants what they smell and how long they think it will take before the smell disappears.
  3. Make the link to the Restricted Entry Interval and the use of pesticides and have a discussion with the participants. What do they think of labourers entering the field shortly after spraying?

## 3.4 Personal Hygiene


### Learning Objectives

After this section participants:

- Know what personal hygiene rules to follow and corresponding actions to take after working with or getting in contact with pesticides during work;
- Understand that personal hygiene rules and actions will not only protect themselves, but also their family members.

Explain in this section with explain the personal hygiene rules to follow and actions to take after having worked with or have been in contact with pesticides during work (**Slide 50** and **Slide 51**). Emphasize that these personal hygiene rules and actions will not only protect themselves, but also their family members (see also Module A, Section 3 'Pesticides & Exposure')!

**Personal hygiene (1)**



When you have worked with or came into contact with pesticides during work:

- Wash hands with soap and water before eating, drinking and smoking
- Wash hands with soap and water before entering the house
- Take shoes off and change clothes after working with pesticides or in fields that have been contaminated with pesticides before entering the house


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Slide 50

**Personal hygiene (2)**

When you have worked with or came into contact with pesticides during work:

- Shower / bath / rinse off immediately after working with pesticides or in areas where pesticides have been applied
- Keep work clothes separate from other clothes
- Wash work clothes separately from the rest of the family clothes
- Keep out of contact with family members until after getting cleaned up



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Slide 51

## 3.5 Disposal of Pesticide Waste

### Learning Objectives

After this section participants:

- Can apply the triple rinse procedure for rinsing empty pesticide containers;
- Are familiar with proper ways to dispose empty pesticide containers and other pesticide waste;
- Are aware that improper disposal of empty pesticide containers can cause risks to the environment, humans and animals.

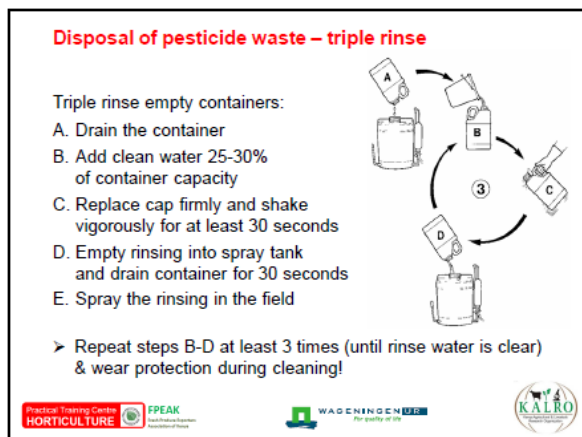
Start this section with asking the participants how to properly dispose empty pesticide containers and other pesticide waste (**Slide 52**). Give the participants the opportunity to reply to this question or ask some of the participants to answer the question. First explain **Slide 53** explaining how to correctly rinse an empty pesticide container, the triple rinse procedure, which is part of proper pesticide waste disposal.

Continue explaining the proper way to dispose pesticide waste (**Slide 54**). Especially emphasize that empty containers should never be re-used and that pesticide waste which is not being disposed of in the right way can cause a risk to the environment, humans and animals!



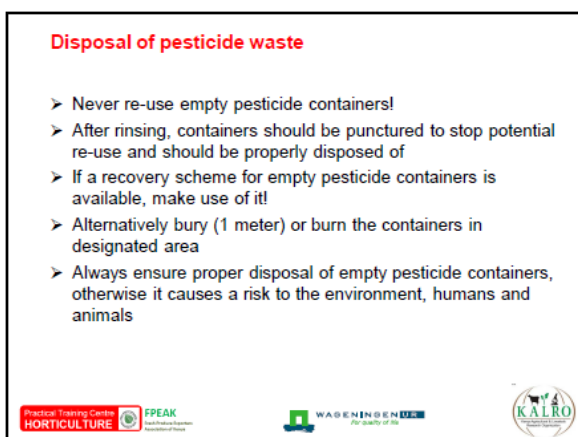
Slide 52 features a large red question mark icon on the left. To its right, the text "How to properly dispose pesticide waste?" is written in red. At the bottom of the slide, there are four logos: Practical Training Centre HORTICULTURE, EPEAK, WAGENINGEN, and KALRO.

Slide 52



Slide 53 is titled "Disposal of pesticide waste – triple rinse" in red. It lists five steps for rinsing containers: A. Drain the container; B. Add clean water 25-30% of container capacity; C. Replace cap firmly and shake vigorously for at least 30 seconds; D. Empty rinsing into spray tank and drain container for 30 seconds; E. Spray the rinsing in the field. A circular diagram with arrows and the number 3 indicates that steps B, C, and D are repeated three times. A note below the steps says: "Repeat steps B-D at least 3 times (until rinse water is clear) & wear protection during cleaning!". The same four logos as Slide 52 are at the bottom.

Slide 53



Slide 54 is titled "Disposal of pesticide waste" in red. It lists five disposal instructions: "Never re-use empty pesticide containers!"; "After rinsing, containers should be punctured to stop potential re-use and should be properly disposed of"; "If a recovery scheme for empty pesticide containers is available, make use of it!"; "Alternatively bury (1 meter) or burn the containers in designated area"; "Always ensure proper disposal of empty pesticide containers, otherwise it causes a risk to the environment, humans and animals". The same four logos as Slide 52 are at the bottom.

Slide 54



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### Suggestion for interactive assignment (Slide 53): Triple Rinse

Requisites:

- Empty (clean) pesticide container;
- Water;
- Knapsack sprayer (clean).

1. Give the participants an empty pesticide container and a knapsack sprayer.
2. Let them practice with the triple rinse method.
3. Afterwards discuss if they have done the triple rinse in the correct way.

## 3.6 Storage of Pesticides

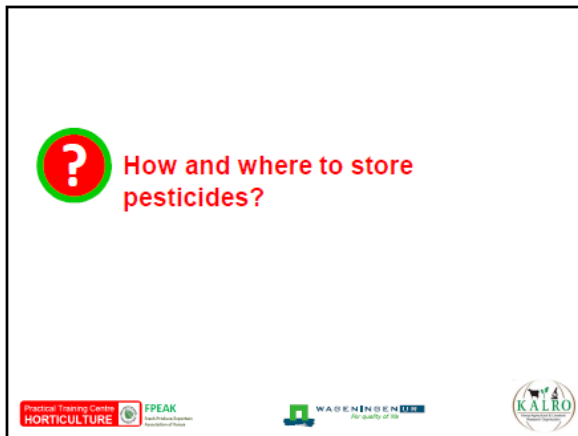
### Learning Objectives

After this section participants:

- Are familiar with proper ways to store pesticides and especially where not to store them;
- Understand to keep pesticides out of reach of children and animals;
- Understand that a simple locked box mounted on the wall is a good and safe way to store small amounts of pesticides in the house.

Start this section with asking the participants how and where they store pesticides (and spraying equipment) at home (**Slide 55**). Give the participants the opportunity to reply to this question or ask some of the participants to answer the question.

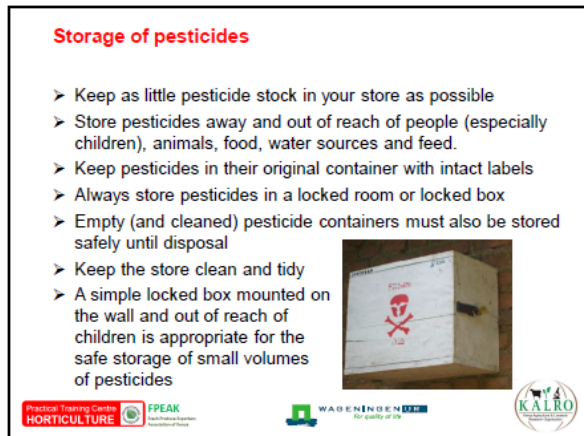
Continue with **Slide 56** explaining what to take into account when storing small amounts of pesticide and presenting an example of a simple solution for storing small amounts of pesticides in the house: a simple locked box mounted on the wall.



**?** How and where to store pesticides?

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Slide 55



**Storage of pesticides**

- Keep as little pesticide stock in your store as possible
- Store pesticides away and out of reach of people (especially children), animals, food, water sources and feed.
- Keep pesticides in their original container with intact labels
- Always store pesticides in a locked room or locked box
- Empty (and cleaned) pesticide containers must also be stored safely until disposal
- Keep the store clean and tidy
- A simple locked box mounted on the wall and out of reach of children is appropriate for the safe storage of small volumes of pesticides

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Slide 56

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## 4 Poisoning Centres Kenya

### **Kenya Gertrude's Children's Hospital Pharmacy**

Address : Muthaiga Road  
City : Nairobi  
Telephone : +254 20 720 6438  
Fax : +254 20 376 3281  
Emergency telephone : +254 20 210 0082  
E-mail address : [pharmacy@gerties.org](mailto:pharmacy@gerties.org)  
Website : [www.gerties.org/pharmacy](http://www.gerties.org/pharmacy)  
Hours of operation : 24hrs

### **National Poison Information and Management Centre**

Address : Kenyatta National Hospital  
PO Box 20723  
City : Nairobi  
Telephone : +254 27 26 300 ext. 44365  
Fax : +254 272 52 72  
Emergency telephone : 0800 720021  
E-mail address : -  
Website : -  
Hours of operation : 24hrs

## 5 Further Resources

### *Safety and Health Guides*

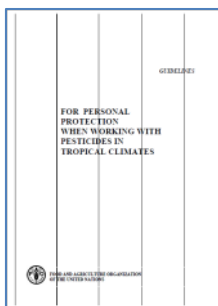
The following publications are examples of other safety and health guides for the use of pesticides:



#### **Preventing Health Risks from the Use of Pesticides in Agriculture**

World Health Organization  
2001

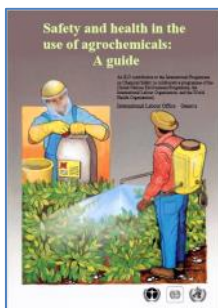
[http://www.who.int/occupational\\_health/publications/en/oehpesticides.pdf](http://www.who.int/occupational_health/publications/en/oehpesticides.pdf)



#### **Guidelines for Personal Protection when Working with Pesticides in Tropical Climates**

Food and Agriculture Organization of the United Nations  
1990

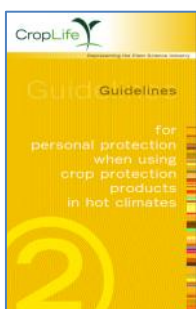
[http://www.fao.org/fileadmin/templates/agphome/documents/Pests\\_Pesticides/Code/Old\\_guidelines/PROTECT.pdf](http://www.fao.org/fileadmin/templates/agphome/documents/Pests_Pesticides/Code/Old_guidelines/PROTECT.pdf)



#### **Safety and Health in the Use of Agrochemicals: A Guide**

International Labour Organization  
1991

[http://www.ilo.org/wcmsp5/groups/public/@ed\\_protect/@protrav/@safework/documents/instructionalmaterial/wcms\\_110196.pdf](http://www.ilo.org/wcmsp5/groups/public/@ed_protect/@protrav/@safework/documents/instructionalmaterial/wcms_110196.pdf)

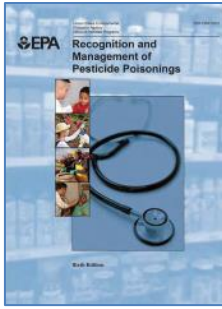


#### **Guidelines for Personal Protection when Using Crop Protection Products in Hot Climates**

CropLife  
2004

<https://croplife.org/wp-content/uploads/2014/04/Guidelines-for-personal-protection-when-using-crop-protection-products-in-hot-climates.pdf>

## Other Interesting Publications



### Recognition and Management of Pesticide Poisoning

United States Environmental Protection Agency  
2013

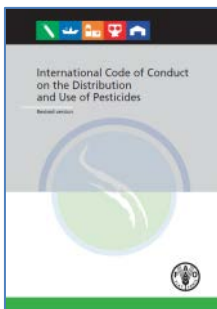
[http://www2.epa.gov/sites/production/files/2015-01/documents/rmpp\\_6thed\\_final\\_lowresopt.pdf](http://www2.epa.gov/sites/production/files/2015-01/documents/rmpp_6thed_final_lowresopt.pdf)



### PAN International List of Highly Hazardous Pesticides

Pesticide Action Network International  
2014

[http://www.panna.org/sites/default/files/PAN\\_HHP\\_List\\_2014.pdf](http://www.panna.org/sites/default/files/PAN_HHP_List_2014.pdf)



### International Code of Conduct on the Distribution and Use of Pesticides

Food and Agriculture Organization of the United Nations  
2005

<http://www.fao.org/docrep/018/a0220e/a0220e00.pdf>



### The WHO Recommended Classification of Pesticides by Hazard

World Health Organization  
2009

[http://www.who.int/ipcs/publications/pesticides\\_hazard\\_2009.pdf?ua=1](http://www.who.int/ipcs/publications/pesticides_hazard_2009.pdf?ua=1)

## Websites



### Pesticidewise – Applying Pesticides Safely and Effectively

Website Syngenta

<https://www.pesticidewise.com>





To explore  
the potential  
of nature to  
improve the  
quality of life



Wageningen UR  
Centre for Development Innovation  
P.O. Box 88  
6700 AB Wageningen  
The Netherlands  
[www.wageningenUR.nl/cdi](http://www.wageningenUR.nl/cdi)

Report CDI-16-029

The Centre for Development Innovation works on processes of innovation and change in the areas of food and nutrition security, adaptive agriculture, sustainable markets, ecosystem governance, and conflict, disaster and reconstruction. It is an interdisciplinary and internationally focused unit of Wageningen UR within the Social Sciences Group. Our work fosters collaboration between citizens, governments, businesses, NGOs, and the scientific community. Our worldwide network of partners and clients links with us to help facilitate innovation, create capacities for change and broker knowledge.

The mission of Wageningen UR (University & Research) is 'To explore the potential of nature to improve the quality of life'. Within Wageningen UR, nine specialised research institutes of the DLO Foundation have joined forces with Wageningen University to help answer the most important questions in the domain of healthy food and living environment. With approximately 30 locations, 6,000 members of staff and 9,000 students, Wageningen UR is one of the leading organisations in its domain worldwide. The integral approach to problems and the cooperation between the various disciplines are at the heart of the unique Wageningen Approach.

