REMEMBER - GOOD PREPARATION WILL TAKE YOU MORE THAN HALF WAY TO ACHIEVING A SUCCESSFUL COURSE.

This pesticide retailer course has been prepared by CropLife International. It consists of 21 sessions that can be given altogether in seven days or, spread over a longer time as needed:

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INTRODUCTION
Objectives of the Course

The overall objectives of the training course are:

- To provide the essential knowledge required by pesticide retailers. This consists of the basic principles and concepts of storing, handling, selling, and using pesticides, and of dealing with farmers, rather than detailed technical knowledge of individual pests and pesticides.
- To enable pesticide retailers to provide appropriate advice to farmers on crop and pest management, and pesticide use and safety.
- To structure, and to make the links within, the existing knowledge of individual pesticide retailers.
- To make pesticide retailers think about their current practices and how these can be improved.
- To provide retailers with the tools to help them give a better service to their customers.
- In summary, to make retailers examine their current practices and to persuade them to provide better service to farmer customers in terms of the quality of both the products sold and of the advice on their use given to farmers.

Trainers should always keep these course objectives in mind during training sessions, and ensure that all topics are adequately covered. In particular, trainers should emphasize the concept of “Good Service = Good Business” in all training activities.

Trainers should also note the objectives given at the beginning of each Session plan and ensure that the activity is carried out so as to achieve these objectives.

Course Duration and Location

The full course takes 7 days (at 4 training hours per day). Many participants may find it difficult to attend for this length of time. In this case, the course can be spread over a longer period of time, such as one or two sessions in a morning, afternoon or evening over several weeks. This will need to be decided based on the needs of the participants prior to the course. If this schedule is followed, the introductory activity of each session will be important as a reminder of the results and conclusions of the previous session.

A suitable venue should be selected for the course. The facilities available at the venue will partly depend on how the course is to be held in terms of timing of the sessions. More facilities in terms of refreshments, and perhaps accommodation, will be needed if the full course is to be held in one instance.

Training Method

The training method is participatory, and the role of the facilitator is to create the conditions within the sessions that assist this type of learning. For the course to be effective it is essential that the facilitator has the necessary participatory training skills and experience.

Since the training is participatory, not more than 30 farmers should attend each session, otherwise applying effective adult learning methodology will prove difficult.

Facilitator and session activities are specified during each session plan. This is deliberate, and does not question the skills or experience of the facilitator. Activities are specified in this way so as to take course participants step-by-step through course topics. Facilitators are free to adjust activities to a certain extent depending on their knowledge and experience, and of local circumstances.
Introduction

The training room should be laid out either with individual participant chairs or tables in a U-shape, or with 3-4 tables in a semi-circle around the main flipchart, with 4-5 participants per table. The room should be large enough for participant groups to work separately and without disturbing each other in group activities; otherwise an additional room will be needed.

Course Participant Evaluation

The facilitator can apply the assessment questions at the end of each session to assess their knowledge after receiving the training. Alternatively, the facilitator can leave these questions at the very end of the course. In this case, it is recommended to apply a pre-course evaluation to measure the participant knowledge prior the course that consists of at least 25 questions selected from the assessment questions given in each sessions. These same 25 questions should be given to the participants as a post-course evaluation so the facilitator can see how the participant knowledge has change.

Preparation of Training Notes, Visual Aids and Training Equipment

Electricity supplies may be unreliable in many areas, a data projector may not be available, or it may not be possible to darken the room sufficiently. For these reasons, this training course deliberately does not rely on PowerPoint presentations, rather it uses flipcharts and similar equipment.

All session printed materials should be prepared and duplicated well before each session. Participants should be given a notebook, pen, and file cover. On the assumption that participants will attend all sessions, these materials should be provided in Session 1 only. Even so, spare notebooks and pens should be available at each session for those participants who forget to bring them.

Flipcharts should be prepared of the objectives of each session, to be used in the session introduction and referred to at the end of the session. Also, where presentations are made it is useful to pre-prepare flipcharts with the main points that can be referred to during the presentation.

Some sessions require additional training equipment, such as pesticide containers, gloves, or bottles of water. There is a check-list at the end of this Introduction, and also specific requirements in each session introduction. The Trainer should note where such equipment is needed in the course, and decide what they need to obtain and from where.

A display of relevant booklets and other material, e.g. pesticide labels and information leaflets, and pest and beneficial insect identification charts may also be made available; these can be browsed by participants at coffee and lunch breaks.

In addition to any pesticide labels and information leaflets that are displayed during the course, certain pesticides, pesticide products, or companies are mentioned or indicated during the course. These are for example purposes only, and are not a recommendation for the particular pesticide or product.
Activity Times

The times given for each activity of a session are indicative, and are given to help the Facilitators when planning and running the session. However, they are not fixed, and it may be found that with a more knowledgeable group of participants some of the activities may be completed in less than the indicated time. Conversely, on occasion more time must be allowed in order for participants to thoroughly cover the topic.

Trainer Notes

Trainer notes are provided at various places in the Trainers Manual. These are to provide additional assistance and direction for the running of the relevant activity.

Sample questions are provided in many Session activities. These are suggestions or indicative questions only, and are intended to guide the trainer in the type of questions to ask so as to stimulate discussion and ensure that all aspects of the topic are covered and discussed. Other questions may be required to achieve this – the trainer must facilitate the discussion and ask these additional questions.

Fact Sheets

The Fact Sheets for each session contain the essential information from each session. They are intended both as reminder notes for participants, and for the Trainer to use as a checklist during an activity to ensure that all the topics are adequately covered.

Sufficient numbers of all Fact Sheets for participants must be printed or photocopied prior to the start of the course.

Participant Details

Participant details need to be kept both as a record of attendance, and also for possible future contacts. Projects may have their own Forms to record such information. In case they do not, a generic Attendance Form is included at the end of this Introduction. This form also allows for adding participant scores from the end of session assessment.
Checklist of Training Materials Required

1. Trainers Manual
2. Flipchart stands x 4-6
3. Flipcharts x 200 sheets
4. Marker pens x 24 assorted red, green, blue, black – chisel tipped
5. Masking tape x 1 roll
6. Cards 100 approx 25 x 12cm, assorted colours
7. Glue stick x 1
8. Block notes x No. participants
9. Pens / Pencils x No. participants
10. File covers x No. participants
11. Selection of pesticide containers/different types of formulations of each hazard classification. Ensure that these are from genuine products.
12. Selection of labels of each hazard classification. Ensure that these are from genuine products.
13. Selection of pesticide data sheets/technical leaflets
14. Rubber gloves and other personal protective equipment (PPE)
15. Soap/water
16. Examples of different types of hand sprayers
17. Examples of different types of nozzles
18. Selection of illustrations of major insect pests, beneficial insects, diseases, weeds
19. Pest management leaflets/booklets/recommendations
20. Any other suitable leaflets/booklets/recommendations available, eg from pesticide companies
SESSION 1:
BASICS OF GOOD CUSTOMER SERVICE
### Lesson Plan

<table>
<thead>
<tr>
<th>Materials needed:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>✔ Flipchart stands.</td>
<td></td>
</tr>
<tr>
<td>✔ Flipchart paper.</td>
<td></td>
</tr>
<tr>
<td>✔ Markers (4 colours).</td>
<td></td>
</tr>
<tr>
<td>✔ Notebooks, pens, and file covers for participants.</td>
<td></td>
</tr>
<tr>
<td>✔ Coloured cards.</td>
<td></td>
</tr>
<tr>
<td>✔ Glue stick or blue tack.</td>
<td></td>
</tr>
<tr>
<td>✔ Masking tape.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Time needed:</th>
<th>100 minutes</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Intended audience:</th>
<th>Pesticide Retailers</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Preparation:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>✔ Flipchart with the session title “Dealing With Farmers”, and the Session Objectives.</td>
<td></td>
</tr>
<tr>
<td>✔ Print off sufficient Retailer Self-Assessment Forms</td>
<td></td>
</tr>
<tr>
<td>✔ Print off sufficient Attendance Record sheets.</td>
<td></td>
</tr>
<tr>
<td>✔ Print off sufficient Assessment question sheets.</td>
<td></td>
</tr>
<tr>
<td>✔ Print off sufficient Fact Sheets for participants.</td>
<td></td>
</tr>
<tr>
<td>✔ Organise venue and seating arrangements.</td>
<td></td>
</tr>
</tbody>
</table>

### Attendance Record

As participants arrive, ask them to enter their name and other information on the Attendance Record. There is also a column on the form to enter their marks from the Assessment Questions at the end of the training session.
<table>
<thead>
<tr>
<th>Date:</th>
<th>Telephone Number</th>
<th>Location</th>
<th>Organisation</th>
<th>Name</th>
<th>Assessment Mark</th>
</tr>
</thead>
</table>
### Set up / Introduction

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Trainer Note:</strong></td>
<td>This first session lays the foundation for the whole retailer course. The underlying objective all sessions and activities is for retailers to think and reflect on their current situation and practices, what needs to be improved, and how to make these improvements. The trainer must always ensure that participants are given encouragement and time to make these reflections.</td>
</tr>
<tr>
<td><strong>Attention:</strong></td>
<td>Welcome the retailers to this first session of the course.</td>
</tr>
<tr>
<td><strong>Ask:</strong></td>
<td>How many of the retailers have been in business for more than 15 years? 10 years? 5 years? Less than 5 years?</td>
</tr>
<tr>
<td><strong>Say:</strong></td>
<td>that between them the retailers have extensive experience, knowledge and skills. This training course will structure and build on these factors.</td>
</tr>
<tr>
<td><strong>Title:</strong></td>
<td>Refer to the Title Flipchart and tell participants that this training session will cover <em>Dealing with Farmers.</em></td>
</tr>
<tr>
<td><strong>Credibility:</strong></td>
<td>Tell participants your experience in dealing with farmers, particularly with providing advice and inputs.</td>
</tr>
<tr>
<td><strong>Objectives:</strong></td>
<td>Refer to the Title Flipchart with the Lesson Objectives. By the end of the session, participants will be able to:</td>
</tr>
<tr>
<td></td>
<td>• Describe the issues and problems that retailers most frequently experience in the sale and handling of pesticides, and when dealing with customers (including the problems most often raised by farmers in connection with pesticides and application equipment).</td>
</tr>
<tr>
<td></td>
<td>• State clearly why good service to farmers is good for business, and what the key elements of good service entail.</td>
</tr>
<tr>
<td><strong>Benefits:</strong></td>
<td>Providing good service to customers will improve the retailer’s customer base and business.</td>
</tr>
<tr>
<td><strong>Direction:</strong></td>
<td>• Activities begin with an introduction of the participants and to the course.</td>
</tr>
<tr>
<td></td>
<td>• This is followed by a working group discussion to discover the expectations of the participants from the training course. This first activity sets the tone for all sessions, in that training is participatory and interactive.</td>
</tr>
<tr>
<td></td>
<td>• A second working group task is designed to get retailers thinking about the real issues and problems they and their customers face in the handling, sale and use of pesticides.</td>
</tr>
<tr>
<td></td>
<td>• During the plenary discussion following group reports, the trainer adds values and principles of good service to customers not already raised in the reports or discussion.</td>
</tr>
<tr>
<td></td>
<td>• These values and principles of good service, and the message that they “equal” good business, will be a foundation of the course, and will be referred back to repeatedly throughout course sessions.</td>
</tr>
</tbody>
</table>
### Delivery

**Explanation, Demonstration, Exercise, and Guidance:**

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Trainer Note:</strong>&lt;br&gt;If not already sitting in table groups, divide the participants into 3-4 groups depending on numbers.</td>
<td></td>
</tr>
<tr>
<td>1. 10 minutes</td>
<td><strong>Introduction to the Training Program</strong>&lt;br&gt;&lt;br&gt;&lt;br&gt;<strong>Welcome</strong> participants to the first session of the training course. Introduce yourself.&lt;br&gt;&lt;br&gt;Take a few minutes for each person to introduce himself as follows:&lt;br&gt;• Name&lt;br&gt;• Place of business&lt;br&gt;• Years as a Pesticide Retailer&lt;br&gt;&lt;br&gt;<strong>Explain</strong> the Course Rules to participants:&lt;br&gt;• We are on time for each session.&lt;br&gt;• Mobile phones are switched off or on silent.&lt;br&gt;• Only one person speaks at a time – no separate discussions.</td>
</tr>
<tr>
<td>2. 10 minutes</td>
<td><strong>Work Groups – Participant Expectations</strong>&lt;br&gt;&lt;br&gt;&lt;br&gt;<strong>Ask</strong> participants to think individually about the following question, and note on paper some of their thoughts:&lt;br&gt;• What am I hoping to gain from this training course?&lt;br&gt;&lt;br&gt;After 3-4 minutes, ask participants to work in their table groups to do the following:&lt;br&gt;&lt;br&gt;<strong>Work Group Task:</strong>&lt;br&gt;• Share your expectations with each other.&lt;br&gt;• Agree on the 3-4 expectations for the course that you share most in common.&lt;br&gt;&lt;br&gt;After 10 minutes, <strong>Ask</strong> one group to give you one of their expectations.&lt;br&gt;&lt;br&gt;<strong>Record</strong> on the flipchart.&lt;br&gt;&lt;br&gt;<strong>Repeat</strong> for the second group, and then the third, followed by the fourth.&lt;br&gt;&lt;br&gt;<strong>Return</strong> to the first group and take their second expectation if it is not already on the flipchart. (If already on the flipchart, put a check next to it to show that an additional group also had the same expectation.) <strong>Repeat</strong> for the other groups.&lt;br&gt;&lt;br&gt;When all expectations are listed, <strong>Review</strong> the results and <strong>explain</strong> what can be expected in the course, and what cannot be expected.&lt;br&gt;&lt;br&gt;<strong>Trainer Note:</strong>&lt;br&gt;Keep this flipchart so that further reference can be made to the expectations as the course progresses.</td>
</tr>
<tr>
<td>3.</td>
<td><strong>Work Groups – Problems Affecting Retailers and their Farmer Customers in the Safe Handling, Sale and Effective Use of Pesticides</strong></td>
</tr>
<tr>
<td>-----</td>
<td>--------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>20 minutes</strong></td>
<td>Refer back to the introduction to the session and acknowledge the considerable amount of first-hand experience that all the participants bring to the course, and say how important it is that we should all benefit from the sharing of this experience.</td>
</tr>
<tr>
<td></td>
<td>Ask them to get up and sit at different tables so that they have a chance to interact with more of the participants in the course.</td>
</tr>
<tr>
<td></td>
<td>Give work groups the following task:</td>
</tr>
<tr>
<td></td>
<td><strong>Work Group Task</strong></td>
</tr>
<tr>
<td></td>
<td>• Agree as a group on the 3-4 most important problems that they face as retailers in handling and selling pesticides, and in providing advice to farmers.</td>
</tr>
<tr>
<td></td>
<td>• Agree as a group on the 3-4 most common problems raised by farmers in the selection, handling and use of pesticides.</td>
</tr>
<tr>
<td></td>
<td>• Select one person to report to the full group.</td>
</tr>
<tr>
<td></td>
<td>Say that they have 20 minutes.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4.</th>
<th><strong>Work Group Reports – Problems Affecting Retailers and their Farmer Customers in the Safe Handling, Sale and Effective Use of Pesticides</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>20 minutes</strong></td>
<td>Explain that we will hear from each group on their responses to the first task before moving on to the second task.</td>
</tr>
<tr>
<td></td>
<td>Starting with the first task, ask a table to give you one of their problems as retailers.</td>
</tr>
<tr>
<td></td>
<td>Record on the flipchart.</td>
</tr>
<tr>
<td></td>
<td>Repeat for the second group, and then the third, followed by the fourth.</td>
</tr>
<tr>
<td></td>
<td>Return to the first group and take their second expectation if it is not already on the flipchart. (If already on the flipchart, put a check next to it to show that an additional group also had the same expectation.) Repeat for the other groups.</td>
</tr>
<tr>
<td></td>
<td>Then repeat the same procedure with the second task for problems of farmers.</td>
</tr>
<tr>
<td></td>
<td>Throughout these group reports, ensure that all the points made are clearly understood by all participants.</td>
</tr>
<tr>
<td></td>
<td>Indicate those problems that will be examined and addressed during the course, and those that are outside the scope of the course.</td>
</tr>
<tr>
<td></td>
<td><strong>Trainer Note:</strong> Keep this flipchart so that further reference can be made to the problems as the course progresses. The first opportunity will be in Session 2, Activity 1.</td>
</tr>
</tbody>
</table>
5. 20 minute

**Discussion / Presentation – Good Service = Good Business**

**Ask:**
- Do any participants have a favourite restaurant?
- Why is this restaurant their favourite, what encourages them to go there on a regular basis and not to another restaurant?

**List** participant responses on the flipchart.

**Summarise** by saying that a good restaurant attracts and keeps customers through:
- Good service to customers
- A friendly atmosphere
- Knowledge of the food being prepared, and ability to provide advice on dishes
- Attractive and clean surroundings
- Good food
- Value for money

**Ask:**
- How do these responses relate to their pesticide shop and attracting farmer customers?

**Present** *Good Service = Good Business* from the Fact Sheet, and then **ask** for participant comments on these points.

**Present** *The Elements of Good Service* and *The Elements of Bad Service* from the Fact Sheet, and again ask for participant comments.

**Say:**
The retailer has choices:
- To maximize profits by selling as much pesticide product as possible to each farmer regardless of the need or suitability of a pesticide product for that farmer.
- Or to adhere to principles of good service and good advice to farmer customers, and expect that these principles in the long run will result in a competitive and successful business through building trust with farmers and expanding the customer base.

**Ask:**
- How should the retailer think about these choices?

**Trainer Note:**
Keep the restaurant flipchart and refer back to it continually during the course to emphasise the factors which attract customers to a business.
### Finish

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
</table>
| **Summary:** 1 minute | Include as major messages:  
- Participant expectations  
- The major problems faced by retailers  
- Good Service = Good Business |
| **Questions:** 1 minute | Ask if everyone understands or if there are any additional questions. Answer these provided they are relevant.  
Ask if the session objectives were met |
| **Evaluation:** 12 minutes | Hand out the Assessment Sheet and ask participants to complete two of the questions.  
Collect the Assessment Sheet for later marking and entering the marks on the Attendance Record. |
| **Next step:** 1 minute | Say that in this session we learned about Good Service = Good business. In future sessions, we will discuss and learn various ways of ensuring that we are providing good service to customers.  
Hand out the *Elements of Good Service: Retailer Self-Assessment Form*.  
Say that as a first step, participants should think about the current situation of their shop and customer service and should complete the *Elements of Good Service: Retailer Self-Assessment Form* when they have returned to their shops.  
Explain that they will not need to show anyone the scores they give themselves, but we will discuss their results in general at the beginning of the next session.  
Hand out the Fact Sheet to participants. |
The Elements of Good Service

Retailer Self-Assessment Form

With regard to your pesticide shop, decide on an overall rating for each question. Identify examples that support each rating. Be objective. Giving a rating of “excellent” when it should be “need to improve” does not provide true self-assessment.

1. A well-lit, clean, tidy shop, with products and posters attractively displayed.

<table>
<thead>
<tr>
<th></th>
<th>Poor</th>
<th>Need to Improve</th>
<th>Average</th>
<th>Good</th>
<th>Excellent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rating</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

Examples for Rating

2. Treating the farmer as a friend.

<table>
<thead>
<tr>
<th></th>
<th>Poor</th>
<th>Need to Improve</th>
<th>Average</th>
<th>Good</th>
<th>Excellent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rating</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

Examples for Rating

3. Knowledge of the farmers’ problems, and appropriate solutions.

<table>
<thead>
<tr>
<th></th>
<th>Poor</th>
<th>Need to Improve</th>
<th>Average</th>
<th>Good</th>
<th>Excellent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rating</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

Examples for Rating
4. The ability to ask questions to identify the problem.

<table>
<thead>
<tr>
<th>Poor</th>
<th>Need to Improve</th>
<th>Average</th>
<th>Good</th>
<th>Excellent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

Examples for Rating

5. Good quality, practical advice which is easily understood and remembered by the farmer.

<table>
<thead>
<tr>
<th>Poor</th>
<th>Need to Improve</th>
<th>Average</th>
<th>Good</th>
<th>Excellent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

Examples for Rating

6. Constant availability of good quality products at reasonable prices.

<table>
<thead>
<tr>
<th>Poor</th>
<th>Need to Improve</th>
<th>Average</th>
<th>Good</th>
<th>Excellent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

Examples for Rating

7. Honesty in all dealings with the farmer.

<table>
<thead>
<tr>
<th>Poor</th>
<th>Need to Improve</th>
<th>Average</th>
<th>Good</th>
<th>Excellent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

Examples for Rating
Assessment Questions

Name: ...........................................  Date: .................  Mark: □

Answer TWO (2) only of the following questions.
You may write your answers on this question sheet or tell your trainer the answers.
All questions are the same value (5 marks).

Question 1: Give two reasons why farmers often distrust pesticide retailers.
...........................................................................................................................................................................................
...........................................................................................................................................................................................
...........................................................................................................................................................................................

Question 2: Give two reasons why farmers will choose a particular pesticide retailer.
...........................................................................................................................................................................................
...........................................................................................................................................................................................
...........................................................................................................................................................................................

Question 3: Give three of the elements of good service.
...........................................................................................................................................................................................
...........................................................................................................................................................................................
...........................................................................................................................................................................................

Question 4: Give three of the elements of bad service.
...........................................................................................................................................................................................
...........................................................................................................................................................................................
...........................................................................................................................................................................................
Good Service = Good Business

• The retailer relies on customers (farmers) for the success of his shop. The more customers that the retailer can attract, the more the shop will prosper.

• Farmers are often suspicious of private pesticide retailers. They consider that:
  • Pesticides from retailers are of poor quality and expensive
  • Retailers provide no or poor advice on the selection and use of pesticides
  • The retailer just wants to take their money.

• Customers look for service when they come to a shop – if they receive good service, they will use that shop rather than another shop.

• Farmers will choose a retailer where:
  • Pesticides are of good quality and reasonably priced
  • Good advice on the selection and use of pesticides is provided
  • The farmer is treated as a valued friend.

• Once farmers discover such a retailer, they will use that retailer rather than competitors that do not provide such good service, and they will tell their friends.

The Elements of Good Service

• A well-lit, clean, and tidy shop, with products and posters attractively displayed.

• Treating the farmer as a friend and establishing trust.

• Knowledge of the farmers’ problems, and being able to provide appropriate solutions.

• The ability to ask questions and to listen to the farmer so as to identify the problem.

• Up-to-date knowledge of the latest products, recommendations, and all agronomic practices.

• Knowledge of the effect of agronomic practices on pest levels.

• Good quality, practical advice, including the economics of pesticide use, which is easily understood and remembered by the farmer.

• Constant availability of genuine, good quality products at reasonable prices, with prices clearly marked.

• Honesty and establishing trust in all dealings with the farmer.
The Elements of Bad Service

- A dark, dirty, cluttered shop, with products badly displayed.
- Leaking or damaged product containers, or with no labels.
- Treating the farmer as ignorant, and as someone to just take money from.
- Providing no advice or help to the farmer in the selection of an appropriate solution or product for his problem.
- Selling any pesticide, regardless of its suitability or the problem, because the farmer asks for the cheapest product, or because the retailer makes the most profit on that product.
- Selling counterfeit, illegal, poor quality, out-of-date, or adulterated pesticides.
- Dishonesty.
SESSION 2:
CROP AND PEST MANAGEMENT
Lesson Plan

<table>
<thead>
<tr>
<th>Materials needed:</th>
</tr>
</thead>
<tbody>
<tr>
<td>☑ Flipchart stands.</td>
</tr>
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<tr>
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</tr>
<tr>
<td>☑ Coloured cards.</td>
</tr>
<tr>
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</tr>
<tr>
<td>☑ Masking tape.</td>
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</tbody>
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<table>
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<tr>
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<td>100 minutes</td>
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</table>

<table>
<thead>
<tr>
<th>Intended audience:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pesticide Retailers</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Preparation:</th>
</tr>
</thead>
<tbody>
<tr>
<td>☑ Flipchart with the session title “Crop and Pest Management”, and the Session Objectives.</td>
</tr>
<tr>
<td>☑ Flipchart: <em>Pests, Diseases and Weeds from Fact Sheet.</em></td>
</tr>
<tr>
<td>☑ Flipchart: <em>Crop Management and Yield Potential from Fact Sheet.</em></td>
</tr>
<tr>
<td>☑ Flipchart: <em>Main Agronomic Factors for a Healthy Crop from Fact Sheet.</em></td>
</tr>
<tr>
<td>☑ Flipchart: <em>Methods of Pest Management from Fact Sheet.</em></td>
</tr>
<tr>
<td>☑ Print off sufficient Attendance Record sheets.</td>
</tr>
<tr>
<td>☑ Print off sufficient Assessment Question sheets.</td>
</tr>
<tr>
<td>☑ Print off sufficient Fact Sheets for participants.</td>
</tr>
<tr>
<td>☑ Organise venue and seating arrangements.</td>
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Attendance Record

As participants arrive, ask them to enter their name and other information on the Attendance Record. There is also a column on the form to enter their marks from the Assessment Questions at the end of the training session.
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<thead>
<tr>
<th>Time</th>
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<tbody>
<tr>
<td>Attention:</td>
<td>Welcome the retailers to the session.</td>
</tr>
<tr>
<td>Ask:</td>
<td>Who completed the <em>Elements of Good Service: Retailer Self-Assessment Form</em>?</td>
</tr>
<tr>
<td></td>
<td>Can anyone say where they identified they could do better?</td>
</tr>
<tr>
<td></td>
<td>What actions are needed to achieve these improvements?</td>
</tr>
<tr>
<td></td>
<td>Take responses from 2-3 participants.</td>
</tr>
<tr>
<td>Say:</td>
<td>That retailers should continually assess their business and the level of service they provide to customers. There is room for improvement.</td>
</tr>
<tr>
<td>Title:</td>
<td>Refer to the Title Flipchart and tell participants that this training session will cover <em>Crop and Pest Management</em>.</td>
</tr>
<tr>
<td>Credibility:</td>
<td>Give an example from the Fact Sheet of how crop management affects pest levels.</td>
</tr>
<tr>
<td>Objectives:</td>
<td>Refer to the Title Flipchart with the Lesson Objectives.</td>
</tr>
<tr>
<td></td>
<td>By the end of the session, participants will be able to:</td>
</tr>
<tr>
<td></td>
<td>• State why retailers need to know about both crop management and pest management.</td>
</tr>
<tr>
<td></td>
<td>• Understand the relationships between crop management and pest management.</td>
</tr>
<tr>
<td></td>
<td>• Define what are pests, insect pests, diseases, and weeds.</td>
</tr>
<tr>
<td></td>
<td>• Describe the different categories and methods of pest management.</td>
</tr>
<tr>
<td>Benefits:</td>
<td>Knowing about the relationship between crop management and pest management enables retailers to give better advice to farmers.</td>
</tr>
<tr>
<td>Direction:</td>
<td>• Activities begin with a short presentation on why retailers need to know about crop management, and how it is linked to good business.</td>
</tr>
<tr>
<td></td>
<td>• This is followed by a full group brainstorming on common pest problems in the locality.</td>
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<tr>
<td></td>
<td>• Another full group brainstorming which identifies the major elements of crop management then leads into a workgroup session which examines the effects of crop management on pest levels.</td>
</tr>
<tr>
<td></td>
<td>• The session concludes with a presentation which explains the different categories and methods of pest management, and links these to crop management.</td>
</tr>
</tbody>
</table>
## Delivery

**Explanation, Demonstration, Exercise, and Guidance:**

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 10 minutes</td>
<td><strong>Presentation--Why Retailers Need to Know About Crop Management</strong></td>
</tr>
<tr>
<td></td>
<td>Refer to the questions about farmers in the Retailer Self-Assessment Form.</td>
</tr>
<tr>
<td></td>
<td>Say that we will now look in more detail at the sort of advice that will be</td>
</tr>
<tr>
<td></td>
<td>Say that we will now look in more detail at the sort of advice that will be</td>
</tr>
<tr>
<td></td>
<td>most helpful to farmers.</td>
</tr>
<tr>
<td></td>
<td>Present Why Retailers Need to Know About Crop Management from the Fact Sheet.</td>
</tr>
<tr>
<td></td>
<td>Compare the points in the Fact Sheet to the flipchart of responses from</td>
</tr>
<tr>
<td></td>
<td>Session 1, Activity 3-4, Problems Affecting Retailers and their Farmer</td>
</tr>
<tr>
<td></td>
<td>Customers in the Safe Handling, Sale, and Effective Use of Pesticides.</td>
</tr>
<tr>
<td></td>
<td>Explain that later in this session we will start to examine all these other</td>
</tr>
<tr>
<td></td>
<td>measures.</td>
</tr>
<tr>
<td></td>
<td><strong>Ask:</strong></td>
</tr>
<tr>
<td></td>
<td>• How will it improve your business if a farmer comes to your shop to buy</td>
</tr>
<tr>
<td></td>
<td>a pesticide, and you advise him on crop management and non-pesticide control methods instead?</td>
</tr>
<tr>
<td>2. 10 minutes</td>
<td><strong>Brainstorming - Pests, Diseases, and Weeds</strong></td>
</tr>
<tr>
<td></td>
<td>Say that before we look at the different methods of pest management, we</td>
</tr>
<tr>
<td></td>
<td>need to understand exactly what we mean by an insect pest, disease or weed</td>
</tr>
<tr>
<td></td>
<td>as this will help us to understand the various types of control methods.</td>
</tr>
<tr>
<td></td>
<td>Ask participants to brainstorm all the pests that affect humans, animals or</td>
</tr>
<tr>
<td></td>
<td>crops in their part of the country.</td>
</tr>
<tr>
<td></td>
<td>Record their responses on the flipchart.</td>
</tr>
<tr>
<td></td>
<td><strong>Trainer Note:</strong></td>
</tr>
<tr>
<td></td>
<td>To simplify reviewing the responses, list them in the various pest categories of Pests, Diseases and Weeds in the Fact Sheet, although without using a heading.</td>
</tr>
<tr>
<td></td>
<td>Put all the insect pests into one column, weeds into another, etc as the responses come from participants. Then put in the headings afterwards, when reviewing the responses.</td>
</tr>
<tr>
<td></td>
<td><strong>Say</strong></td>
</tr>
<tr>
<td></td>
<td>Say that we now can step back and review this list</td>
</tr>
<tr>
<td></td>
<td><strong>Explain</strong></td>
</tr>
<tr>
<td></td>
<td>Explain that it is useful for this course and our work together that we all</td>
</tr>
<tr>
<td></td>
<td>have a common, and correct, understanding of how we define and describe insect pests, weeds, and diseases. These are the definitions that form the basis of our next sessions.</td>
</tr>
<tr>
<td></td>
<td><strong>Present</strong></td>
</tr>
<tr>
<td></td>
<td>Present one by one the points on Pests, Diseases and Weeds in the Fact Sheet, referring to the brainstormed list on the flipchart, correcting, deleting and adding as appropriate.</td>
</tr>
</tbody>
</table>
### Session 2: Crop and Pest Management

#### 3. Brainstorming—Elements of Crop Management

**15 minutes**

**Explain** that we will now spend some time looking at crop management and pest management, and how one can affect the other.

**Say** that we will start by looking at the elements of crop management.

**Present** *Crop Management and Yield Potential* from the Fact Sheet.

**Ask:**
- What are major agronomic operations, practices, and activities of crop management that are required to produce a healthy crop with a high yield potential?

**List** participant responses on the flipchart, using *Main Agronomic Factors for a Healthy Crop* from the Fact Sheet as a checklist.

#### 4. Work Groups – Effects of Crop Management on Pest Levels

**15 minutes**

**Say** that now we have identified the major elements of crop management, we will look at how these can affect pest levels.

**Work Group Task:**
- Identify how the elements of crop management identified in the previous activity could affect pest levels.
- For example, how could variations in plant spacing and density affect insect pest, disease, or weed levels.

#### 5. Work Group Reports – Effects of Crop Management on Pest Levels

**20 minutes**

After the groups have completed the task, **ask** each group to report.

**Summarise** the reports using *The Effects of Crop Management on Pest Levels* from the Fact Sheet as a checklist of main headings.

**Trainer Note:**
- Do not go into detail from the Fact Sheet, cover only the main headings.

**Say** that details of the effects of crop management on pest levels, with examples, are in the Fact Sheet they will receive at the end of the session. Participants should study this in their own time.

#### 6. Presentation – Methods of Pest Management

**10 minutes**

**Explain**, using *Methods of Pest Management*, from the Fact Sheet, that for simplicity these practices are grouped under various headings.

**Emphasise** that if you give the sort of information and advice that we have discussed today, then the farmer will trust you and know that you are doing your best to help him.
### Finish

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Summary:</strong></td>
<td><strong>1 minute</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Include</strong> as major messages:</td>
</tr>
<tr>
<td></td>
<td>• Why retailers need to know about crop management</td>
</tr>
<tr>
<td></td>
<td>• The broad definition of a pest</td>
</tr>
<tr>
<td></td>
<td>• The major types of pests</td>
</tr>
<tr>
<td></td>
<td>• Pest management only protects the crop, it does not increase yield</td>
</tr>
<tr>
<td></td>
<td>potential</td>
</tr>
<tr>
<td></td>
<td>• The main elements of growing a healthy crop</td>
</tr>
<tr>
<td></td>
<td>• The different categories and methods of pest management</td>
</tr>
<tr>
<td><strong>Questions:</strong></td>
<td><strong>1 minute</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Ask</strong> if everyone understands or if there are any additional questions.</td>
</tr>
<tr>
<td></td>
<td>Answer these provided they are relevant.</td>
</tr>
<tr>
<td></td>
<td><strong>Ask</strong> if the session objectives were met</td>
</tr>
<tr>
<td><strong>Evaluation:</strong></td>
<td><strong>12 minutes</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Hand out</strong> the Assessment Sheet and ask participants to complete two of</td>
</tr>
<tr>
<td></td>
<td>the questions.</td>
</tr>
<tr>
<td></td>
<td><strong>Collect</strong> the Assessment Sheet for later marking and entering the marks</td>
</tr>
<tr>
<td></td>
<td>on the Attendance Record.</td>
</tr>
<tr>
<td><strong>Next step:</strong></td>
<td><strong>1 minute</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Say</strong> that in this session we learned about the effects of crop</td>
</tr>
<tr>
<td></td>
<td>management on pest levels. In the next session, we will investigate this</td>
</tr>
<tr>
<td></td>
<td>further.</td>
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<tr>
<td></td>
<td><strong>Hand out</strong> the Fact Sheet to participants.</td>
</tr>
</tbody>
</table>
Assessment Questions

Answer TWO (2) only of the following questions. You may write your answers on this question sheet or tell your trainer the answers. All questions are the same value (5 marks).

Question 1: Give two types of advice that farmers will welcome.
...........................................................................................................................................................................................
...........................................................................................................................................................................................
...........................................................................................................................................................................................

Question 2: What is the broad definition of a pest.
...........................................................................................................................................................................................
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Question 3: Give four of the factors for growing a healthy crop.
...........................................................................................................................................................................................
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Question 4: Give three examples of cultural control that affect pest levels.
...........................................................................................................................................................................................
...........................................................................................................................................................................................
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FACT SHEET

Why Retailers Need to Know about Crop Management

- Farmers will welcome advice that helps them to:
  - Minimise pesticide use
  - Apply pesticides correctly
  - Minimise the costs of pest management
  - Minimise the costs of crop production
  - Increase crop yields
  - Increase income from crop production

- If you give this sort of advice, then the farmer will trust you and know that you are doing your best to help him. This will attract him, and his friends, to your shop.

- Pest management is part of crop management. Each affects the other, and neither can be considered on its own.

- In order to provide helpful advice to farmers, retailers need to know about all methods of pest and crop management, and how pesticides fit into the overall management programme.

- Pesticides were once seen as the only answer to most pest problems, but pesticides are just one of many control measures that are available, and must be used carefully so as to fit in with these other measures.

Pest, Diseases and Weeds

A pest is any organism that:
- Competes with humans, domestic animals or desirable plants for food or water.
- Injures humans, animals, desirable plants, structures or possessions.
- Spreads disease to humans, animals or plants.
- Annoys humans or animals.

A PEST CAN BE BROADLY DEFINED AS:
ANY ORGANISM WHICH ADVERSELY AFFECTS MAN, HIS CROPS, HIS LIVESTOCK, OR ANYTHING HE CONSIDERS TO BE OF VALUE

The types of pests include:
- Insects (aphids, beetles, caterpillars, ants, mosquitoes, cockroaches, etc).
- Insect-like organisms (mites, spiders, ticks).
- Weeds (any plant growing where it is not wanted)
- Microbial organisms that cause disease (bacteria, fungi, nematodes, viruses).
- Molluscs (slugs, snails)
- Vertebrates (birds, rats)
Crop Management and Yield Potential

- The genetic makeup of the seed determines the potential yield of a crop.
- Pest management, good or bad, has no effect on this potential.
- The final yield is determined by the yield potential of the seed, and how well crop and pest management are implemented.

**PEST MANAGEMENT DOES NOT INCREASE THE YIELD POTENTIAL OF A CROP. IT ONLY PROTECTS THE CROP AGAINST LOSS OR DAMAGE.**

- The primary objective of crop production is to use good seed and good crop management to grow a healthy crop with maximum yield potential.
- A strong, healthy crop is more able to withstand the effects of pest attack.

Understanding how a crop grows and develops, and its place in the cropping system, is thus essential for successful pest management.

Main Agronomic Factors for a Healthy crop

**Growing a strong, healthy crop is affected by:**
- Quality of site and soil texture
- Crop rotation
- Land preparation
- Seed quality
- Time of planting
- Plant spacing and density
- Weeding
- Timing and amount of fertiliser
- Timing and amount of irrigation

And for some crops also:
- Transplanting
- Thinning
- Pruning
- Ridging
- Trellising

The Effects of Crop Management on Pest Levels

**Quality of site and soil texture**
Stony sites, areas with shallow soils or poor soil texture should be avoided, as these are often associated with a hard pan, which restricts root development. Soils with poor drainage should also be avoided.

**Crop rotation**
Crop rotations and the previous crop(s) can affect the growth of the current crop. Crop rotations help to minimise the build-up of soil pests and pathogens, such as nematodes, weeds, diseases such as Fusarium, and root rots such as *Phytophthora* and *Pythium*. 
Land Preparation
Appropriate preparation of a good seedbed is important to assist seeds to germinate and seedlings to grow quickly. Good land preparation also breaks any hard pans and opens up the soil, allowing roots to penetrate fully to obtain water and nutrients. Improved soil tilth and drainage can reduce nematode levels. Tillage can destroy the pupae and overwintering stages of many insect pests. However, the advantages of tillage should be weighed against other advantages gained through no-till agriculture (build-up of organic matter, water retention, soil conservation, lower labour etc).

Seed / Root Stock Quality
The seed / root stock is the basis of the crop. Good seed produces healthy plants with high yield potential and high produce quality. Clean, certified seed or root stock is free of both diseases and weed seeds.

Time of planting
Planting at the correct time promotes healthy plant growth and avoids periods of attack by major pests. For example early planting of cotton to avoid late season bollworm attack.

Plant spacing and density
Plants sown too close together are weaker and more susceptible to pest attack. Too close spacing also provides suitable micro-climate conditions within the crop for the build-up of pests and diseases, such as aphids and whitefly in cotton, blight in tomatoes, downy mildew in cucumbers, and aphids, mites, blight, mildew, and scab in apple.

Weeding
Weeds compete with the crop for sunlight, water and nutrients. Slow growing seedlings, such as cotton, compete poorly with weeds, and the plants are weak and stunted. Weed seeds can contaminate the crop produce, as in wheat. Weeds can attract pests, such as fruitworm in tomato. Tall weeds in orchards can attract rodents, but a low cover of grass or weeds between trees avoids the dusty conditions which promotes red spider mite.

Timing and amount of fertiliser
Wrongly timed or excess fertiliser can promote vegetative and dense plant growth which encourages insect pests such as aphids and whitefly, and diseases such as mildews and blights.

Timing and amount of irrigation
Similarly to fertiliser, wrongly timed or excess irrigation can promote vegetative plant growth which encourages pests and diseases such as aphids and whitefly in cotton, blight in tomatoes, and spider mite, aphids, and blight in apple.

Other Factors

Transplanting
Ensure seed beds are disease, insect pest, and nematode free to avoid transferring these pests to the field.

Thinning of seedlings
When seedlings are not thinned or thinned too late, the plants are weaker and more susceptible to pest attack.

Pruning of tree and vine crops
Allows more air and light, and lowers humidity so that diseases (eg blight, mildew, scab) and insect pests (eg aphid) are discouraged.

Removal of Infested Plants / Branches
Infested plants and branches provide sources of disease infestation. Remove and burn all such plants and branches to control the spread of diseases.
Post Harvest Sanitation
Crop residues left in the field can provide food and shelter for over-wintering pests (eg pink bollworm, cotton stainer, codling moth) and diseases (eg blight, mildew).

General
The main direct problems caused to pest management by poor crop management are vegetative, tall, or dense growth.

A vegetative or dense crop has a climate inside it which promotes the development of pests such as aphid, jassid and whitefly, and diseases such as blight and mildews. In addition, spraying is less effective as spray penetration and coverage of all the plant surfaces is poor, and it is difficult for the spray operator to walk through the crop.

There is thus the double effect of encouraging pests while reducing the effectiveness of pesticide control measures. Pests are much more difficult to control effectively in a dense crop.

Methods of Pest Management

Cultural Control
Practices which optimise crop growth, or produce unfavourable conditions for insect pests, diseases, weeds
- Crop rotation
- Time of planting
- Thinning of seedlings
- Timing and amount of fertiliser
- Timing and amount of irrigation
- Plant spacing and density
- Pruning of tree and vine crops
- Trap crops

Sanitation
- Practices which remove or prevent access to food and shelter
- Using certified, clean seed
- Ploughing-in of crop residues
- Collection and burning of crop residues

Mechanical Control
- Involves use of machines or other tools
- Soil cultivation and tillage
- Traps

Resistant Crop Varieties
- Have in-built resistance or tolerance to attack by certain pests

Biological Control
- The use of natural enemies of pests – predators, parasites and diseases

Chemical Control
- The use of pesticides, which kill pests or control their activity
SESSION 3: INTEGRATED PEST MANAGEMENT (IPM)
## Lesson Plan

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<td>Pesticide Retailers</td>
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<tr>
<th>Preparation:</th>
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<tbody>
<tr>
<td>✓ Flipchart with the session title “Integrated Pest Management (IPM)”, and the Session Objectives.</td>
</tr>
<tr>
<td>✓ Flipchart: <em>Pest Control, Pest Management, and Integrated Pest Management (IPM)</em> from the Fact Sheet.</td>
</tr>
<tr>
<td>✓ Flipchart: <em>Components of IPM - The IPM Circle</em> from the Fact Sheet.</td>
</tr>
<tr>
<td>✓ Print off sufficient Attendance Record sheets.</td>
</tr>
<tr>
<td>✓ Print off sufficient Assessment question sheets.</td>
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### Attendance Record

As participants arrive, ask them to enter their name and other information on the Attendance Record. There is also a column on the form to enter their marks from the Assessment Questions at the end of the training session.
### Session 3: Integrated Pest Management (IPM)

#### Set up/Introduction  
5 minutes

<table>
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<tr>
<th>Time</th>
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</tr>
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<tbody>
<tr>
<td>Attention:</td>
<td><strong>Welcome the retailers to the session.</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Ask:</strong></td>
</tr>
<tr>
<td></td>
<td>• Who has heard of Integrated Pest Management or IPM? Put up your hands if you have.</td>
</tr>
<tr>
<td></td>
<td>• Can anyone explain what is meant by Integrated Pest Management or IPM?</td>
</tr>
<tr>
<td></td>
<td><strong>Take</strong> answers from several participants.</td>
</tr>
<tr>
<td>Title:</td>
<td><strong>Refer</strong> to the Title Flipchart and tell participants that this training session will cover <em>Integrated Pest Management (IPM).</em></td>
</tr>
<tr>
<td></td>
<td><strong>Say</strong> that in this session we will be looking at what is meant by IPM in practice.</td>
</tr>
<tr>
<td>Credibility:</td>
<td><strong>Give</strong> participants a local example where following an IPM programme has been beneficial to farmers.</td>
</tr>
<tr>
<td>Objectives:</td>
<td><strong>Refer</strong> to the Title Flipchart with the Lesson Objectives.</td>
</tr>
<tr>
<td></td>
<td><strong>By the end of the session, participants will be able to:</strong></td>
</tr>
<tr>
<td></td>
<td>• Explain the differences between pest control, pest management, and Integrated Pest Management (IPM).</td>
</tr>
<tr>
<td></td>
<td>• Describe alternative non-chemical pest management practices that could be used in certain local crops as part of an overall crop/pest management (IPM) programme.</td>
</tr>
<tr>
<td></td>
<td>• Explain the principles of the economics of pest management.</td>
</tr>
<tr>
<td></td>
<td>• Ask questions in a structured manner so as to identify a farmer problem and to provide appropriate advice.</td>
</tr>
<tr>
<td>Benefits:</td>
<td><strong>Say</strong> that IPM is a rational approach to pest management that is being increasingly encouraged by both governments and private sectors, and so pesticide retailers also need to understand and promote IPM.</td>
</tr>
<tr>
<td>Direction:</td>
<td>• Following an examination of the differences between pest control, pest management, and IPM, this session takes the relationship between crop and pest management a stage further in a work group activity which identifies non-pesticide practices that local farmers use to control pests.</td>
</tr>
<tr>
<td></td>
<td>• This leads into presentations on the IPM Circle and the Economics of Pest Management.</td>
</tr>
<tr>
<td></td>
<td>• The final activity is a ‘What If’ exercise which gives participants the opportunity to think about and practice asking questions of farmers to identify a problem and to give appropriate advice.</td>
</tr>
</tbody>
</table>
## Delivery

### Explanation, Demonstration, Exercise, and Guidance:

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td><strong>Discussion – Pest Control, Pest Management and Integrated Pest Management</strong></td>
</tr>
<tr>
<td>10 minutes</td>
<td><strong>Ask:</strong></td>
</tr>
<tr>
<td></td>
<td>• Can anyone explain the differences between Pest Control, Pest Management, and Integrated Pest Management (IPM).</td>
</tr>
<tr>
<td></td>
<td><strong>Take</strong> answers from several participants.</td>
</tr>
<tr>
<td></td>
<td><strong>Summarise</strong> the answers, using <em>Pest Control, Pest Management, and Integrated Pest Management (IPM)</em> from the Fact Sheet as a checklist.</td>
</tr>
<tr>
<td></td>
<td>If there are no answers, <strong>present</strong> the contents of the Fact Sheet section.</td>
</tr>
<tr>
<td></td>
<td><strong>Work Groups – Local Methods of Non-Pesticide Pest Control</strong></td>
</tr>
<tr>
<td>2.</td>
<td><strong>Remind</strong> participants of Activity 4-5 of the previous session – <em>Effects of Crop Management on Pest Levels</em>.</td>
</tr>
<tr>
<td>30 minutes</td>
<td><strong>Say</strong> that we will now look at some of these crop management elements in practice.</td>
</tr>
<tr>
<td></td>
<td><strong>Ask</strong> participants for examples of the most common local crops (e.g., cotton, apple, date palm, tomatoes).</td>
</tr>
<tr>
<td></td>
<td><strong>Assign</strong> one crop to each work group, and give the following task.</td>
</tr>
<tr>
<td></td>
<td><strong>Work Group Task:</strong></td>
</tr>
<tr>
<td></td>
<td>• For the crop assigned to your table, identify any non-pesticide practices that local farmers use to manage pest levels.</td>
</tr>
<tr>
<td></td>
<td>• They have 10 minutes for the task.</td>
</tr>
<tr>
<td></td>
<td>When groups have completed the task, <strong>ask</strong> each one to report in turn.</td>
</tr>
<tr>
<td></td>
<td><strong>Say</strong> that these practices show that farmers are already practicing IPM. In fact, farmers have been practicing IPM for hundreds of years, before the introduction of pesticides.</td>
</tr>
<tr>
<td></td>
<td><strong>Emphasise</strong> that pesticides should only be used when necessary, and only when non-pesticide methods have not been sufficient to provide adequate control.</td>
</tr>
<tr>
<td></td>
<td><strong>Trainer Note:</strong></td>
</tr>
<tr>
<td></td>
<td>Typical examples of non-pesticide practices for several crops are given in <em>Non-Pesticide Methods of Pest Management</em> in the Fact Sheet.</td>
</tr>
<tr>
<td></td>
<td><strong>Explain</strong> that these are examples from around the world, and not all practices are appropriate in all situations.</td>
</tr>
<tr>
<td>3.</td>
<td>Presentation – Components of IPM - The IPM Circle</td>
</tr>
<tr>
<td>----</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>10 minutes</td>
<td>Show the flipchart with the IPM Circle.</td>
</tr>
<tr>
<td></td>
<td><strong>Explain:</strong></td>
</tr>
<tr>
<td></td>
<td>• That all the components together make up an IPM strategy in a crop.</td>
</tr>
<tr>
<td></td>
<td>• Not all components will be in every IPM strategy.</td>
</tr>
<tr>
<td></td>
<td>• External Factors are those largely outside the control of the farmer. For example, weather (temperature, rainfall, humidity, wind), quality of irrigation water, quarantine and other government regulations.</td>
</tr>
<tr>
<td></td>
<td><strong>Emphasise</strong> that pesticides are only one component or tool of many that are available to a farmer.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>10 minutes</td>
<td>Say that many of the non-pesticide methods of pest management we have discussed have no, or little, extra cost to the farmer. However, when pesticides are used as one of the IPM tools, they can have a high cost.</td>
</tr>
<tr>
<td></td>
<td><strong>Present</strong> <em>Economic Principles of Pest Management</em> from the Fact Sheet.</td>
</tr>
<tr>
<td></td>
<td><strong>Ask:</strong> Can you describe an example of when farmers have wasted their money, and reduced their profit, with unnecessary or inefficient or pesticide use?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>5.</th>
<th>“What if” Situations – Giving Practical Advice to Farmers</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 minutes</td>
<td><strong>Trainer Note:</strong></td>
</tr>
<tr>
<td></td>
<td>• The situations below are intended to reinforce the concept of good service = good business among participants.</td>
</tr>
<tr>
<td></td>
<td>• The situations are somewhat artificial, but are intended to illustrate the principles of diagnosing problems in a logical manner, in dealing with farmers, and for participants to put these principles into practice.</td>
</tr>
<tr>
<td></td>
<td>• The situations are not intended for participants to show their detailed technical knowledge.</td>
</tr>
<tr>
<td></td>
<td>• It may also be necessary to think of other “What If” situations if the following do not suit local crops and conditions. If this is necessary, then the new situations should concentrate on illustrating principles rather than technical details.</td>
</tr>
<tr>
<td></td>
<td><strong>Present</strong> the following “What if” situation to participants:</td>
</tr>
<tr>
<td></td>
<td><strong>“What if” Situation</strong></td>
</tr>
<tr>
<td></td>
<td><em>What if a farmer comes into the shop to ask how to control pests in tomatoes.</em></td>
</tr>
<tr>
<td></td>
<td>• <em>What questions would you ask the farmer?</em></td>
</tr>
<tr>
<td></td>
<td>• <em>What advice would you give the farmer?</em></td>
</tr>
<tr>
<td></td>
<td>Give participants 2-3 minutes to think of the questions they would ask and the advice they might give the farmer.</td>
</tr>
<tr>
<td></td>
<td><strong>First ask</strong> different participants what questions they would ask the farmer.</td>
</tr>
</tbody>
</table>
Then ask what the appropriate advice might be given to the farmer.

Take a response from one participant, then ask if anyone would approach the problem differently, or give different advice.

Trainer Note:
In the above situation, appropriate questions and advice would include:

Has the tomato crop already been planted?

If no:
- Give advice on seed variety, land preparation, plant spacing, fertilizer, irrigation, etc., and what pests to expect and suitable methods of control.

If yes:
- What pest(s) are present? (If the farmer doesn’t know the name, ask for a description of the pest.)
- Has he brought a sample of the pest or disease?
- How many of each type of pest has the farmer seen?
- What growth stage are the pest(s) in?
- What growth stage are the tomatoes in?
- What damage does the farmer see the pest(s) inflicting?
- What, if any, steps has the farmer already taken?

Then present a second “What if” situation.

“What if” Situation

What if a farmer comes into the shop to ask that you come to see his cotton field, which is infested with aphids. You go to the field.
- What will you look for?
  - On the basis of what you find, what advice would you give the farmer?

Take responses from several people, allowing some debate for each question.

Then give your own advice.

Trainer Note:
In the above situation it is best that the dealer
- Looks for:
  - Confirms that the problem is aphids.
  - The level of aphid infestation, and how much of the field is affected.
  - Damage to the plants.

- Gives advice to farmer:
  - If aphid numbers are low, and beneficial insects are present, then watch and wait for 3-4 days to see if the beneficial insects reduce the aphid numbers.
Repeat for the final “what if” situation.

“What if” Situation

What if a farmer comes into the shop to ask for help with his mango orchard. He has brought in leaves from one tree to show you.

• What would you do?

Take a response from one participant, then ask if anyone would approach the problem differently, or give different advice.

Trainer Note:

In the above situation it is best that the dealer take steps that would include:
• Determine whether insects or disease have damaged the leaves.
• Ask if only 1 or 2 trees have been affected, or most trees in the orchard.
• Ask if the infestation is over the whole tree or if only parts of the tree are affected.
• If only 1 or 2 trees are affected, advise the farmer to spot spray the affected trees with a suitable pesticide, not the whole orchard.

Ask:
What are the lessons from this activity with regard to:
• Dealing with farmers?
• IPM?

Take responses from several participants.
## Finish

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Summary:</strong></td>
<td><strong>Include</strong> as major messages:</td>
</tr>
<tr>
<td>1 minute</td>
<td>• Pest control, Pest management, and Integrated Pest Management (IPM)</td>
</tr>
<tr>
<td></td>
<td>• Local non-pesticide pest management practices</td>
</tr>
<tr>
<td></td>
<td>• The IPM Circle</td>
</tr>
<tr>
<td></td>
<td>• The economics of pest management</td>
</tr>
<tr>
<td></td>
<td>• The lessons learnt from the “What If” activity with regard to dealing with farmers.</td>
</tr>
<tr>
<td><strong>Questions:</strong></td>
<td><strong>Ask</strong> if everyone understands or if there are any additional questions. Answer these provided they are relevant.</td>
</tr>
<tr>
<td>1 minute</td>
<td><strong>Ask</strong> if the session objectives were met</td>
</tr>
<tr>
<td><strong>Evaluation:</strong></td>
<td><strong>Hand out</strong> the Assessment Sheet and ask participants to complete two of the questions.</td>
</tr>
<tr>
<td>12 minutes</td>
<td><strong>Collect</strong> the Assessment Sheet for later marking and entering the marks on the Attendance Record.</td>
</tr>
<tr>
<td><strong>Next step:</strong></td>
<td><strong>Say</strong> that in these last two sessions we have learned about how crop management practices can affect pest levels, and also about IPM. With this knowledge, participants can offer advice that will benefit their customers and so improve their business.</td>
</tr>
<tr>
<td>1 minute</td>
<td><strong>Hand out</strong> the Fact Sheet to participants.</td>
</tr>
</tbody>
</table>
Assessment Questions

Name: .............................................  Date: ...............  Mark: [ ]

Answer TWO (2) only of the following questions. You may write your answers on this question sheet or tell your trainer the answers. All questions are the same value (5 marks).

Question 1: Explain what is meant by IPM.
...........................................................................................................................................................................................
...........................................................................................................................................................................................
...........................................................................................................................................................................................

Question 2: What is meant by external factors in the components of IPM? Give one example.
...........................................................................................................................................................................................
...........................................................................................................................................................................................
...........................................................................................................................................................................................

Question 3: How is profit from crop production calculated?
...........................................................................................................................................................................................
...........................................................................................................................................................................................
...........................................................................................................................................................................................

Question 4: Before selling a pesticide or giving advice to a farmer, the retailer must do what?
...........................................................................................................................................................................................
...........................................................................................................................................................................................
...........................................................................................................................................................................................
Pest Control, Pest Management and Integrated Pest Management

- **Pest control:**
  Corrective measure, pesticides or other methods are used when pests are already or are likely to become a problem, often attempts to reduce population to lowest possible level.

- **Pest management:**
  Includes preventative methods as well; manages populations so that they are below damaging levels.

- **Integrated pest management:**
  Uses all available pest management techniques in an overall crop / pest management programme which considers all the potential pests. Pesticides are applied only when absolutely necessary, and an important part of IPM is determining if and when pesticides are actually needed.

Examples of Cultural, Mechanical, and Sanitation Methods of Pest Management

These examples are from around the world. Not all practices will be appropriate for all situations, but the list gives an indication of possible practices that can be tried.

<table>
<thead>
<tr>
<th>All Crops</th>
<th>Practices and Management of:</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Crops</td>
<td>Implement optimum crop management practices to produce healthy and strong plants, which are more resistant/tolerant to insects, diseases and weeds.</td>
</tr>
<tr>
<td><strong>Tomatoes</strong></td>
<td></td>
</tr>
<tr>
<td>Tolerant varieties</td>
<td>Nematodes, <em>Fusarium</em> wilt, <em>Verticillium</em> wilt, virus diseases, Early blight, Late blight, <em>Sclerotina</em>, Bacterial canker, Blossom end rot, Fruit cracking.</td>
</tr>
<tr>
<td>Crop rotation</td>
<td>Do not grow tomatoes on the same land for at least 3 years. Rotate with wheat, barley, maize, rice, chillies. Nematodes, <em>Fusarium</em> wilt, <em>Verticillium</em> wilt, Early blight, <em>Sclerotinia</em></td>
</tr>
<tr>
<td>Rotation with cereal crops</td>
<td>Nematodes</td>
</tr>
<tr>
<td>Rotation with rice</td>
<td><em>Sclerotinia</em></td>
</tr>
<tr>
<td>Avoid infested fields</td>
<td><em>Orobanche, Striga</em></td>
</tr>
<tr>
<td>Use certified seed</td>
<td>Disease free, weed seed free</td>
</tr>
<tr>
<td>Seedbed sterilisation / solarisation</td>
<td>Nematodes, all bacterial and fungal diseases</td>
</tr>
<tr>
<td>Establish seedbeds in light soil</td>
<td>Seedling wilt</td>
</tr>
<tr>
<td>Ensure seedbeds are free of nematodes and diseases to avoid transplanting infected plants into the field</td>
<td>All nematodes and diseases</td>
</tr>
<tr>
<td>Prevention Step</td>
<td>Potential Problems</td>
</tr>
<tr>
<td>-----------------</td>
<td>--------------------</td>
</tr>
<tr>
<td>Ensure good seedbed ventilation</td>
<td>All bacterial and fungal diseases</td>
</tr>
<tr>
<td>Avoid excessive seedbed irrigation</td>
<td>Seedling wilt, Damping off, Root rot</td>
</tr>
<tr>
<td>Fallow before planting</td>
<td>Keep field free of weeds or cover crops for at least 10 days (3 weeks is best) before planting to minimise Cutworm.</td>
</tr>
<tr>
<td>Deep ploughing of field</td>
<td>Orabanche, Cutworm</td>
</tr>
<tr>
<td>Avoid close plant spacing, which reduces ventilation and increases humidity</td>
<td>Plants growing too close together give an environment which encourages diseases and insects. All bacterial and fungal diseases, aphids, whitefly</td>
</tr>
<tr>
<td>Avoid damaging plants when transplanting</td>
<td>All diseases</td>
</tr>
<tr>
<td>Immediately gapfill cut seedlings after transplanting</td>
<td>Cutworm</td>
</tr>
<tr>
<td>Heavy irrigation / flooding of field prior to sowing</td>
<td>Nematodes, Cutworm, Sclerotinia</td>
</tr>
<tr>
<td>Avoid insufficient or irregular irrigation</td>
<td>Fruit cracking, Blossom end rot</td>
</tr>
<tr>
<td>Avoid excessive irrigation</td>
<td>Orabanche, Phytophthera root rot (late blight), Sclerotinia</td>
</tr>
<tr>
<td>Ensure balanced fertilisation</td>
<td>Diseases and insect pests</td>
</tr>
<tr>
<td>Nitrogen</td>
<td>Excess encourages Blossom end rot, Blight, Powdery mildew, Aphids, Whitefly (which transmit virus diseases, cause delay in maturity and reduced yield).</td>
</tr>
<tr>
<td>Potassium</td>
<td>Correct rate increases tolerance to diseases, essential for fruit formation</td>
</tr>
<tr>
<td>Sterilise manure / compost</td>
<td>Orabanche, other weeds, Nematodes, fungal and bacterial diseases.</td>
</tr>
<tr>
<td>Increase organic matter of soil</td>
<td>Nematodes</td>
</tr>
<tr>
<td>Control weeds</td>
<td>Virus diseases, Fruit worm</td>
</tr>
<tr>
<td>Plough crop residues under, as soon as harvesting completed</td>
<td>Late blight</td>
</tr>
<tr>
<td>Remove and burn crop residues</td>
<td>All diseases</td>
</tr>
<tr>
<td>Clean all equipment and feet before leaving field to avoid spreading pests and diseases</td>
<td>Nematodes, Verticillium wilt, Fusarium wilt, many diseases</td>
</tr>
</tbody>
</table>
## Haricot / Faba Beans

<table>
<thead>
<tr>
<th>Tolerant varieties</th>
<th>Orobanche.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crop rotation</td>
<td>Root rots, Orobanche</td>
</tr>
<tr>
<td>Late planting</td>
<td>Avoids infestation by Aphids (and Necrotic Yellows) from other legumes.</td>
</tr>
<tr>
<td>Irrigation</td>
<td>Avoid excess humidity in the soil and in the plant’s direct environment to reduce risk of disease such as root rot.</td>
</tr>
<tr>
<td>Ensure balanced fertiliser</td>
<td>Excess nitrogen makes plants more susceptible to diseases (Chocolate Spot) and insects (aphids = indirectly virus diseases). Correct rate of K increases tolerance to diseases.</td>
</tr>
<tr>
<td>Roguing</td>
<td>Reduces number of virus infected plants, and so spread of virus. Can also be applied to Orobanche if infestation is low.</td>
</tr>
<tr>
<td>Weeding</td>
<td>Removes potential hosts of aphids and virus.</td>
</tr>
</tbody>
</table>

## Vegetables general

<table>
<thead>
<tr>
<th>Site selection</th>
<th>Use land without a history of disease or weed pressure.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crop rotation</td>
<td>3 year crop rotation best for vegetables. At least one cereal crop before cultivating the same vegetable crop, or fallow for several months. Nematodes, diseases</td>
</tr>
<tr>
<td>Use certified seed</td>
<td>Disease free, weed seed free</td>
</tr>
<tr>
<td>Seedlings</td>
<td>Produce in greenhouse or tunnel to avoid insect infestations.</td>
</tr>
<tr>
<td>Tunnels / plastic sheets</td>
<td>Ventilate to reduce humidity and incidence of disease and insect pests.</td>
</tr>
<tr>
<td>Ensure balanced fertiliser</td>
<td>Excess nitrogen makes plants susceptible to pests and diseases. Correct rate of potassium increases tolerance to diseases, and essential for fruit formation.</td>
</tr>
<tr>
<td>Fallow before planting</td>
<td>Keep field free of weeds or cover crops for at least 10 days (3 weeks is best) before planting to minimise cutworm.</td>
</tr>
<tr>
<td>Ensure balanced irrigation</td>
<td>Diseases</td>
</tr>
<tr>
<td>Remove and burn infested plants</td>
<td>All diseases</td>
</tr>
<tr>
<td>Remove and burn crop residues</td>
<td>All diseases</td>
</tr>
</tbody>
</table>
**Clean all equipment and feet before leaving field to avoid spreading pests and diseases**

Nematodes, *Verticillium* wilt, *Fusarium* wilt, many diseases, Red spider mite

**Clean and disinfect all equipment at the end of the season**

Avoids carry-over, spreading, to the following season. *Verticillium* wilt, *Fusarium* wilt, many diseases

**Cotton**

<table>
<thead>
<tr>
<th>Rotation with cereals.</th>
<th><em>Fusarium</em> wilt, Bacterial blight, seedling diseases.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rotation with soyabean</td>
<td>Bacterial blight, Root knot nematode.</td>
</tr>
<tr>
<td>Adjacent crops</td>
<td>Avoid growing cotton close to wheat, melon, cucumber, pumpkins, onion. Aphid, Thrips, Whitefly</td>
</tr>
<tr>
<td>Land preparation</td>
<td>Kills and exposes pests such as Cutworm, Bollworm. Fine seedbed allows plants to germinate and grow strongly, increasing tolerance to pest attack.</td>
</tr>
<tr>
<td>Resistant varieties</td>
<td>Jassid, Mites, Bollworm, Aphid, Whitefly, Bacterial blight, <em>Fusarium</em> wilt</td>
</tr>
<tr>
<td>Certified, acid delinted seed</td>
<td>Bacterial blight free, weed seed free</td>
</tr>
<tr>
<td>Fallow before planting</td>
<td>Keep field free of weeds or cover crops for at least 10 days (3 weeks is best) before planting to minimise cutworm.</td>
</tr>
<tr>
<td>Early planting</td>
<td>Avoids late season Bollworm, Pink bollworm, Aphid, Whitefly.</td>
</tr>
<tr>
<td>Short season varieties</td>
<td>Pink bollworm, Bollworm, Aphid, Whitefly</td>
</tr>
<tr>
<td>Avoid planting seed too deeply</td>
<td>Seedling diseases (Damping off, Root rot, etc)</td>
</tr>
<tr>
<td>Avoid planting into cold, wet, soil</td>
<td>Seedling diseases (Damping off, Root rot, etc)</td>
</tr>
<tr>
<td>Avoid too close plant spacing</td>
<td>Close spacing makes plants weak, and gives an environment which encourages Aphids, Whitefly, Bollworms.</td>
</tr>
<tr>
<td>Early thinning</td>
<td>Allows plants to grow strongly, increasing tolerance to pest attack.</td>
</tr>
<tr>
<td>Ensure balanced fertiliser</td>
<td>Excess Nitrogen makes plants attractive or susceptible to Aphid, Jassid, Whitefly, Bollworm, and encourages <em>Fusarium</em> wilt.</td>
</tr>
<tr>
<td>Ensure balanced irrigation</td>
<td>Excess irrigation encourages Aphid, Whitefly, Bollworm</td>
</tr>
<tr>
<td>Weeding</td>
<td>Seedlings are very susceptible to weed competition. Weeds in the crop encourage Aphid, Whitefly, Spider mite.</td>
</tr>
<tr>
<td>Avoid plant stress (water, fertiliser, weeds)</td>
<td>Spider mites and other sucking pests</td>
</tr>
<tr>
<td>---------------------------------------------</td>
<td>------------------------------------</td>
</tr>
<tr>
<td>Remove and burn crop residues</td>
<td>Pink bollworm, Cotton stainer, Stem weevil, Whitefly, all diseases</td>
</tr>
<tr>
<td>Plough after harvest</td>
<td>Bollworm</td>
</tr>
<tr>
<td><strong>Rice</strong></td>
<td></td>
</tr>
<tr>
<td>Certified seed</td>
<td>No weed seeds</td>
</tr>
<tr>
<td>Resistant varieties</td>
<td>Brown plant hopper, Rice leaf roller</td>
</tr>
<tr>
<td>Early maturing varieties</td>
<td>Brown plant hopper, Rice gall midge</td>
</tr>
<tr>
<td>Early planting</td>
<td>Rice leaf roller</td>
</tr>
<tr>
<td>Avoid damaging plants when transplanting</td>
<td>Bacterial blight</td>
</tr>
<tr>
<td>Avoid excess nitrogen</td>
<td>Bacterial blight, Rice blast, Rice leaf roller</td>
</tr>
<tr>
<td>Avoid pesticide use</td>
<td>Brown plant hopper (and other hoppers)</td>
</tr>
<tr>
<td>Weeding</td>
<td>Rice gall midge</td>
</tr>
<tr>
<td>Weed free bunds</td>
<td>Rice bug</td>
</tr>
<tr>
<td>Land preparation and flooding after harvest</td>
<td>Stem borer</td>
</tr>
<tr>
<td><strong>Mango</strong></td>
<td></td>
</tr>
<tr>
<td>Pruning</td>
<td>After harvest. Enhances aeration within the tree, reducing risk and spread of disease.</td>
</tr>
<tr>
<td>Removal of malformed flowers</td>
<td>Reduces spread of flower malformation.</td>
</tr>
<tr>
<td>Others</td>
<td>As for Citrus.</td>
</tr>
<tr>
<td><strong>Apple</strong></td>
<td></td>
</tr>
<tr>
<td>Improve soil tilth and drainage</td>
<td>Nematodes</td>
</tr>
<tr>
<td>Do not plant apple orchards within 2km of cedar trees</td>
<td>Cedar apple rust</td>
</tr>
<tr>
<td>Do not plant apple with pear</td>
<td>Fire blight</td>
</tr>
<tr>
<td>Resistant varieties</td>
<td>Woolly apple aphid, apple scab, cedar apple rust, fire blight, Powdery mildew</td>
</tr>
<tr>
<td>Certified, virus-free seedlings</td>
<td>Apple leaf spot virus, Apple mosaic virus</td>
</tr>
<tr>
<td>Avoid close spacing of trees when establishing orchard, so as to ensure adequate ventilation and light</td>
<td>Aphids, Mites, Apple scab, Branch wilt, Fire blight, Powdery mildew</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Ensure balanced irrigation</td>
<td>Red spider mite, Nematodes, Branch wilt</td>
</tr>
<tr>
<td>Avoid over-irrigation</td>
<td>Fire blight</td>
</tr>
<tr>
<td>Balanced fertilisation</td>
<td>Nematodes</td>
</tr>
<tr>
<td>Avoid over-fertilisation with nitrogen</td>
<td>Aphids, Fire blight</td>
</tr>
<tr>
<td>Open tree to improve ventilation</td>
<td>Pruning in late winter, early spring. Aphids, Apple scab, Powdery mildew</td>
</tr>
<tr>
<td>Remove infested, dead, diseased wood, cankers, mummified fruits</td>
<td>Stemborer, Woolly apple aphid, Apple scab, Fire blight, Powdery mildew</td>
</tr>
<tr>
<td>Summer pruning of water sprouts</td>
<td>Green apple aphid</td>
</tr>
<tr>
<td>Avoid excessive pruning</td>
<td>Fire blight</td>
</tr>
<tr>
<td>Ensure area around base of trunk is free of grass and weeds</td>
<td>Rodents, Stemborer</td>
</tr>
<tr>
<td>Keep grass and weeds between trees cut short</td>
<td>Rodents</td>
</tr>
<tr>
<td>Remove and bury/burn all fallen fruit</td>
<td>Codling moth, Rodents, Apple scab</td>
</tr>
<tr>
<td>Remove and burn/compost fallen leaves at the end of the season</td>
<td>Codling moth, Apple scab</td>
</tr>
<tr>
<td>Avoid dusty conditions</td>
<td>Keep low cover of grass and weeds between trees. Red spider mite</td>
</tr>
</tbody>
</table>

**Citrus**

<p>| Certified planting material | Disease and virus free. |
| Circle trunk with soil | Avoids infection and spread of <em>Phytophthora</em>. |
| Ensure balanced fertiliser | Diseases and insect pests |
| Ensure balanced irrigation | Diseases and pests |
| Pruning to enhance aeration and reduce humidity | All diseases, many insect pests. Navels and mandarins should be pruned immediately after harvest in January to induce early spring flush that avoids leaf miner attack. |</p>
<table>
<thead>
<tr>
<th>Collect and bury dropped fruit</th>
<th>Mediterranean fruit fly.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Date Palm</strong></td>
<td></td>
</tr>
</tbody>
</table>
| Ensure planting material and enclosing soil is disease free | Bayoud (*Fusarium*)  
(This is the means of transmission of the disease to new areas, and adequate quarantine measures are absolutely essential) |
| Resistant Varieties           | Old world mite, Bayoud (*Fusarium*), Black rot, Inflorescence rot, *Graphiola* leaf spot |
| Well-spaced trees to increase ventilation and reduce humidity. | Approx 120 trees/ha, 9-10m between trees in both directions. Dubas bug, Fruit stalk borer, Green scale, White scale, Inflorescence rot, *Graphiola* leaf spot, Fruit rot |
| Ensure balanced irrigation    | Fig moth, Fruit stalk borer, Green scale, Lesser date moth, Palm stem borer, Black rot, Inflorescence rot |
| Avoid excessive irrigation    | Dubas bug, |
| Avoid use of surface irrigation | Bayoud (*Fusarium*) |
| Ensure good drainage          | Fig moth, Lesser date moth, Black rot, Inflorescence rot |
| Ensure balanced fertilisation | Fig moth, Fruit stalk borer, Green scale, Lesser date moth, Palm stem borer, Black rot, Inflorescence rot |
| Prune dead, old leaves to lower level of fruit bunches to reduce humidity | Dubas bug, Fruit stalk borer, Green scale, White scale, Inflorescence rot, *Graphiola* leaf spot, Fruit rot |
| Keep plantation free of weeds | Fig moth, Lesser date moth, termites |
| Remove and burn/bury all old and fallen fruits, old bunches, spathes, dry leaves, dead trunks, fronds. | Dubas bug, Fig moth, Fruit stalk borer, Lesser date moth, Palm stem borer, Black rot, Inflorescence rot, *Graphiola* leaf spot |
| Remove and burn/bury infected material | Green scale, Red scale, White scale, Black rot, Inflorescence rot, *Graphiola* leaf spot |
| Do not use pollen from infected trees | Inflorescence rot |
| Protect date bunches with nets, shade cloth or paper bags. | Greater date moth, Lesser date moth, Oriental wasp.  
(Reduction in pesticide use against these pests by bunch protection also enhances natural control of Date palm scale, Green scale, Mealy bug, Red scale). Fruit rot |
| Fruit thinning                | Fruit rot |
| Light Traps                   | Fruit stalk borer, Palm stem borer |
Components of IPM – The IPM Circle
Economic Principles of Pest Management

• Pesticides are not the only means of pest management. Other methods should be used first to promote a healthy crop and to minimize pest infestations.

• Pesticides are inputs in crop production and cost the farmer money. The more he spends on inputs, including pesticides, the less profit he makes.

• Profit = Value of harvested crop Less Cost of production and harvesting Less Cost of transport and marketing

• Inputs (pesticides) thus need to be used effectively and economically.

• Example: A crop needs water, but irrigation every day does not increase yields. Similarly, spraying every day, or more often than necessary, will not increase yields.

• Pesticides should only be used when pests reach a level where the value of the crop that will be lost is greater than the cost of the pesticide application.

• The use of a pesticide in this case will give a RETURN on the farmer’s investment in applying a pesticide.

• If pests are at a low level, the value of the crop that will be lost is less than the cost of the pesticide application.

• The use of a pesticide in this case will mean that the farmer LOSES money by applying a pesticide.
SESSION 4: PESTICIDE RESISTANCE MANAGEMENT
Lesson Plan

| Materials needed: | ✓ Flipchart stands.  
|                  | ✓ Flipchart paper.  
|                  | ✓ Markers (4 colours).  
|                  | ✓ Notebooks, pens, and file covers for participants who have forgotten to bring them.  
|                  | ✓ Coloured cards.  
|                  | ✓ Glue stick or blue tack.  
|                  | ✓ Masking tape.  

| Time needed:     | 100 minutes  

| Intended audience: | Pesticide Retailers  

| Preparation: | ✓ Flipchart with the session title “Pesticide Resistance Management” and the Session Objectives.  
|              | ✓ Flipchart with definitions of Pesticide Resistance.  
|              | ✓ Sufficient copies of “How Resistance Develops in a Population” for all participants.  
|              | ✓ Three blank flipcharts with a vertical dividing line down the middle.  
|              | ✓ Print off sufficient Attendance Record sheets.  
|              | ✓ Print off sufficient Assessment question sheets.  
|              | ✓ Print off sufficient Fact Sheets for participants.  
|              | ✓ Organise venue and seating arrangements.  

Attendance Record

As participants arrive, ask them to enter their name and other information on the Attendance Record. There is also a column on the form to enter their marks from the Assessment Questions at the end of the training session.
### Set up/Introduction  
**5 minutes**

<table>
<thead>
<tr>
<th>Module</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Attention:</strong></td>
<td>Welcome the participants to the session.</td>
</tr>
<tr>
<td><strong>Say:</strong></td>
<td>Puppies are one of the most common pets in the world.</td>
</tr>
<tr>
<td></td>
<td>They are all nice and soft and playful, but will inevitably grow and show inherited characteristics of their parents – hair color, size, strength, aptitudes - which can be desirable or not in the pet owner’s eyes.</td>
</tr>
<tr>
<td><strong>Ask:</strong></td>
<td>• Why should this be?</td>
</tr>
<tr>
<td><strong>Take</strong></td>
<td>several responses.</td>
</tr>
<tr>
<td></td>
<td>Inherited traits in puppies, like in any other living organism, such as hair color and size, pass from generation to generation with minimal external pressure or interventions. In the same way, resistance traits in pests are inherited, and could be passed on the offspring of resistant individuals.</td>
</tr>
<tr>
<td><strong>Title:</strong></td>
<td>Refer to the Title Flipchart and tell participants that this training session will cover Pesticide Resistance Management.</td>
</tr>
<tr>
<td><strong>Credibility:</strong></td>
<td>Say that pesticide resistance has caused major problems to farmers in all parts of the world. This has meant that certain pesticides can no longer be used against the pest.</td>
</tr>
<tr>
<td></td>
<td>In some instances this effect has been so severe that production of a crop has had to be abandoned, and farmers have lost a major part, or all, of their livelihood.</td>
</tr>
<tr>
<td><strong>Objectives:</strong></td>
<td>Refer to the Title Flipchart with the Lesson Objectives.</td>
</tr>
<tr>
<td></td>
<td>By the end of the session, participants will be able to:</td>
</tr>
<tr>
<td></td>
<td>• State clearly what is pesticide resistance, and how it develops in a pest population.</td>
</tr>
<tr>
<td></td>
<td>• Outline the different types of pesticide resistance mechanisms.</td>
</tr>
<tr>
<td></td>
<td>• Describe the factors which promote pesticide resistance.</td>
</tr>
<tr>
<td></td>
<td>• Explain the practices which can be used to avoid or manage pesticide resistance.</td>
</tr>
<tr>
<td><strong>Benefits:</strong></td>
<td>Knowing the factors which promote pesticide resistance, and the practices which can avoid the development of resistance, ensures that development of pesticide resistance is prevented, a full range of pesticides remains available to manage pests, and farmers can continue to economically produce crops.</td>
</tr>
</tbody>
</table>
• The session starts with an interactive discussion exploring what is meant by pesticide resistance.
• The Facilitator then gives a presentation on how resistance develops in a population, together with brief presentations on resistance mechanisms and cross resistance.
• The remainder of the session is taken up with a work group activity looking at the factors which promote the development of resistance, and the corresponding practices which can prevent or avoid the development of resistance.

Delivery
Explanation, Demonstration, Exercise, and Guidance:

<table>
<thead>
<tr>
<th>Module/Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 5 minutes</td>
<td>Interactive Discussion – What Is Meant By Pesticide Resistance</td>
</tr>
</tbody>
</table>

Say that in the introduction we noted that people from tropical areas of the world have darker coloured skin than people from temperate areas, as this gives them protection from skin cancer and so they have an advantage in the strong sunlight over people with lighter coloured skin. Even so, in both populations there are people who are born with no skin or hair colouration at all due to genetic variation.

Ask
• How can we apply this concept of genetic variation and genetic advantage to the use of pesticides?

Guide the discussion, and write participant comments on the flipchart when these are appropriate to the definition of Pesticide Resistance below.

Put up the “Definition of Pesticide Resistance” flipchart, and explain the definitions, referring to the responses on the participant comments flipchart.

The definition of pesticide resistance used by FAO and IRAC (the Insecticide Action Committee) is:

“A heritable change in the sensitivity of a pest population that is reflected in the repeated failure (more than one instance) of a product to achieve the expected level of control when used according to the label recommendation for that pest species and where problems of product storage, application and unusual climatic or environmental conditions can be eliminated as causes of the failure.” (Text in italics is additional in the FAO definition)

Put simply, a pest population is resistant to a pesticide when:
“There is repeated failure of the pesticide to achieve the expected level of control when used according to the label recommendation.”
| 2. | 15 minutes | **Presentation - How Resistance Develops in a Pest Population, the Different Resistance Mechanisms, and Cross Resistance**

Distribute the “How Pesticide Resistance Develops in a Population” diagram.

**Explain** how resistance develops with repeated use of the same pesticide.
- Every population has a low number of naturally resistant individuals.
- When a pesticide is applied, these resistant individuals survive, together with some susceptible individuals.
- The proportion of resistant individuals in the remaining population is higher than before the pesticide was applied.
- When the survivors reproduce, there is more chance of resistant individuals mating with another resistant individual, so the next generation has a higher proportion of resistant individuals than the previous population.
- This process is repeated each time the same pesticide is used.

This effect is also described as “natural selection” or “survival of the fittest”.

**Point out** that for example purposes the diagram shows only three generations, but that resistance is unlikely to develop this quickly.

**Emphasise** that resistance can develop in any pest organism - insects, mites, weeds, diseases, etc.

**Say** now that we understand what resistance actually is, we now need to understand what are the different resistance mechanisms - how an individual is able to prevent being killed by a pesticide.

**Explain** that we will not go into these different methods in detail, but it is important to be aware of them as this knowledge can be useful in the prevention or avoidance of pesticide resistance.

**Briefly present** “Resistance Mechanisms” and “Cross Resistance” from the Fact Sheet.
### 3. Work Groups – Factors Which Promote the Development of Pesticide Resistance, and Practices to Prevent / Avoid the Development of Resistance

- **30 minutes**

  **Divide** participants into 3 groups. Give each group a flipchart with a vertical dividing line down the middle.

  **Say** that now we understand what is meant by pesticide resistance and the different resistance mechanisms, we need to look at the factors which promote the development of pesticide resistance in a pest population.

  **Work Group Task:**
  - Agree amongst yourselves the different factors which could promote the development of pesticide resistance. Write these on the left of the flipchart (right in Arabic speaking countries).
  - Against each of the factors which promote the development of resistance, write the corresponding practices which would prevent / avoid the development of pesticide resistance.

  **Say** that participants have 25 minutes for the activity.


- **60 minutes**

  **Ask** each group to put their flipchart up on the wall.

  Participants should get up, look at the flipcharts from the other two groups, and **make** notes of any comments they may have or points they would disagree with.

  **Allow** 10 minutes for the walk round, and then participant should take their seats again.

  **Ask** participants if they have any comments to make regarding the other group’s flipcharts, or disagree with any of the points.

  **Review** the flipcharts, **using** “Factors Which Promote the Development of Pesticide Resistance” and “Practices Which Prevent or Avoid the Development of Pesticide Resistance” as a checklist to ensure that all points are covered, **adding** where points are not included on the group flipcharts.

  **Point out** that the prevention or avoidance of pesticide resistance is largely concerned with avoiding the practices which promote resistance.

  **Describe** Resistance Management Strategies and Mode/Site of Action in detail, including rotation of MoA. Discuss how to find out MoA. If relevant describe resistance management for biotech crops. Concentrate on Bt-crops – point out this is a similar approach to #6 for chemical pesticides (preservation of susceptible insects).
### Finish

<table>
<thead>
<tr>
<th>Module/Time</th>
<th>Activity</th>
</tr>
</thead>
</table>
| **Summary:** 1 minute | **Include** as major messages:  
- The definition of pesticide resistance, particularly the simple definition  
- How pesticide resistance develops in a population  
- That pesticide resistance can occur in any pest population – insects, mites, weeds, diseases, etc.  
- Factors which promote the development of pesticide resistance, and the consequent corresponding practices to prevent or avoid resistance.  
- Resistance management strategies. |
| **Questions:** 1 minute | **Ask** if everyone understands or if there are any additional questions. Answer these provided they are relevant.  
**Ask** if the session objectives were met. |
| **Evaluation:** 12 minutes | **Hand out** the Assessment Sheet and ask participants to complete two of the questions.  
**Collect** the Assessment Sheet for later marking and entering the marks on the Attendance Record. |
| **Next step:** 1 minute | **Say** participants are now able to provide appropriate advice about pesticide resistance to farmers and other pesticide users, which will help to prevent or avoid the development of resistance, and so protect their livelihoods.  
**Hand out** the Fact Sheet to participants. |
How Insecticide Resistance Develops in a Population

Susceptible individual

Resistant individual

Pesticide applied

70% Control

Survivors reproduce

Pesticide applied

50% Control

Survivors reproduce
How Fungicide Resistance Develops in a Population

- **Susceptible individual**
- **Resistant individual**

1. **Pesticide applied**
   - 70% Control
   - Survivors reproduce

2. **Pesticide applied**
   - 50% Control
   - Survivors reproduce
How Insecticide Resistance Develops in a Population

Susceptible individual

Resistant individual

Pesticide applied

70% Control

Survivors reproduce

Pesticide applied

50% Control

Survivors reproduce
Assessment Questions

Name: .......................................................... Date: .................. Mark: ..........

Answer TWO (2) only of the following questions.
You may write your answers on this question sheet or tell your trainer the answers.
All questions are the same value (5 marks).

Question 1: Give the simple definition of pesticide resistance.
...........................................................................................................................................................................................
...........................................................................................................................................................................................
...........................................................................................................................................................................................

Question 2: The effect of pesticide resistance developing in a pest population is also known as? Give one of the two possible terms.
...........................................................................................................................................................................................
...........................................................................................................................................................................................
...........................................................................................................................................................................................

Question 3: Give three factors which promote the development of pesticide resistance.
...........................................................................................................................................................................................
...........................................................................................................................................................................................
...........................................................................................................................................................................................

Question 4: For your three answers in Question 3, give the corresponding practices which will prevent or avoid the development of pesticide resistance.
...........................................................................................................................................................................................
...........................................................................................................................................................................................
...........................................................................................................................................................................................

Question 5 (optional): How do you manage resistance development in a Bt-crop?
...........................................................................................................................................................................................
...........................................................................................................................................................................................
FACT SHEET

DEFINITION OF PESTICIDE RESISTANCE

Both FAO and IRAC (Insecticide Resistance Action Committee) use the following definition:

“A heritable change in the sensitivity of a pest population that is reflected in the repeated failure (more than one instance) of a product to achieve the expected level of control when used according to the label recommendation for that pest species and where problems of product storage, application and unusual climatic or environmental conditions can be eliminated as causes of the failure.” (Text in italics is additional in the FAO definition)

Put simply, a pest population is resistant to a pesticide when:

“There is repeated failure of the pesticide to achieve the expected level of control when used according to the label recommendation.”

RESISTANCE MECHANISMS

Metabolic / Detoxification

• Most commonly found in insects, less common in diseases, becoming more common in weeds.
• Based on systems insects have developed to detoxify natural occurring toxins in their host plants or other food sources.
• Resistant individuals can detoxify the pesticide at a faster rate than susceptible individuals, and before the pesticide can kill the individual.
• Level of resistance can range from low to high, and from pesticide to pesticide.

Reduced Target Site Sensitivity

• The binding site of the pesticide in the organism is changed so that the pesticide cannot bind to the site, reducing the effectiveness of the pesticide.
• The most common known mechanism in weeds and fungi, and is also common in insects.

Reduced Penetration

• Slows the penetration of the pesticide through the cuticle of resistant insects.
• On its own, this mechanism only produces low levels of resistance, but can greatly increase the effect of other resistance mechanisms when combined with these.

Sequestration (separation or isolation)

• In plants the pesticide is removed from sensitive parts to a tolerant site, such as a vacuole.

1 Some or all of these can be used as handouts to participants depending on requirements
**Behavioural Resistance**

- Occurs only in insects, mites, and rodents.
- Individuals change their behaviour so that they do not come into contact with the pesticide.
- Insects may stop feeding if they come across the pesticide, or leave the sprayed area (for example move to the underside of a leaf, move deeper into the crop canopy, or fly out of the sprayed area).

**CROSS RESISTANCE**

Cross resistance is when resistance to one pesticide also results in resistance to another pesticide, even when the pest has not been exposed to the second pesticide. It occurs when the different pesticides have the same resistance mechanism in the organism.

Cross resistance most commonly develops with pesticides that have the same mode or site of action, and are usually, but not always, from the same chemical group.

Some resistance mechanisms can affect pesticides from different chemical groups. This usually occurs when resistance is caused by metabolism.
### Factors Which Promote the Development of Pesticide Resistance

- Reliance on pesticides as the main tool of pest management, and ignoring non-pesticide management methods.
- Use non-pesticide crop and pest management practices for all types of pests – insects, mites, weeds, diseases, etc.:
  - Optimal crop management practices.
  - Cultural pest management.
  - Mechanical pest management.
  - Biological pest management.
  - Only use pesticides when necessary (weeds with high fecundity rates might require preventive applications also)
- Scout the crop to determine pest and beneficial levels before applying a pesticide.
- Crop rotation and soil cultivation practices are often particularly important strategies for weed control.
- Continual and frequent use of the same pesticide on a pest population, particularly populations with short generation times.
- Avoid repeated use of the same pesticide, or pesticides with the same mode of action.
- Rotate pesticides with different mode/site of action.
- Treatment of both larval and adult stages at the same time with a single pesticide.
- Pesticide applications should target early pest developmental stages, or the most susceptible stages.
- Use of broad spectrum pesticides. These are likely to be used more in an area as they control more pest species, and so the selection pressure on all pest species is increased.
- Use selective pesticides, avoid broad spectrum pesticides. This is not necessary true for weeds.
- The use of application rates which are below or above those recommended on the label.
- Apply pesticides according to the dose rates on the label.
- Poor coverage of the area being treated. This includes both cover of the whole target area (eg a field), and also within the target area (eg poor underleaf coverage, or crop penetration). It also includes areas of over- and/or under-dosing in the target area.
- Ensure even and adequate coverage of the target area.
- Use of counterfeit/illegal pesticides that may have unknown active ingredient and/or unknown concentration
- Use of genuine products.
| • Areas where there is little or no immigration of susceptible individuals from outside. | • If pesticide mixtures are used (tank or pre-mixtures), the following must be considered:
| | • The individual insecticides must be highly effective, and applied at the individually recommended rates.
| | • Mixtures of pesticides with the same mode of action should not be used.
| | • Known or potential cross resistance problems between the individual pesticides.
| | • The individual pesticides should have similar persistence periods. This is not necessary true for herbicides. |
How Resistance Develops in a Population

Susceptible individual

Resistant individual

Pesticide applied

70% Control

Survivors reproduce

Pesticide applied

50% Control

Survivors reproduce

Note: Although this example uses insects, resistance can develop in any pest population – insects, mites, weeds, diseases, etc.
MANAGING RESISTANCE

Resistance development can be delayed by adopting a number of different practices that rely on pest management and pesticide use strategies:

1. **Integrated Pest Management (IPM):** Adoption of IPM, which includes cultural practices such as crop rotation, possible use of pest-resistant varieties and maintenance of naturally-occurring predators and parasites and other beneficial organisms, help keep pest populations low and therefore avoids the need to use control measures. If pest control is needed a range of practices can be used including mechanical control e.g. hand-picking of diseased leaves, biological pesticides, chemical deterrents and chemical pesticides. The net result is chemical pesticides are only used when necessary and not continuously. **Chemical pesticide should always be used within an IPM strategy.**

2. **Using the correct pesticide dose:** Using less than the recommendation dose results in greater survival of the pest and promotes the build-up of resistance. High doses select for the most resistant individuals and also can be damaging to the environment and unsafe. **Always use the dose recommended on the pesticide label.**

3. **Calibrate and maintain the application equipment:** Poorly calibrated and maintained equipment results in leakage and uneven coverage of the crop and/or target with resulting under- or over-dosing. **Always calibrate application equipment before use and keep it properly maintained.**

4. **Good application practices:** A pesticide needs to be applied effectively to the target – this is achieved by directing to the target location e.g. undersurface of leaves, by ensuring the right droplet size (with liquid sprays) etc., correct volume of water (to avoid run-off), do not spray in windy conditions and, in hot climates, during the hottest time of the day. Incorrect application results in under- or overdosing. **Always used recommended application techniques e.g. direct spray to target, correct nozzles (droplet size), correct volume of water etc.**

5. **Double-hit strategy:** If the pest survives the pesticide application, consider the option of applying a different pesticide or a different control technique to kill survivors. This is a useful strategy for surviving weeds. In small plots single surviving weeds can be removed by hand; this or other control technique should be done before seeding. Avoid resorting to applying increased doses of the original pesticides. **Consider controlling survivors from a pesticide application with a different pesticide or control technique.**

6. **Preservation of susceptible insects:** A few programmes preserve susceptible pests through leaving unsprayed areas or promoting attractive habitats with the cropping area that facilitate immigration of the pest so that susceptible and resistant individual mix and mate, diluting the resistant individuals. This is exclusively done with insect pests.

7. **Use good quality, genuine pesticides:** Use of illegal or counterfeit pesticides can result in applications of unknown amounts of the active ingredient (or a different active ingredient), which results in under-, over, or incorrect dosing and undermines resistance strategies. **Never use illegal or counterfeit pesticides.**

8. **Mode/Site of Action (MoA) rotation:** There are hundreds of active pesticide substances, many of which act in different ways – referred to as a different mode or site of action (MoA). A key element of effective resistance management is the use of rotations (alternations, sequences) of different insecticide MoA classes. Users should avoid by repeated use within the crop cycle, or year after year, of the same insecticide or related products in the same MoA class. MoA classes can be determined by labelling on the pesticide bottle (in a few countries) or looking up the active ingredient against lists (see hand-out Rotation of Mode of Action). In some cases the result can be obtained through applying mixtures with different MoAs e.g. some fungicides and many herbicides, if recommended (note: if mixtures are used the full dose recommended for each pesticide should be used). Generally, however, mixtures are not recommended for resistance management for insecticides. **If repeated applications of chemical pesticides are necessary, the MoA should be rotated.**
BIOTECH-DERIVED CROPS

1. **Herbicide-tolerant**: Resistance management in herbicide-tolerant crops follows the same strategy as conventional crops, outlined above.

2. **Bt-crops**: Management of resistance in Bt-crops is achieved through planting of a refuge. This is an area or percentage of the crop that is planted to conventional seed or planted to a crop that is equally attractive to the pest insect. Surviving resistant insects from the Bt-crop plants mix and are diluted by susceptible insects from the refuge (see hand-out of resistance management in Bt-crops). The amount (%) of refuge for each product should be stated on the label. Some products consist of a mixture of Bt and conventional seed at the required percentage. Refuge should be employed from initial planting of Bt-crops.

MODE/SITE OF ACTION

There are hundreds of active pesticide substances, many of which act in different ways - referred to as a different **mode or site of action (MoA)**. This is illustrated in the picture below that shows where different pesticides may affect an insect.

Although the picture illustrates MoA for insects, many different herbicides and fungicides also have different MoA.

Continued use of products with the same MoA will result in development of resistance, normally in the target pest, but this could also be more broadly e.g. several weed species to a broad spectrum herbicide that is repeatedly used.
MODE/SITE OF ACTION ROTATION

There are hundreds of different pesticides, many of which have different modes/sites of action (mechanism or site of activity, MoA). Resistance can develop to a specific MoA and can be delayed through avoiding using the same MoA all the time by rotating MoA over time. This is illustrated by two examples below:

This requires that the MoA of a product is easily known. This is the case where the label of the product has a letter or number code that gives the MoA: each different MoA has a different code, so a user just needs to choose products with different code numbers and rotate as shown above. In the absence of a MoA labelling, the user needs to take note of the active ingredient that is listed on product label and look up the MoA on the lists/posters shown on CropLife International Resistance Action Committees’ websites:

- the Fungicide Resistance Action Committee (FRAC: www.frac.info)
- the Insecticide Resistance Action Committee (IRAC: www.irac-online.org)
- the Herbicide Resistance Action Committee (HRAC: www.hracglobal.com)

A good retailer should have access to the lists/posters and keep up-to-date. Local pesticide company representatives should be able to help. If only some products have MoA labelling it may be easier to preferentially choose those.
On the basis of this information MoA rotation can be included as part of an IPM strategy and adapted for specific crops, for example:
Resistance Management in a Bt Crop: Use of Refuge

Susceptible individual

Resistant individual

Mating: R x R  R x S  S x S

Bt-trait  Refuge
See also:


Resistance Management for Sustainable Agriculture and Improved Public Health (IRAC)
http://www.irac-online.org/documents/irac-croplife-irm-booklet/?ext=pdf

Overview of an Insect Resistance Management (IRM) Plan for Plant Protection Insecticides (IRAC)
http://www.irac-online.org/documents/key-components-of-an-irm-plan/?ext=pdf

General Principles of Insecticide Resistance Management from IRAC
http://www.irac-online.org/documents/principles-of-irm/?ext=pdf

Herbicide Resistance Action Committee website
http://www.hracglobal.com/

Fungicide Resistance Action Committee website
http://www.frac.info/

Rodenticide Resistance Action Committee website
http://www.rrac.info/
SESSION 5:
PESTICIDE CLASSIFICATION
Lesson Plan

Materials needed:
- ☑ Flipchart stands.
- ☑ Flipchart paper.
- ☑ Markers (4 colours).
- ☑ Notebooks, pens, and file covers for participants who have forgotten to bring them.
- ☑ Coloured cards.
- ☑ Glue stick or blue tack.
- ☑ Masking tape.

Time needed: 85 minutes

Intended audience: Pesticide Retailers

Preparation:
- ☑ Flipchart with the session title “Pesticide Classification”, and the Session Objectives.
- ☑ Examples of different local pesticide labels or containers with labels.
- ☑ Print off sufficient Attendance Record sheets.
- ☑ Print off sufficient Assessment question sheets.
- ☑ Print off sufficient Fact Sheets for participants.
- ☑ Organise venue and seating arrangements.

Attendance Record

As participants arrive, ask them to enter their name and other information on the Attendance Record. There is also a column on the form to enter their marks from the Assessment Questions at the end of the training session.
Set up / Introduction

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attention:</td>
<td>Welcome the retailers to the session.</td>
</tr>
<tr>
<td>Ask:</td>
<td>• When you buy a new tyre for your car or truck, what information do you have to provide to the seller to make sure you get the right tyre?</td>
</tr>
<tr>
<td>Take:</td>
<td>answers from several participants.</td>
</tr>
<tr>
<td>Summarise:</td>
<td>the answers - the correct tyre depends on cross ply or radial, tyre size, tubed or tubeless, and tread pattern.</td>
</tr>
<tr>
<td>Say:</td>
<td>tyres are classified by these different characteristics. Some classifications are simple, such as cross ply or radial, others have many different types within the classification, such as tyre size. But to obtain the correct tyre for the vehicle, the right characteristics must be specified.</td>
</tr>
<tr>
<td></td>
<td>Pesticides are the same, they are classified according to different characteristics, and to obtain the best result from the use of a pesticide, the correct classification and characteristics must be selected.</td>
</tr>
<tr>
<td>Title:</td>
<td>Refer to the Title Flipchart and tell participants that this training session will cover Pesticide Classification.</td>
</tr>
<tr>
<td>Credibility:</td>
<td>Tell participants your experience of using a pesticide with the wrong classification and characteristics, and the results.</td>
</tr>
<tr>
<td>Objectives:</td>
<td>Refer to the Title Flipchart with the Lesson Objectives.</td>
</tr>
<tr>
<td></td>
<td>• By the end of the session, participants will be able to:</td>
</tr>
<tr>
<td></td>
<td>• Explain the different types of pesticide names.</td>
</tr>
<tr>
<td></td>
<td>• Describe the different ways in which pesticides are classified.</td>
</tr>
<tr>
<td></td>
<td>• Provide advice to farmer customers on the selection of an appropriate product for a particular pest situation.</td>
</tr>
<tr>
<td>Benefits:</td>
<td>Best results from the use of a pesticide depend on the selection of a pesticide with the correct classification characteristics for the pest and situation.</td>
</tr>
<tr>
<td>Direction:</td>
<td>• The session begins with a work group activity on the different types of pesticide names.</td>
</tr>
<tr>
<td></td>
<td>• Two interactive discussion and presentation activities then examine the different ways in which pesticides are classified.</td>
</tr>
<tr>
<td></td>
<td>• The session ends with a work group activity selection of the most appropriate pesticide for a pest situation based on pesticide classification characteristics.</td>
</tr>
</tbody>
</table>
## Delivery

**Explanation, Demonstration, Exercise, and Guidance:**

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
</table>
| 1. 10 minutes | **Work Groups – Pesticide Names**  
Divide participants into 3-4 groups depending on numbers.  
Distribute a different sample pesticide label or container to each group.  
Work Group Task:  
Identify from the supplied label:  
• The Product Name of the pesticide  
• The Common or Chemical Name of the pesticide  
• The Active Ingredient of the pesticide  
Say groups have 5 minutes for the task.  
Ask each group for their answers and write the responses on the flipchart.  
Ask: It could be confusing for a pesticide to have different names. Why do pesticides have these different names?  
Take several answers, and then summarise using Pesticide Names from the Fact Sheet as a checklist. |
| 2. 15 minutes | **Interactive Discussion – Classification of Pesticides (1)**  
Remind participants of the broad definition of “pest” from Session 1:  
• Any organism which adversely affects man, his crops, his livestock, or anything he considers to be of value.  
Similarly, a pesticide can be simply defined as:  
• Any substance which is used to prevent or reduce loss or damage caused by pests, either by directly killing the pest, or by inhibiting its growth, or by repelling it.  
Ask:  
What are examples of the most common products used by farmers in the country, and what are they used to control?  
List the answers on the flipchart.  
Trainer Note:  
Write the product answers in columns of the same type of pest that the product controls, such as insects, weeds, diseases, etc, so that the headings can be added when there are no more answers.  
Ask:  
From this list, what headings can we give to each of the columns to describe the pests these products control?  
Write the pest type above each column, and also write the pesticide type above each column – insecticide, herbicide, fungicide, etc using Type of Pest Controlled from the Fact Sheet as a checklist, adding additional types as necessary  
Say that this is one way in which pesticides are classified – according to the type of pest against which they are used, for example insecticides, fungicides, herbicides. |
### Session 5: Pesticide Classification

**3. Interactive Discussion / Presentation – Classification of Pesticides (2)**

**Ask:**
- In what other ways do you think pesticides might be classified?

**Lead** responses to the answers, and write the answers on the flipchart:
- Chemical Group
- Toxicity
- Mode of Action

**Present** *Chemical Group, Toxicity and Mode of Action* from the Fact Sheet.

**Say** that we will be looking at toxicity again in future sessions on safety and the pesticide label.

### 4. Work Groups – Pesticide Selection

**Work Group Task:**
- How does knowing about the different types of classification help in handling and using pesticides most effectively?
- Why might you select a particular pesticide for a pest on the basis of one or more of the different types of classification?

**Allow** 10 minutes for the activity.

**Ask** each group to report in turn.

**Ask** how will this knowledge help in providing advice to farmers.
### Finish

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
</table>
| **Summary:** 1 minute | **Include** as major messages:  
  - The different pesticide names.  
  - Ways of classifying pesticides.  
  - How knowing how pesticides are classified can help in selecting the best product(s) for a pest situation. |
| **Questions:** 1 minute | **Ask** if everyone understands or if there are any additional questions. Answer these provided they are relevant.  
**Ask** if the session objectives were met |
| **Evaluation:** 12 minutes | **Hand out** the Assessment Sheet and ask participants to complete two of the questions.  
**Collect** the Assessment Sheet for later marking and entering the marks on the Attendance Record. |
| **Next step:** 1 minute | **Say** that in this session we learned about pesticide selection. With this knowledge, participants can provide better advice to farmers.  
In a future session we will look at toxicity again with regard to safe use of pesticides.  
**Hand out** the Fact Sheet to participants. |
Answer TWO (2) only of the following questions.
You may write your answers on this question sheet or tell your trainer the answers. All questions are the same value (5V marks).

Question 1: What is a pesticide chemical or common name?
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Question 2: What type of pests are controlled by a) herbicides, b) acaricides?
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Question 3: What is the difference between inorganic and organic pesticides?
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Question 4: In what situation are fumigants used?
...........................................................................................................................................................................................
...........................................................................................................................................................................................
...........................................................................................................................................................................................
FACT SHEET

PESTICIDE NAMES

• **Active ingredient**
  Only a certain component of a pesticide product has pesticidal activity. This component is called the **active ingredient**.

• **Chemical name**
  Each active ingredient is given a chemical name that describes the actual chemical composition. This name is often long and complicated. It may appear on the label in brackets.

• **Common name**
  Each active ingredient is also given an internationally recognised common name that is much easier to use and remember than the chemical name. A specific common name always refers to the same active ingredient, regardless of the manufacturer of the product. Common names are always given on the label.

• **Product name**
  Manufacturers give their own name to their products containing a particular active ingredient. It is the product name which appears in large print on the label.

Examples of pesticide names, including example product names, are:

- **Chemical Name:** alpha-cyano-3-phenoxybenzyl-3-(2-chloro-3,3,3-trifluoroprop-1-enyl)-2,2-dimethylcyclopropanecarboxylate
  - **Common Name:** Lambda Cyhalothrin
  - **Product Name:** Demand, Icon, Karate, Reeva, Sentry

- **Chemical Name:** N-(phosphonomethyl)glycine
  - **Common Name:** Glyphosate
  - **Product Name:** Azural, Brake, Clinic, Glyphos, Glyphogan, Glyphosate, Glyphotox, Noweed, Roundup, Solado, Spraymate, Sting, Stirrup

PESTICIDE CLASSIFICATION

**Type of Pest Controlled**

- Insecticides against Insects.
- Fungicides against Fungi.
- Herbicides against Weeds.
- Acaricides against Mites.
- Rodenticides against Rats, mice, and other rodents.
- Molluscicides against Snails.
- Nematicides against Nematodes.

CHEMICAL GROUP

**The chemical group to which the pesticide belongs.**

**Insecticides**

Inorganic:
Do not contain carbon. Commonly based on arsenic, copper, mercury, sulphur, tin or zinc.
Many of these compounds are now banned or have severely limited uses.
An example still in use is sulphur.
Organic:
Contain carbon. Some are derived directly from plants and other living material, but most have been developed by man. These are the most common pesticides.

Organophosphate:
Organic pesticides. Examples are Chlorpyrifos and Dimethoate.

Carbamate:
Organic pesticides. Examples are Carbaryl.

Pyrethroid:
Organic pesticides, related to pyrethrum (plant extract) but developed by man. Examples are Deltamethrin and Lambda-Cyhalothrin.

Biological/Microbial
Contain bacteria, fungi, protozoa or viruses, such as Bacillus thuringiensis and Abamectin

Botanical
Obtained from plant extracts, such as rotenone, neem, and pyrethrum

Herbicides
Herbicides have many different chemical groups, among the most common of which are triazines, substituted ureas and sulfonylureas

Fungicides
As with herbicides, fungicides have many different chemical groups. Common groups are inorganic and dithiocarbamates.
• Inorganic. Examples are wettable sulphur.
• Dithiocarbamates. Examples are Thiram

TOXICITY

A measure of how poisonous a pesticide is to man. High toxicity to man does not necessarily mean that the pesticide is highly toxic to the pest. Formulations are usually less toxic than the pure active ingredient.

The following WHO classification of toxicity is most commonly used, although there are others such as national systems:
• Class Ia: "Extremely Hazardous"
• Class Ib: "Highly Hazardous"
• Class II: "Moderately Hazardous"
• Class III: "Slightly Hazardous"
• [no class] "Unlikely to Cause Hazard in Normal Use"

The toxicity warning on the pesticide label refers to the formulation, not the active ingredient
MODE OF ACTION

**Describes the method by which the pesticide acts on the pest.**

**Contact:** The target pest is only killed when it comes into direct contact with the pesticide. For a given volume of spray, the more drops per square centimeter of surface, the better the effectiveness of the pesticide. Most insecticides are contact pesticides, and are most effective against insect pests which move about a lot.

**Stomach:** A pesticide that must be eaten by the insect pest to kill it. Most contact pesticides are also stomach poisons for insect pests. These pesticides are more effective against pests which move around a lot.

**Systemic:** A pesticide that is absorbed and moved within a plant, and kills the pest when it feeds on the plant. Movement is mainly from the upper to lower leaf surface, and upwards within the plant. There is very little movement down the plant, so overall plant coverage is essential for pests in the lower parts of the crop. Absorption of the pesticide by the plant is reduced if the plants are under stress. Systemic insecticides are most effective against insect pests which do not move very much, and suck plant juices. Most herbicides are also systemic.

**Fumigant:** A pesticide in vapour or gas form in the air which the pest breathes in. These pesticides can only be used in enclosed spaces, such as greenhouses and warehouses.

PESTICIDE SELECTION

The obvious example of incorrect selection of a pesticide is selecting a fungicide to control an insect pest – this will have no effect at all on the insect pest.

Selecting a pesticide with the wrong characteristics for a particular pest situation can result in poor or no results.

For example, applying a contact pesticide against aphids, which are protected under leaves and do not move around a great deal. However, if a contact pesticide is the only one available, with this knowledge of mode of action the pesticide application can be adjusted to ensure good underleaf coverage, resulting in better control.

Continual use against a pest of products with the same active ingredient or from the same chemical group can result in the pest developing resistance to the pesticide. Alternatives from different chemical groups must be used in rotation to avoid this.

If more than one pesticide active ingredient is available for a particular pest situation, selecting the one with the lowest toxicity is safest for the user, for other people, and for the environment.
SESSION 6: PESTICIDE FORMULATIONS
Lesson Plan

<table>
<thead>
<tr>
<th>Materials needed:</th>
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<tbody>
<tr>
<td>✓ Flipchart stands.</td>
</tr>
<tr>
<td>✓ Flipchart paper.</td>
</tr>
<tr>
<td>✓ Markers (4 colours).</td>
</tr>
<tr>
<td>✓ Notebooks, pens, and file covers for participants who have forgotten to bring them.</td>
</tr>
<tr>
<td>✓ Coloured cards.</td>
</tr>
<tr>
<td>✓ Glue stick or blue tack.</td>
</tr>
<tr>
<td>✓ Masking tape.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Time needed:</th>
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<tbody>
<tr>
<td>100 minutes</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Intended audience:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pesticide Retailers</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Preparation:</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓ Flipchart with the session title “Dealing With Farmers”, and the Session Objectives.</td>
</tr>
<tr>
<td>✓ Examples of different local pesticide labels or containers with labels.</td>
</tr>
<tr>
<td>✓ Print off sufficient Attendance Record sheets.</td>
</tr>
<tr>
<td>✓ Print off sufficient Assessment question sheets.</td>
</tr>
<tr>
<td>✓ Print off sufficient Fact Sheets for participants.</td>
</tr>
<tr>
<td>✓ Organise venue and seating arrangements.</td>
</tr>
</tbody>
</table>

Attendance Record

As participants arrive, ask them to enter their name and other information on the Attendance Record. There is also a column on the form to enter their marks from the Assessment Questions at the end of the training session.
### Set up / Introduction

**5 minutes**

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Attention:</strong></td>
<td>Welcome the retailers to the session.</td>
</tr>
<tr>
<td></td>
<td><strong>Ask:</strong> What ingredients are used to make a cake?</td>
</tr>
<tr>
<td></td>
<td><strong>Take</strong> responses from the participants.</td>
</tr>
<tr>
<td></td>
<td><strong>Say</strong> that these ingredients all have a part to play in making a cake. The main ingredients are flour for bulk, sugar for sweetness, eggs or water to bind the ingredients together, chocolate or other additives for flavour, and so on.</td>
</tr>
<tr>
<td></td>
<td>In the same way, a pesticide product in a container contains many ingredients. The product is called a pesticide formulation.</td>
</tr>
<tr>
<td><strong>Title:</strong></td>
<td>Refer to the Title Flipchart and tell participants that this training session will cover Pesticide Formulations.</td>
</tr>
<tr>
<td><strong>Credibility:</strong></td>
<td>Tell participants your experience in selecting a pesticide product on its formulation characteristics.</td>
</tr>
<tr>
<td><strong>Objectives:</strong></td>
<td>Refer to the Title Flipchart with the Lesson Objectives.</td>
</tr>
<tr>
<td></td>
<td>By the end of the session, participants will be able to:</td>
</tr>
<tr>
<td></td>
<td>• Identify from the product label the type of formulation and concentration of active ingredient.</td>
</tr>
<tr>
<td></td>
<td>• State the different components of a pesticide product formulation.</td>
</tr>
<tr>
<td></td>
<td>• Explain the advantages and disadvantages of each type of formulation.</td>
</tr>
<tr>
<td></td>
<td>• Describe the problems associated with sub-standard formulations.</td>
</tr>
<tr>
<td><strong>Benefits:</strong></td>
<td>Knowing how pesticides are formulated, and the properties of different formulation types, helps in selecting a pesticide product for a particular pest situation.</td>
</tr>
<tr>
<td><strong>Direction:</strong></td>
<td>• Activities begin with a short work group activity to identify the formulation type and the active ingredient content of a product, followed by a trainer presentation on the components of a formulation.</td>
</tr>
<tr>
<td></td>
<td>• Following a quick brainstorm on other types of formulations, the work groups discuss the advantages and disadvantages of different formulation types.</td>
</tr>
<tr>
<td></td>
<td>• The session ends with an interactive discussion on the problems associated with sub-standard pesticides.</td>
</tr>
</tbody>
</table>
## Delivery

**Explanation, Demonstration, Exercise, and Guidance:**

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
</table>
| 1. 10 minutes | **Work Groups – Pesticide Formulations**  
Remind participants of the opening activity on the ingredients in a cake.  
Say that pesticide products are a mixture of the active ingredient and other substances known as *inert ingredients* which have no pesticidal effect. This mixture is known as the formulation and allows the active ingredient to be more conveniently handled and stored, and to be more effective in its action.  
Divide participants into 3-4 groups depending on numbers.  
Distribute the sample pesticide labels or containers to each group.  
**Work Group Task:**  
• Identify the formulation type from the label.  
• What is the concentration of the pesticide active ingredient in the formulation?  
Allow groups 2-3 minutes to look at the labels.  
Ask each group to report, *ensuring* that they have correctly identified the formulation type and concentration of active ingredient.  
Present *Formulation Components* from the Fact Sheet. |
| 2. 5 minutes | **Brainstorming – Common Types of Formulations**  
Say that in the last activity we identified some types of formulations.  
Ask if anyone knows of other types of formulations.  
Write answers on the flipchart. Use *Common Types of Formulations* from the Fact Sheet as a checklist. |
3. 40 minutes

**Work Groups – Advantages and Disadvantages of Different Types of Formulations**

**Give** each group one formulation from the list on the flipchart, for example:
- Emulsifiable Concentrate
- Wettable Powder
- Flowable
- Dust
- Granule
- Bait
- Fumigant

**Work Group Task:**
- The type of formulation given to your group has advantages and disadvantages for storage, mixing, application and safety. Agree as a group on all these advantages and disadvantages.

**Allow** 15 minutes for discussions.

**Ask** one group to give their answers. **Ask** the other groups if they agree or have any other advantages or disadvantages to add.

**Repeat** for each group. Use *Advantages and Disadvantages of Formulation Types*, from the Fact Sheet to cover any points missed by the participants.

**Ask:**
- From what we have learnt about formulations, what types of formulations are most suitable for farmer use?
- What types of formulations would be best in an IPM programme?
- What types of formulations are most commonly used by local farmers? Are these the most suitable?
- Would a different type of formulation of the same active ingredient be more suitable for farmers? Are such alternatives available?

**Trainer Note:**
There is no ‘correct’ answer to these questions. The most suitable formulation will depend on a range of factors including the availability of alternative products, the farmer’s situation of crop and pest, his knowledge and experience, the destination of the produce, etc. The intention of the questions is to make participants think about, and to re-enforce, their knowledge of pesticide classification and the properties of different formulations.
### 4. Interactive Discussion – Problems Associated with Sub-Standard Formulations

Say that counterfeit and fraudulent pesticides products are becoming more of a problem in many countries. The formulations of these products are often sub-standard.

**Ask:**
- What do you think are problems that could be associated with sub-standard formulations?

**Write** answers on the flipchart, using *Problems of Sub-Standard Formulations* from the Fact Sheet as a checklist.

**Emphasise** that for effective pest management and safety in use, only high quality formulations from reputable manufacturers should be sold and used.

**Say** that we will look at counterfeit and fraudulent products in more detail in another session.

### 5. Role Play – Advice to Farmers on Pesticide Selection

**Role Play setup:**
One participant plays the role of a ‘farmer’ who wants a pesticide to control whitefly in tomatoes (or a similar local pest / crop combination). He has seen another farmer using a very cheap pesticide, and wants something similar.

A second participant plays the role of a ‘pesticide retailer’. He needs to persuade the farmer not to buy the cheapest product, which is probably counterfeit, but to purchase a more expensive, but genuine, product with appropriate mode of action and formulation characteristics.

**Ask** for two volunteers to play the roles of the ‘farmer’ and the ‘pesticide retailer’.

**Let** the two participants proceed with the role play.

When they have finished, **ask** the ‘farmer’:
- Was he persuaded to purchase the more expensive product?
- How and why was he persuaded?

**Ask** the other participants:
- What did they think of the arguments of the ‘retailer’?
- Would they have done anything differently?
- If so, What?

**Summarise** by saying that:
- Providing appropriate advice to farmers is an essential part of good service.
- In a previous ‘What If’ activity we advised the farmer in some situations that a pesticide was not necessary at that time.
- In this activity we have advised use of a pesticide that is genuine and appropriate, and will control the pest in question.
### Finish

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
</table>
| Summary:  | Include as major messages:  
| 1 minute  | • Information about the formulation on the product label.  
|           | • That different formulation types have different advantages and disadvantages.  
|           | • The problems associated with counterfeit and fraudulent products.  |
| Questions:| Ask if everyone understands or if there are any additional questions.  
| 1 minute  | Answer these provided they are relevant.  
|           | Ask if the session objectives were met  |
| Evaluation:| Hand out the Assessment Sheet and ask participants to complete two of the questions.  
| 12 minutes| Collect the Assessment Sheet for later marking and entering the marks on the Attendance Record.  |
| Next step:| Say that in the last session we looked at selecting a product based on the classification of the pesticide that it contained. In this session we added to that, and can now include type of formulation in the pesticide / product selection criteria.  
| 1 minute  | In the next sessions we will look at the pesticide label in more detail, and the information it contains about the pesticide.  
|           | Hand out the Fact Sheet to participants.  |
Assessment Questions

Answer TWO (2) only of the following questions.
You may write your answers on this question sheet or tell your trainer the answers.
All questions are the same value (5 marks).

Question 1: Give three types of inert ingredients in a formulation.

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Question 2: Give three advantages of an emulsifiable concentrate formulation.

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Question 3: Give three disadvantages of wettable powder formulations.

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Question 4: Give three problems associated with sub-standard formulations.

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FACT SHEET

FORMULATION COMPONENTS

<table>
<thead>
<tr>
<th>Active ingredient</th>
<th>The component with pesticidal effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inert ingredients</td>
<td>Components which have no pesticidal effect</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Solvents</th>
<th>Liquid formulations. The active ingredient is dissolved in the solvent.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carriers</td>
<td>Dry formulations. The active ingredient is mixed with or absorbed onto the carrier.</td>
</tr>
<tr>
<td>Emulsifiers</td>
<td>Help emulsifiable concentrates mix better with water.</td>
</tr>
<tr>
<td>Wetting agents</td>
<td>Help wettable powders mix better with water, and help formulations spread on water repellent surfaces.</td>
</tr>
<tr>
<td>Stickers</td>
<td>Help the spray mix stick to surfaces.</td>
</tr>
<tr>
<td>Spreaders</td>
<td>Help the spray mix spread evenly over treated surfaces.</td>
</tr>
</tbody>
</table>

Not all formulations will contain all the different types of inert ingredients.

COMMON TYPES OF FORMULATIONS

Emulsifiable Concentrate (EC)
- Liquid formulations where the active ingredient is dissolved in a petroleum solvent.
- The formulation is diluted with water to form an emulsion for application.
- Usually contain 25 to 75 percent of active ingredient.
- ECs are among the most common pesticide formulations.

Wettable Powder (WP)
- Dry formulations of fine, insoluble powders. The active ingredient is combined with an inert carrier such as clay or talc, together with wetting and/or dispersing agents.
- The formulation is diluted with water to form a suspension for application.
- Usually contain more than 50 percent active ingredient.
- WPs are among the most common pesticide formulations.

Flowable (F or FL)
- Used for active ingredients that are not soluble in the more common solvents.
- Active ingredients are mixed on a carrier, such as clay, and formulated with a liquid to form a thick, paste-like suspension.
- The formulation is diluted with water to form a suspension for application.
- Combine the benefits of both ECs and WPs.

Dust (D)
- Finely ground, dry mixtures in which the active ingredient is combined with an inert carrier, such as talc, chalk or clay.
- Applied without any further dilution.
- Usually contain 1 to 10 percent of active ingredient.
- They are not commonly used in agriculture, because of the problems of drift.

Granule (G)
- Granule formulations are similar to dusts, except that the particles are larger and heavier.
- The active ingredient may be coated on the outside or absorbed into the particles.
• Applied without any further dilution.
• Usually contain 1 to 15 percent of active ingredient.
• Most commonly used for soil application to control weeds, nematodes and soil living insects.

**Bait (B)**
• An active ingredient mixed with food or other attractant material.
• The bait may be sold pre-mixed, or the pesticide and bait material mixed by the user.
• Pests are killed by eating the pesticide contained in the bait, either in a single dose, or over time.
• The concentration of active material is low, usually less than 5 percent.
• Commonly used in indoor situations, but may be used in agriculture.

**Fumigant (F)**
• Pesticides that form poisonous gases.
• May be a liquid under high pressure that changes to a gas when released, or a volatile liquid, or a solid that releases a gas under high humidity.
• Used for structural pest control, food and grain storage, soil sterilization, and greenhouses.

**Definitions:**

<table>
<thead>
<tr>
<th><strong>Soluble</strong></th>
<th>A substance that will dissolve in a solvent to form a solution. For example, sugar is soluble in water or tea.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Emulsion</strong></td>
<td>A mixture or two liquids in which particles of one liquid are suspended evenly throughout the other. For example, the butter fat in milk.</td>
</tr>
<tr>
<td><strong>Suspension</strong></td>
<td>Fine particles of a solid suspended in a liquid. For example, the mud in a river.</td>
</tr>
</tbody>
</table>

**PROBLEMS OF SUB-STANDARD FORMULATIONS**

• In an increasing number of countries it is common for some of the formulations on the market to be counterfeit, fraudulent, and sub-standard, with low quality ingredients and low quality manufacturing processes.

• Problems associated with sub-standard formulations include:
  • Poor quality active ingredient which has reduced effectiveness.
  • A lower concentration of active ingredient than indicated on the label.
  • No active ingredient in the product.
  • Excessive, often highly toxic, by-products of the active ingredient manufacturing process in the formulation.
  • Rapid break down of the formulation in the container during storage. In tropical countries, this is made worse by the high temperatures prevailing for much of the year.
  • Separation out of the spray mix of emulsifiable concentrate formulations
  • Settling out of the spray mix of powder formulations.
  • Damage or total loss of crops by the product not being effective or being phytotoxic.

**FOR EFFECTIVE PEST MANAGEMENT AND FOR SAFETY IN USE, ONLY HIGH QUALITY FORMULATIONS FROM REPUTABLE MANUFACTURERS SHOULD BE USED.**
# Advantages and Disadvantages of Different Types of Formulations

<table>
<thead>
<tr>
<th>Emulsifiable Concentrate (EC)</th>
<th>Wettable Powder (WP)</th>
<th>Flowable (F or FL)</th>
<th>Dust (D)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Advantages</strong></td>
<td><strong>Advantages</strong></td>
<td><strong>Advantages</strong></td>
<td><strong>Advantages</strong></td>
</tr>
<tr>
<td>Easy to handle, transport and store</td>
<td>Can be used with most types of application equipment</td>
<td>Can be used with most types of application equipment</td>
<td>Ready to use, no mixing needed</td>
</tr>
<tr>
<td>Can be used with most types of application equipment</td>
<td>Usually less phytotoxic than ECs</td>
<td>Usually less phytotoxic than ECs</td>
<td>Require only simple application equipment</td>
</tr>
<tr>
<td>Little agitation needed in spray tank, does not settle out</td>
<td>Absorbed less readily through the skin than ECs</td>
<td>Absorbed less readily through the skin than ECs</td>
<td>Effective in hard-to-reach indoor areas</td>
</tr>
<tr>
<td>Not abrasive to nozzles and pumps</td>
<td>Disadvantages</td>
<td>Disadvantages</td>
<td>Disadvantages</td>
</tr>
<tr>
<td>Do not block filters or nozzles</td>
<td>Usually high concentration in the formulation</td>
<td>Mixers need more protective clothing than applicators</td>
<td>Easily drift off target in outdoor application</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Require constant agitation in the spray tank, or they quickly settle out</td>
<td>Easily drift off target in outdoor application</td>
</tr>
<tr>
<td><strong>Disadvantages</strong></td>
<td></td>
<td>Abrasive to nozzles and pumps</td>
<td>Do not stick to target surfaces, easily removed by wind</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Can clog filters and nozzles</td>
<td>Can be difficult to obtain even distribution over target area</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Risk of inhaling powder during mixing</td>
<td>May irritate eyes, nose, throat and skin</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Inert carriers may leave a deposit on crops, which has to be removed before marketing</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Granule (G)</td>
<td>Disadvantages</td>
<td></td>
<td></td>
</tr>
<tr>
<td>------------</td>
<td>---------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Advantages</strong></td>
<td><strong>Disadvantages</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Ready to use, no mixing needed</td>
<td>• Do not stick to foliage or other non-level surfaces</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Slow release of pesticide gives extended protection</td>
<td>• May need to be incorporated in soil</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Low risk of drift</td>
<td>• Can be difficult to obtain even distribution over the target area</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Little hazard in use to applicator</td>
<td>• Slow release of pesticide results in long persistence</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Require only simple application equipment</td>
<td>• May be hazardous to non-target animals such as chickens and other birds who mistake granules for food grain</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Bait (B)</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Advantages</strong></td>
<td><strong>Disadvantages</strong></td>
</tr>
<tr>
<td>• May be ready to use</td>
<td>• Can be attractive to non-target organisms (domestic animals, children etc)</td>
</tr>
<tr>
<td>• Little pesticide needed – bait applied only where pests are present and pests are attracted to the pesticide</td>
<td>• Pests may prefer other food or crop to the bait</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fumigant (F)</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Advantages</strong></td>
<td><strong>Disadvantages</strong></td>
</tr>
<tr>
<td>• Toxic to a wide range of pests.</td>
<td>• Target site must be covered and airtight to prevent the gas from escaping.</td>
</tr>
<tr>
<td>• Can penetrate cracks, wood, soil and grain.</td>
<td>• Highly toxic to humans and all other living organisms.</td>
</tr>
<tr>
<td>• Single treatment will usually kill most pests in the treated area</td>
<td>• Need specialized protective clothing, including respirators.</td>
</tr>
<tr>
<td></td>
<td>• Need specialized application equipment</td>
</tr>
</tbody>
</table>
## Major Pesticide Formulation Types – Solids

<table>
<thead>
<tr>
<th>Physical State</th>
<th>How Applied</th>
<th>Formulation Type</th>
<th>Diluent</th>
<th>Problems, Hazards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solid</td>
<td>Undiluted</td>
<td>Dust</td>
<td>None</td>
<td>• drifting easily</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• do not stick to target surfaces</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• difficult to obtain even distribution</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• risk of inhalation</td>
</tr>
<tr>
<td></td>
<td>Diluted</td>
<td>Wettable Powder</td>
<td>Water</td>
<td>• mixer needs more protection than operator</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• needs constant agitation</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• abrasive to nozzles and pumps</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• can clog filters and nozzles</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bait</td>
<td>Bran, grain</td>
<td>• can be attractive to non-target organisms (food)</td>
</tr>
</tbody>
</table>

- Dust when handling concentrate
- Operator exposed to concentrate
# Major Pesticide Formulation Types - Liquids

<table>
<thead>
<tr>
<th>Physical State</th>
<th>How Applied</th>
<th>Formulation Type</th>
<th>Diluent</th>
<th>Problems, Hazards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liquid</td>
<td>Diluted</td>
<td>Emulsifiable Concentrate</td>
<td>Water</td>
<td>• Mixer needs more protection than applicator</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Easy to under- or over-dose</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• May cause phytotoxicity</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Easily absorbed through skin</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• May attack rubber, plastic, hoses, gaskets</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Flammable</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Flowable</td>
<td></td>
<td>Mixer exposed to concentrate</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Splashes adhere to clothes and skin</td>
</tr>
</tbody>
</table>

- **See also:**
- CropLife International Guidelines for the Safe and Effective Use of Crop Protection Products
  [http://croplife.org/?s=guidelines](http://croplife.org/?s=guidelines)
SESSION 7: THE PRODUCT LABEL
Lesson Plan

| Materials needed:                                                                 |
|                                                                               |
| ✓ Flipchart stands.                                                           |
| ✓ Flipchart paper.                                                            |
| ✓ Markers (4 colours).                                                        |
| ✓ Notebooks, pens, and file covers for participants who have                  |
| forgotten to bring them.                                                     |
| ✓ Coloured cards.                                                             |
| ✓ Glue stick or blue tack.                                                    |
| ✓ Masking tape.                                                               |

| Time needed: 95 minutes |

| Intended audience: Pesticide Retailers |

| Preparation: |
| ✓ Flipchart with the session title “Dealing With Farmers”, and the Session Objectives. |
| ✓ Examples of different local pesticide labels or containers with labels. |
| ✓ Flipchart with diagram representation of a local label, or the example label given at the end of the session plan. |
| ✓ Flipchart with Hazard Warning Symbols, or printed copies, from the end of the session plan. |
| ✓ Printed copies of Visual 1 from the end of the session plan (10-12 copies). |
| ✓ Print off sufficient Attendance Record sheets. |
| ✓ Print off sufficient Assessment question sheets. |
| ✓ Print off sufficient Fact Sheets for participants. |
| ✓ Organise venue and seating arrangements. |

Attendance Record

As participants arrive, ask them to enter their name and other information on the Attendance Record. There is also a column on the form to enter their marks from the Assessment Questions at the end of the training session.
### Set up / Introduction

**Time** | **Activity**
--- | ---
**Attention:** | Welcome the retailers to the session.

**Ask:**
Where is the one place where you can immediately and easily find all the necessary information about a pesticide product?

**Say** that the pesticide product label contains all the essential information about safe handling and use of a pesticide product

**Title:** | Refer to the Title Flipchart and tell participants that this training session will cover The Pesticide Label.

**Credibility:** | Tell participants an experience of not reading the label and so using a product incorrectly.

**Objectives:** | Refer to the Title Flipchart with the Lesson Objectives.

By the end of the session, participants will be able to:
- Describe the types of information given on a pesticide label, and how to find this information on the label.
- Explain the toxicity classification of the product indicated by the colour band on the label.
- Explain how to read the colour band.
- State clearly the meanings of the symbols and pictograms on the colour band.

**Benefits:** | Knowing where to find all the necessary information regarding a pesticide product will enable participants to give appropriate and practical advice to farmers.

**Direction:** | • The session begins with a work group activity on the information that should be on a product label.
- An interactive discussion, followed by a short presentation, introduces the product toxicity classifications indicated by the colour band.
- The session ends with a presentation and interactive discussion on pictograms.
### Delivery

**Explanation, Demonstration, Exercise, and Guidance:**

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 30 minutes</td>
<td><strong>Work Groups - What Information Should Be On the Label?</strong></td>
</tr>
<tr>
<td></td>
<td>Say that participants have experience of selling pesticide products and</td>
</tr>
<tr>
<td></td>
<td>advising farmers. We will now look at what information they as retailers</td>
</tr>
<tr>
<td></td>
<td>think should be on a label.</td>
</tr>
<tr>
<td></td>
<td><strong>Work Group Task:</strong></td>
</tr>
<tr>
<td></td>
<td>• Agree as a group on the information that you think should be presented</td>
</tr>
<tr>
<td></td>
<td>on the label of a pesticide container.</td>
</tr>
<tr>
<td></td>
<td><strong>Allow</strong> 15 minutes for this activity.</td>
</tr>
<tr>
<td></td>
<td><strong>Ask</strong> each table to report.</td>
</tr>
<tr>
<td></td>
<td><strong>Write</strong> the responses on the flipchart. <strong>Put</strong> a tick against the</td>
</tr>
<tr>
<td></td>
<td>information if more than one group gives the same response. Use <strong>Information That Should Be on a Pesticide Label</strong> from the Fact Sheet as a checklist.</td>
</tr>
<tr>
<td></td>
<td><strong>Show</strong> the flipchart with the diagram representation of a local label,</td>
</tr>
<tr>
<td></td>
<td>or the example label, and <strong>indicate</strong> the information.</td>
</tr>
<tr>
<td></td>
<td><strong>Explain</strong> that labels can have one, two, or three panels, but all should</td>
</tr>
<tr>
<td></td>
<td>contain the necessary information.</td>
</tr>
<tr>
<td></td>
<td><strong>Emphasise</strong> that the information regarding pests and crops for which the</td>
</tr>
<tr>
<td></td>
<td>product is registered is a legal requirement of use in most countries,</td>
</tr>
<tr>
<td></td>
<td>and the product must not be used on crops or pests other than those given</td>
</tr>
<tr>
<td></td>
<td>on the label.</td>
</tr>
<tr>
<td>2. 15 minutes</td>
<td><strong>Work Groups – Information on the Label</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Distribute</strong> the sample labels to work groups.</td>
</tr>
<tr>
<td></td>
<td><strong>Say</strong> each information type in turn, and <strong>ask</strong> the groups to identify</td>
</tr>
<tr>
<td></td>
<td>the information on the label.</td>
</tr>
<tr>
<td></td>
<td><strong>Walk</strong> round the groups to ensure that they have correctly identified</td>
</tr>
<tr>
<td></td>
<td>the information.</td>
</tr>
</tbody>
</table>
### Session 7: The Product Label

**3. Interactive Discussion / Presentation – Colour Band and Hazard Symbols**

10 minutes

Say that there is a part of the label we have not yet discussed. What is it?

Say that the colour band gives information both on the toxicity of the product formulation, and on safety advice and warnings for the product, as pictures, or pictograms.

Remind participants that in **Lesson 4 on Pesticide Classification**, toxicity was one of the ways in which pesticides are classified, and that there were five toxicity classes.

Say that commonly there are four different colours for the band, red, yellow, green, and blue. Write these colours on the flipchart.

Ask:
- What do participants think that the different colours indicate with regard to the toxicity classes?

Take responses from participants, and when correct write the toxicity category against the colour.

Say that as well as the colour indication of the toxicity class, there is also a hazard warning symbol in the centre of the band.

Show the hazard warning flipchart, or distribute the printed hazard warnings, and explain for each symbol the hazard classification, the hazard statement, and the colour of the band on which it is found.

**4. Presentation – Pictograms**

5 minutes

Distribute 2-3 copies of Visual 1 to each group.

Explain that the pictograms on the band are divided into different areas.
- In the centre of the band is the hazard symbol and hazard statement.
- To the left and right of the centre are two boxes containing pictograms.
- The box on the left refers to mixing, as shown by the Activity pictogram of a gloved hand pouring out a pesticide. To the left of the activity pictogram are Advice pictograms indicating the protective clothing to be worn during mixing.
- The box on the right refers to application, as shown by the Activity pictogram of a person spraying. To the right of the activity pictogram are Advice pictograms indicating the protective clothing to be worn during application.
- To the left and right of the boxes, at the ends of the band are Storage and Warning pictograms.

**5. Interactive Discussion - Pictograms**

10 minutes

Take each example colour band in turn, and ask:
- What protective clothing should be worn during mixing
- What protective clothing should be worn during application
- What is the meaning of the pictogram on the right of the band
- What is the meaning of the pictogram(s) on the left of the band

Say that these pictograms are the most common, although there are others, which are given in the Fact Sheet.
6. 5 minutes
As a final session statement emphasise that:
• The label contains all the necessary information about a product – Type of formulation, usage recommendations, safety advice, date of manufacture and expiry, manufacturer, registration number, and so on.
• It is essential to READ THE LABEL whenever a pesticide is handled.
• This is so even if the handler or user is experienced, both as a reminder and also as the information may have changed since the product was last used.

Finish

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summary:</td>
<td>Include as major messages:</td>
</tr>
<tr>
<td>1 minute</td>
<td>• The pesticide label contains all the necessary information about a</td>
</tr>
<tr>
<td></td>
<td>pesticide product.</td>
</tr>
<tr>
<td></td>
<td>• The toxicity classifications indicated by the colour band</td>
</tr>
<tr>
<td></td>
<td>• How to read the pictograms on the colour band.</td>
</tr>
<tr>
<td>Questions:</td>
<td>Ask if everyone understands or if there are any additional questions.</td>
</tr>
<tr>
<td>1 minute</td>
<td>Answer these provided they are relevant.</td>
</tr>
<tr>
<td></td>
<td>Ask if the session objectives were met</td>
</tr>
<tr>
<td>Evaluation:</td>
<td>Hand out the Assessment Sheet and ask participants to complete two of</td>
</tr>
<tr>
<td>12 minutes</td>
<td>the questions.</td>
</tr>
<tr>
<td></td>
<td>Collect the Assessment Sheet for later marking and entering the marks</td>
</tr>
<tr>
<td></td>
<td>on the Attendance Record.</td>
</tr>
<tr>
<td>Next step:</td>
<td>Say that in this session we learned about the pesticide label, the</td>
</tr>
<tr>
<td>1 minute</td>
<td>information it contains, and how to read the colour band and pictograms.</td>
</tr>
<tr>
<td></td>
<td>As part of their improved service to farmers, when customers purchase</td>
</tr>
<tr>
<td></td>
<td>a pesticide participants should read the label and point out the</td>
</tr>
<tr>
<td></td>
<td>information.</td>
</tr>
<tr>
<td></td>
<td>Hand out the Fact Sheet to participants.</td>
</tr>
</tbody>
</table>
### Example Label

<table>
<thead>
<tr>
<th><strong>ERASE SC</strong></th>
<th><strong>Suspension Concentrate</strong></th>
<th><strong>Precautions</strong></th>
</tr>
</thead>
</table>
| **Directions for Use** | Mix 12ml per 10 litres of water. Apply when young plants show shothole damage. Apply to maize funnel. Repeat after 14 days | • Handle with care  
• Wear rubber gloves when mixing and handling  
• Avoid spray drift  
• Prevent contamination of food and water  
• Dangerous to fish  
• Wash with soap and water after use or accidental contact  
• Keep out of the reach of children |
| **Suspension Concentrate** | Cyfluthrin . . . . . . . . . . 125g/l (pyrethroid) | |
| **Pre-Harvest Interval** | Maize can be eaten 14 days after last treatment | |
| **For the control of stalkborer (Busseola fusca) on maize** | Import and Distributed by: KillPest Ltd PO Box 1111 Harbour Road Mombasa, Kenya | |
| **Symptoms of Poisoning** | • Salivation  
• Skin irritation | |
| **First Aid** | • Remove patient from source of poisoning  
• Keep patient calm, and warm and comfortable | |
| **Advice to Physician** | Man: 8/2013  
Exp: 8/2015  
Lot: C1854 | Reg: 711160/2010 |

1 litre

**Caution**
Colour Band / Label Hazard Warnings

The WHO system is followed in many countries, although some countries have their own system.

<table>
<thead>
<tr>
<th>WHO Class (1)</th>
<th>Label</th>
<th>Hazard statement</th>
<th>Symbol</th>
<th>Band Colour (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ia</td>
<td></td>
<td>Extremely Hazardous</td>
<td></td>
<td>Red</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Very Toxic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ib</td>
<td></td>
<td>Highly Hazardous</td>
<td></td>
<td>Red</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Toxic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>II</td>
<td></td>
<td>Moderately Hazardous</td>
<td></td>
<td>Yellow</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Harmful</td>
<td></td>
<td></td>
</tr>
<tr>
<td>III</td>
<td></td>
<td>Slightly Hazardous</td>
<td></td>
<td>Blue</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Caution</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Products unlikely to present a hazard in normal use</td>
<td></td>
<td>Green</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Caution</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>None</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(1) The hazard warning on the label refers to the formulation, not the active ingredient.

(2) This is the most commonly used colour scheme, but may differ in some countries.
Visual 1

Class Ia Product

Class II Product

Class III Product

Unclassified Product
ALWAYS READ PESTICIDE LABELS BEFORE USE

WHY IS IT IMPORTANT TO READ THE PESTICIDE LABEL?

- It is the primary source of information about the product
- It has information about recommended crops and pests to use the product on, dose and application rates, and other essential information
- It has information on how to handle pesticides while protecting your health and the environment
- Contains information about the first aid measures and antidotes in case of intoxication

REMEMBER: KEEP THE LABEL AT HAND AND ASK FOR ASSISTANCE IF YOU CANNOT READ THE LABEL

www.croplife.org
Assessment Questions

Name: __________________________ Date: ____________  Mark: ________

Answer TWO (2) only of the following questions. You may write your answers on this question sheet or tell your trainer the answers. All questions are the same value (5 marks).

Question 1: There are five WHO toxicity classes. What is the colour of each of the corresponding bands?

Question 2: What hazard symbol will be on a Class II product?

Question 3: What do the following activity symbols represent?

Question 4: What do the following three pictograms represent?
FACT SHEET

Information That Should Be On a Pesticide Label

- Product name of the pesticide.
- Name of the active ingredient(s) in the product.
- Percentage concentration of active ingredient in the product.
- Percentage concentration of inert materials in the product.
- Toxicity of the product.
- Crops and pests for which the product is registered for use.
- Dose or application rates to use.
- Pre-harvest interval.
- Safety precautions to follow when mixing and applying.
- First aid measures, advice to doctors, and antidotes.
- Date of manufacture, batch number, and expiry date.
- Product registration number from the pesticide registration authority in the country
- Name of the manufacturer or importer and contact details.
- Weight or volume of the container contents.

Toxicity

A measure of how poisonous a pesticide is to man. High toxicity to man does not necessarily mean that the pesticide is highly toxic to the pest. Formulations are usually less toxic than the pure active ingredient.

The following WHO classification of toxicity is most commonly used, although there are others such as national systems:

**Class Ia:** “Extremely Hazardous”
**Class Ib:** “Highly Hazardous”
**Class II:** “Moderately Hazardous”
**Class III:** “Slightly Hazardous”
**[no class]** “Unlikely to Cause Hazard in Normal Use”

The toxicity warning on the pesticide label refers to the formulation, not the active ingredient.
Hazard Warnings

The WHO system is followed in many countries, although some countries have their own system.

<table>
<thead>
<tr>
<th>WHO Class (1)</th>
<th>Label</th>
<th>Hazard statement</th>
<th>Symbol</th>
<th>Band Colour (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ia</td>
<td>Extremely Hazardous</td>
<td>Very Toxic</td>
<td>![Symbol]</td>
<td>Red</td>
</tr>
<tr>
<td>Ib</td>
<td>Highly Hazardous</td>
<td>Toxic</td>
<td>![Symbol]</td>
<td>Red</td>
</tr>
<tr>
<td>II</td>
<td>Moderately Hazardous</td>
<td>Harmful</td>
<td>![Symbol]</td>
<td>Yellow</td>
</tr>
<tr>
<td>III</td>
<td>Slightly Hazardous</td>
<td>Caution</td>
<td>None</td>
<td>Blue</td>
</tr>
<tr>
<td></td>
<td>Products unlikely to present a hazard in normal use</td>
<td>Caution</td>
<td>None</td>
<td>Green</td>
</tr>
</tbody>
</table>

(1) The hazard warning on the label refers to the formulation, not the active ingredient.

(2) This is the most commonly used colour scheme, but may differ in some countries.
Pictograms

Storage

Keep locked away and out of reach of children

Activity

Handling liquid concentrate
Handling dry concentrate
Application

Advice

Wear gloves
Wear boots
Wear eye protection
Wear face shield
Wear mask
Wear respirator
Wear overalls
Wear Apron
Wash after use

Warning

Dangerous to animals
Dangerous to fish and water
Examples of Label Layouts

One Panel Layout:
Examples of Colour Bands and Pictograms

Class Ia Product

Class II Product

Class III Product

Unclassified Product

See also:
CropLife International Guidelines for the Safe and Effective Use of Crop Protection Products
http://croplife.org/?s=guidelines
SESSION 8: THE ENVIRONMENT
Lesson Plan

| Materials needed: | ☑️ Flipchart stands.  
|                  | ☑️ Flipchart paper.  
|                  | ☑️ Markers (4 colours).  
|                  | ☑️ Notebooks, pens, and file covers for participants who have forgotten to bring them.  
|                  | ☑️ Coloured cards.  
|                  | ☑️ Glue stick or blue tack.  
|                  | ☑️ Masking tape.  |

| Time needed: | 95 minutes  |

| Intended audience: | Pesticide Retailers  |

| Preparation: | ☑️ Flipchart with the session title “The Environment”, and the Session Objectives.  
|              | ☑️ Print off sufficient Attendance Record sheets.  
|              | ☑️ Print off sufficient Assessment question sheets.  
|              | ☑️ Print off sufficient Fact Sheets for participants.  
|              | ☑️ Organise venue and seating arrangements.  |

Attendance Record

As participants arrive, ask them to enter their name and other information on the Attendance Record. There is also a column on the form to enter their marks from the Assessment Questions at the end of the training session.
<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
</table>
| Attention: | **Welcome the retailers to the session.**  
  **Ask:**  
  • What is the environment? What makes up the environment?  
  **Write** answers on the flipchart.  
  **Say** we will come back to these responses later. |
| Title:   | **Refer** to the Title Flipchart and tell participants that this training session will cover *The Environment*. |
| Credibility: | **Tell** participants an example of environmental protection or pollution. |
| Objectives: | **Refer** to the Title Flipchart with the Lesson Objectives.  
  By the end of the session, participants will be able to:  
  • Define what is meant by the environment.  
  • Identify sensitive areas in the environment.  
  • Describe how pesticides enter and move through the environment.  
  • Explain the problems of pesticide contamination of the environment, and how to avoid or minimise these effects.  
  • Define what is meant by pre-harvest interval and explain its importance. |
| Benefits: | The environment is essential for our existence and survival. Everyone has a responsibility to protect the environment from all sources of contamination. |
| Direction: | • Activities begin with an interactive discussion on what makes up the environment, sensitive areas, and how pesticides enter and move through the environment.  
  • A work group task then investigates the problems associated with pesticide contamination of the environment, and how to avoid or minimise these problems.  
  • A final interactive discussion looks at pesticide residues and the pre-harvest interval. |
## Delivery

**Explanation, Demonstration, Exercise, and Guidance:**

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 20 minutes</td>
<td><strong>Interactive Discussion – The Environment, Sensitive Areas, and Pesticide Movement in the Environment</strong></td>
</tr>
</tbody>
</table>

Refer to the flipchart from the Attention activity.

Say that all the responses are more or less correct.

**Emphasise:**
- The environment is everything around us – soil, water, air, plants, animals, farms, buildings, etc.
- We depend on the environment for our existence. We cannot live if the soil, water, or air is polluted.
- As sellers and users of pesticides, we have a responsibility to ensure that pesticides are used responsibly and safely, and to minimise environmental contamination.

Ask:
- What would be especially sensitive areas of the environment where we would not want pesticide contamination?

Write responses on the flipchart, using *Sensitive Areas* from the Fact Sheet as a checklist.

Ask:
- How would pesticides enter the environment? What would be the potential sources of pesticides entering the environment?

Write responses on the flipchart, using *Sources of Contamination* from the Fact Sheet as a checklist.

Say that some sources are unavoidable, emphasise that every pesticide application contaminates the environment. Other sources are avoidable, or can be minimised.

Say that pesticides can move through the environment from one place to another.

Ask:
- How do pesticides move through the environment from one place to another?

Write responses on the flipchart, using *Pesticide Movement in the Environment* from the Fact Sheet as a checklist.
<table>
<thead>
<tr>
<th>2.</th>
<th>Work Groups – Consequences of Contamination</th>
</tr>
</thead>
<tbody>
<tr>
<td>40 minutes</td>
<td>Say that as pesticide retailers, participants should advise farmer customers on how to avoid or minimise pesticide contamination of the environment, and provide the farmer with the reasons why they should do this.</td>
</tr>
</tbody>
</table>

**Work Group Task:**
- List the possible problems and consequences of pesticide contamination of the environment.
- List possible ways of avoiding or minimising these problems and consequences.
- Write responses on a flipchart.

After 20 minutes, ask each group to present their results.

Review and summarise the group flipcharts, using Problems of Pesticide Contamination of the Environment and Avoiding or Minimising Pesticide Contamination of the Environment as checklists.

<table>
<thead>
<tr>
<th>3.</th>
<th>Interactive Discussion - Pesticide Residues and Pre-Harvest Intervals</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 minutes</td>
<td>Remind participants of the last session on the pesticide product label.</td>
</tr>
</tbody>
</table>

**Say:**
- Every pesticide application leaves a residue on the crop.
- The label should indicate the pre-harvest interval for the product.

**Trainer Note:**
Use Pesticide Residues and Pre-Harvest Intervals from the Fact Sheet as a checklist for responses to the following questions.

**Ask:**
- What is meant by the pre-harvest interval?

Take responses until the correct one is given.

**Ask:**
- Why is a pre-harvest interval necessary?

Write responses on the flipchart.

**Ask:**
- What factors are used to determine the pre-harvest interval?

Write responses on the flipchart.

Review responses to all the questions, and emphasise the importance of following the use recommendations on the pesticide label and adhering to the pre-harvest interval.
<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
</table>
| **Summary:** | **1 minute**  
Include as major messages:  
• What the environment includes and how we are dependent on the environment for our existence.  
• Sensitive areas  
• Sources and problems of pesticide contamination of the environment  
• Ways to avoid or minimise pesticide contamination of the environment  
• Pesticide residues and the pre-harvest interval |
| **Questions:** | **1 minute**  
Ask if everyone understands or if there are any additional questions. Answer these provided they are relevant.  
Ask if the session objectives were met |
| **Evaluation:** | **12 minutes**  
Hand out the Assessment Sheet and ask participants to complete two of the questions.  
Collect the Assessment Sheet for later marking and entering the marks on the Attendance Record. |
| **Next step:** | **1 minute**  
Say that as pesticide retailers they have an important responsibility to ensure that pesticide contamination of the environment is minimised, and that they should advise farmers as to why this is important and how to avoid or minimise contamination.  
Hand out the Fact Sheet to participants. |
Assessment Questions

Name: ................................. Date: .................... Mark: .................................

Answer TWO (2) only of the following questions.
You may write your answers on this question sheet or tell your trainer the answers. All questions are the same value (5 marks).

Question 1: Give three sensitive areas of the environment.
...........................................................................................................................................................................................
...........................................................................................................................................................................................
...........................................................................................................................................................................................

Question 2: Give three avoidable sources of pesticide contamination of the environment.
...........................................................................................................................................................................................
...........................................................................................................................................................................................
...........................................................................................................................................................................................

Question 3: Give three ways of avoiding or minimizing pesticide contamination of the environment.
...........................................................................................................................................................................................
...........................................................................................................................................................................................
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Question 4: What is meant by the pre-harvest interval?
...........................................................................................................................................................................................
...........................................................................................................................................................................................
...........................................................................................................................................................................................
FACT SHEET

THE ENVIRONMENT

The environment includes everything around us:
• “Natural” elements such as soil, water, and air.
• Plants, animals, indoors/outdoors, houses, gardens, offices, everywhere.

We are dependent on the environment for our existence and survival

Pesticide retailers, as handlers and sellers of pesticides, have a responsibility to ensure that environmental contamination by pesticides is avoided or minimised as much as possible. Retailers should advise their customers on the importance of avoiding or minimising pesticide contamination and how to do this.

SENSITIVE AREAS

Sensitive areas are those which are especially susceptible to contamination by pesticides.

Outdoors:
• Areas near open/surface water.
• Where ground water is near the surface.
• Near schools, playgrounds, hospitals, and places where food is sold or prepared.
• Where honey-bees are active.
• Near gardens, food or feed crops.

Indoors:
• All areas where people - especially children, pregnant women, elderly, and the sick - live, work or are cared for.
• Places where food is processed, stored, prepared or eaten.
• Places where domestic animals are kept, live or eat.

SOURCES OF CONTAMINATION

Unavoidable:
• Pesticide use at the site of application - even a correct application puts pesticide into the environment

Avoidable:
• Unnecessary spray applications
• Mixing a higher pesticide rate than recommend
• Run off to ground from excess spray volume
• Spray drift
• Washing water - personal, equipment, clothing
• Spills during transport, storage and mixing
• Improper disposal of containers and excess spray mix

MINIMISE PESTICIDE USE TO MINIMISE ENVIRONMENTAL CONTAMINATION
PESTICIDE MOVEMENT IN THE ENVIRONMENT

- Volatilisation from treated surfaces
- Drift during application
- Washing from treated surfaces to the ground/soil by:
  - Rain
  - Dew
  - Overhead irrigation
- Incorporated into the soil with crop residues
- Removal from field as residues on crop surfaces:
  - Harvested produce (vegetables, fruit, etc)
  - Fodder for animals
  - Fuel
- Removal from the field on contaminated equipment:
  - Spraying and mixing equipment
  - Clothing
  - Containers
- Carried across and out of the field in irrigation water
- Leaching through the soil into ground water

PROBLEMS OF PESTICIDE CONTAMINATION OF THE ENVIRONMENT

- Pesticide residues on food and fodder eaten by humans and animals
- Damage to adjacent crops from spray drift.
- Contamination of water sources:
  - Effect on humans drinking or using the water
  - Effects on fish and other aquatic organisms, including plants
  - Effects on wildlife.
- Effects on beneficial organisms:
  - Bees
  - Natural enemies of pests
  - Soil micro-organisms

AVOIDING OR MINIMISING PESTICIDE CONTAMINATION OF THE ENVIRONMENT

To avoid or minimise pesticide contamination of the environment, all pesticide handling and use activities must follow recommended practices.
- Before handling or using any pesticide – READ THE LABEL
- Handling
- Transport
- Storage
- Application
- Disposal

Safe implementation of these activities is covered in detail in other sessions of the Retailer Training Course.
PESTICIDE RESIDUES AND PRE-HARVEST INTERVALS

• Every pesticide application leaves a pesticide residue on the crop.
• In many countries there is a Maximum Residue Limit (MRL) for each pesticide / food crop combination. This specifies the maximum level of a pesticide residue that can be found on that food crop at harvesting in order to protect consumers. Crop produce for export will also have to comply with MRLs.
• The rate of pesticide residue decrease after application is affected by many factors, including the type of pesticide and formulation, crop growth, the effect of UV light, rain, and temperature.
• The Pre-Harvest Interval (PHI) is the time interval (usually in days) between the last application of the pesticide and harvesting of the crop.
• The PHI is determined from research trials to ensure that, when applied following the manufacturer’s usage recommendations given on the label, the MRL is not exceeded at harvest.

See also:
CropLife International Guidelines for the Safe and Effective Use of Crop Protection Products
http://croplife.org/?s=guidelines
SESSION 9: RISK, HARMFUL EFFECTS, AND FIRST AID
Lesson Plan

| Materials needed: | 🌐 Flipchart stands.  
|                  | 🌐 Flipchart paper.  
|                  | 🌐 Markers (4 colours).  
|                  | 🌐 Notebooks, pens, and file covers for participants who have forgotten to bring them.  
|                  | 🌐 Coloured cards.  
|                  | 🌐 Glue stick or blue tack.  
|                  | 🌐 Masking tape.  |

| Time needed: | 120 minutes |

| Intended audience: | Pesticide Retailers |

| Preparation: | 🌐 Flipchart with the session title “Risk, Harmful Effects, and First Aid”, and the Session Objectives.  
|              | 🌐 Food and drink (eg bread, biscuits, tea), a bottle of water, a clean pesticide container for Role Play 1.  
|              | 🌐 Bottle of water, some pesticide measuring equipment, a clean pesticide container for Role Play 2.  
|              | 🌐 Print off sufficient Attendance Record sheets.  
|              | 🌐 Print off sufficient Assessment question sheets.  
|              | 🌐 Print off sufficient Fact Sheets for participants.  
|              | 🌐 Organise venue and seating arrangements.  |

Attendance Record

As participants arrive, ask them to enter their name and other information on the Attendance Record. There is also a column on the form to enter their marks from the Assessment Questions at the end of the training session.
**Set up / Introduction**  

**Time** | **Activity**
--- | ---
**Attention:** | Welcome the retailers to the session.

**Ask:**  
• What are examples of tools that are commonly used every day and which are potentially dangerous if not used properly, for example a knife?

**Take** several responses.

**Say** all these tools are in common everyday use, and can cause injury if not used properly.

Reasons for causing injury or damage would include:  
• Misuse  
• Lack of knowledge about the potential dangers  
• Not taking the correct precautions in use  
• Carelessness

**Say** that pesticides are also tools which have the potential to cause injury or damage, but this can be avoided if they are used properly and with the correct precautions.

**Title:** Refer to the Title Flipchart and tell participants that this training session will cover *Risk, Harmful Effects, and First Aid*.

**Credibility:** Tell participants about a situation where a pesticide caused injury or damage due to misuse.

**Objectives:** Refer to the Title Flipchart with the Lesson Objectives.

By the end of the session, participants will be able to:  
• Explain the relationship between hazard, exposure, and risk.  
• Describe the routes of pesticide entry into the body, and common causes of exposure to pesticides.  
• Describe the initial symptoms of pesticide poisoning.  
• Provide initial first aid to a person affected by pesticide poisoning

**Benefits:** Knowing the risks of pesticide handling and use, and the common ways in which exposure occurs, helps to avoid the potential adverse effects of pesticides. Knowledge of basic first aid in case of pesticide poisoning can save a life.

**Direction:**  
• The session begins with an interactive discussion on hazard, exposure, and risk.  
• The routes of pesticide entry into the body are then brainstormed followed by a presentation on the potential harmful effects of pesticides.  
• Work groups investigate three questions on preventing pesticide entry into the body, signs of poisoning, and first aid.  
• The session ends with role plays about first aid in two poisoning situations.
## Delivery

### Explanation, Demonstration, Exercise, and Guidance:

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 10 minutes</td>
<td><strong>Interactive Discussion – Hazard, Exposure and Risk</strong></td>
</tr>
</tbody>
</table>

**Remind** participants that with all potentially dangerous tools, provided safety precautions are understood and followed, injury or damage is kept to a minimum. In other words, **prevention is better than cure**.

**Write** the following on the flipchart:

\[
\text{Risk} = \text{Hazard} \times \text{Exposure}
\]

**Ask:**
- What is meant by this equation?
- What do we mean by:
  - Hazard
  - Exposure
  - Risk

**Take** responses, and **write** the correct answer against each of the terms, using **Hazard, Exposure and Risk** from the Fact Sheet as a checklist.

Use sunlight as an example. Say:
- Sunlight can be dangerous and burn the skin if there is too much exposure.
- In the winter, when sunlight intensity is weak, it takes a long exposure to burn the skin.
- In the summer, when sunlight intensity is strong, a short exposure can burn the skin.

**Ask:**
How does this equation help us to minimise the potential risk when handling or using a pesticide?

**Emphasise:**
- We cannot change the hazard of a pesticide, so
- The primary consideration is **to avoid exposure**, and so

**Reduce the risk**
### Session 9: Risk, Harmful Effects, and First Aid

#### 2. Brainstorming – Routes of Entry of Pesticides Into the Body

- **Ask:**
  - What are the main routes through which pesticides can enter the body?

- **Take** responses and **write** the routes on the flipchart as main column headings.

- **Ask:**
  - What would be common reasons for pesticides to enter the body through these routes?

- **Take** responses and **write** the reasons under the three headings, using *Routes of Entry Into the Body* from the Fact Sheet as a checklist.

When there are no more responses, **use** *Common Causes of Pesticide Exposure* as a checklist to fill any gaps.

- **Emphasise:**
  - The most common route of exposure is dermal (through the skin).
  - The primary safety consideration is to avoid exposure.

#### 3. Presentation – Harmful Effects

- **Say** that in the first activity we said that pesticides had inherent hazards, and will now look at these adverse effects in more detail.

- **Present** the contents of Harmful Effects from the Fact Sheet.
### Work Groups – Prevention of Entry, Signs of Poisoning, and First Aid

Divide participants into four groups.

Refer to the flipchart with the routes of entry of pesticides into the body, and allocate one route to each work group.
- Table 1: Skin
- Table 2: Oral
- Table 3: Inhalation
- Table 4: Eyes

**Work Group Task:**
Agree as a group on responses to the following questions:
- What are the best ways to prevent pesticides from entering the body through the route assigned to your table?
- What symptoms might you see if pesticides enter by this route?
- What is the best treatment if pesticides enter by this route?

Allow 20 minutes for the activity

Say we will take responses for questions 1 and 2 at this point, we will cover question 3 later.

Ask each group to report in turn on questions both questions 1 and 2, asking the other groups after each presentation what they would change or add.

Use *General Symptoms of Acute Pesticide Poisoning* as a checklist during the group reports.

When all groups have reported, emphasise:
- Avoiding or reducing exposure lessens the potential risks of handling and using pesticides.
- The most common route of exposure is through the skin.
- The greatest danger is when handling the concentrate, so the use of protective clothing is extremely important for this activity.
- Pesticide can be swallowed by smoking, drinking or eating during application, or by blowing out blocked nozzles.
5.

30 minutes

Role Play – Basic First Aid

Say that we will now get responses for question 3 of the previous activity.

Ask:
• Which group would like to go first?

When one group has volunteered, ask their presenter to step outside the room for a few minutes.

Explain to the remaining participants rather than a simple flipchart presentation, we are going to ‘present’ practically through a Role Play.

Emphasise:
• The role plays are intended to put their group-prepared responses into practice – without warning, as would happen in real life.
• If their first aid skills turn out to be in need of improvement, this is part of the self-evaluation and learning process.

Ask for two volunteers to play the roles of a poisoning victim and his friend in the first role play.

Role Play 1:
• The two volunteers should set themselves up as ‘farmers’ having a break from spraying, and eating and drinking.
• One ‘farmer’ should pretend to be suffering from poisoning (nausea, dizziness, confused, etc).
• The other ‘farmer’ should be ready to answer questions and help the group presenter administer first aid.

Ask the group presenter to come into the training room so that he is immediately presented with the poisoning situation.

• The unaffected ‘farmer’ should say to the presenter that there is something wrong with his friend, but he does not know the reason. Ask for the presenter’s help.

The presenter should then take over and administer first aid to the affected ‘farmer’.

Role Play Debrief:
Ask the other participants:
• Did the volunteer analyse the situation correctly?
• Did he take the correct first aid actions?
• Would they have done anything differently?

Ask for another group presenter to volunteer for Role Play 2, and again ask them to leave the room.
Ask for another two volunteer ‘farmers’ from the other participants.

**Role Play 2:**
- The two volunteers should set themselves up as ‘farmers’ who are mixing a pesticide ready for spraying.
- One ‘farmer’ should pretend to be suffering from pesticide splashed in the eye (burning eye, dizziness, confused, etc).
- The other ‘farmer’ should be ready to answer questions and help the presenter administer first aid.

Ask the presenter to come into the training room so that he is immediately presented with the poisoning situation.

- The unaffected ‘farmer’ should say that his friend has splashed pesticide in his eye, and to ask for the presenter’s help.

The presenter should then take over and administer first aid to the affected ‘farmer’.

**Role Play Debrief:**
Ask the other participants:
- Did the presenter analyse the situation correctly?
- Did he take the correct first aid actions?
- Would they have done anything differently?

**Emphasise:**
- First Aid is the immediate treatment of an affected person before seeking medical attention.
- Follow the label instruction on First Aid treatment if these are available.
- The First Action is to remove the person from the source of exposure by removing pesticide from the skin, removing contaminated clothing, or getting the person to fresh air. While doing this, be careful not to contaminate yourself.
## Finish

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Summary:</strong> 1 minute</td>
<td>Include as major messages:</td>
</tr>
<tr>
<td></td>
<td>• Risk = Hazard x Exposure</td>
</tr>
<tr>
<td></td>
<td>• The primary safety consideration is to reduce exposure and so reduce risk</td>
</tr>
<tr>
<td></td>
<td>• Routes of entry into the body</td>
</tr>
<tr>
<td></td>
<td>• Common causes of exposure</td>
</tr>
<tr>
<td></td>
<td>• First Aid is the immediate treatment of an affected person before seeking medical attention</td>
</tr>
<tr>
<td><strong>Questions:</strong> 1 minute</td>
<td>Ask if everyone understands or if there are any additional questions. Answer these provided they are relevant.</td>
</tr>
<tr>
<td></td>
<td>Ask if the session objectives were met</td>
</tr>
<tr>
<td><strong>Evaluation:</strong> 12 minutes</td>
<td>Hand out the Assessment Sheet and ask participants to complete two of the questions.</td>
</tr>
<tr>
<td></td>
<td>Collect the Assessment Sheet for later marking and entering the marks on the Attendance Record.</td>
</tr>
<tr>
<td><strong>Next step:</strong> 1 minute</td>
<td>Say that in this session we learned how avoid or minimise the potential risk of pesticides, and how to administer basic first aid to an affected person. If possible, participants should attend a proper first aid course.</td>
</tr>
<tr>
<td></td>
<td>Hand out the Fact Sheet to participants.</td>
</tr>
</tbody>
</table>
It is easier to prevent poisoning than to treat it, so always read the label safety instructions. In case of any incident, these are the steps you should follow:

**SKIN**
If pesticides get in contact with your skin, remove any contaminated clothing and wash the skin with abundant soap and water.

**EYES**
If pesticides get in contact with your eyes, wash with a gentle stream of cool clean water for at least 15 minutes. Wash each eye individually, from inside out, to prevent cross contamination.

**INHALATION**
If you accidentally breathe in pesticides, find a ventilated place where you are able to get some fresh air. Loosen your shirt and belt. If breathing stops, artificial respiration must be performed using proper equipment.

**MOUTH**
If you accidentally swallow pesticides, you must seek medical help as quickly as possible. Do not drink anything. Keep calm and comfortable as much as you can and do not induce vomiting.

**REMEMBER, AFTER TAKING THESE FIRST AID STEPS, SEEK MEDICAL HELP AS QUICKLY AS POSSIBLE AND BRING THE PRODUCT LABEL WITH YOU.**

www.croplife.org
Assessment Questions

Name: ____________________________ Date: ___________ Mark: ____________

Answer TWO (2) only of the following questions. You may write your answers on this question sheet or tell your trainer the answers. All questions are the same value (5 marks).

Question 1: How do you avoid or minimise the risk from handling or using a pesticide?
...........................................................................................................................................................................................
...........................................................................................................................................................................................
...........................................................................................................................................................................................

Question 2: What are the routes by which pesticides enter the body?
...........................................................................................................................................................................................
...........................................................................................................................................................................................
...........................................................................................................................................................................................

Question 3: Give three common ways of exposure to pesticides.
...........................................................................................................................................................................................
...........................................................................................................................................................................................
...........................................................................................................................................................................................

Question 4: What are the initial symptoms of pesticide poisoning?
...........................................................................................................................................................................................
...........................................................................................................................................................................................
...........................................................................................................................................................................................
FACT SHEET

HAZARD, EXPOSURE AND RISK

Hazard is the inherent property of substance to cause adverse effects.

Exposure is the amount of time a person is in contact with the substance, or how much they get on their body.

Risk is the probability of adverse effects from using the substance, and is the combination of Hazard and Exposure.

\[
\text{Risk} = \text{Hazard} \times \text{Exposure}
\]

Every time a pesticide is handled or used, there is an associated Risk

The Hazard of a pesticide cannot be changed - it is inherent.

\[
\text{Risk reduction} = \text{Exposure reduction}
\]

For example, sunlight can be dangerous and burn the skin if there is too much exposure. To avoid burning the skin, exposure to sunlight should be avoided or minimised. In the winter, when sunlight intensity is weak, it takes a long exposure to burn the skin. In the summer, when sunlight intensity is strong, a short exposure can burn the skin.

THE PRIMARY SAFETY CONSIDERATION WHEN USING A PESTICIDE IS TO REDUCE EXPOSURE AND SO REDUCE THE RISK

PESTICIDE ROUTES OF ENTRY INTO THE BODY

Dermal: Through the skin or the eyes.

Oral: Swallowed through the mouth.

Inhalation: Breathed into the lungs.
Common Causes of Pesticide Exposure:

<table>
<thead>
<tr>
<th>Dermal</th>
<th>Eyes</th>
<th>Inhalation</th>
<th>Oral</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not washing hands after handling pesticides or containers</td>
<td>Rubbing eyes or forehead with contaminated gloves or hands</td>
<td>Handling pesticides in confined or poorly ventilated areas</td>
<td>Not washing hands before eating, drinking or smoking</td>
</tr>
<tr>
<td>Splashing or spilling pesticide on the skin</td>
<td>Splashing pesticide in the eyes</td>
<td>Handling dusts or powders</td>
<td>Splashing pesticide into the mouth</td>
</tr>
<tr>
<td>Wearing contaminated clothing</td>
<td>Pouring dry formulations without wearing goggles</td>
<td>Using an inadequate or poorly fitting respirator</td>
<td>Storing pesticide in drink bottles</td>
</tr>
<tr>
<td>Being exposed to pesticide drift</td>
<td>Being exposed to pesticide drift</td>
<td>Being exposed to pesticide drift</td>
<td>Accidentally applying pesticide to food</td>
</tr>
<tr>
<td>Applying pesticides in windy weather</td>
<td>Applying pesticides in windy weather</td>
<td>Applying pesticides in windy weather</td>
<td></td>
</tr>
<tr>
<td>Leaking sprayers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Touching treated plants, livestock or soil</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

THE PRIMARY SAFETY CONSIDERATION IS TO AVOID EXPOSURE

COMMON WAYS OF EXPOSURE TO PESTICIDES

- Not washing after handling pesticides
- Smoking, eating or drinking during handling and use of pesticides
- Splashing of liquid formulation or spray mix
- Rubbing eyes with contaminated gloves or hands
- Contaminated clothing
- Drift during spraying
- Spraying in windy weather
- Inhalation of dusts
- Handling pesticides in poorly ventilated areas
- Touching treated plants, livestock or soil
- Decanting pesticides into soft drink, water bottles, etc
Harmful Effects

| Acute          | Occur immediately after exposure, within minutes or hours. | - Poisoning symptoms.  
|                |                                                               | - Physical effects:  
|                |                                                               |   - Mouth, throat, stomach burnt.  
|                |                                                               |   - Lungs burnt.  
|                |                                                               |   - Eyes burnt.  
|                |                                                               |   - Skin blistered, cracked.  
| Delayed or Chronically | Take time to appear, may be years after exposure. Usually caused by repeated exposure, but may be due to single exposure. | - Cancer.  
|                |                                                               | - Damage to internal organs.  
| Allergic       | Affect some people, but not all. Usually require repeated exposure before they appear. | - Asthma (difficulty in breathing).  
|                |                                                               | - Skin irritation (rashes, blisters, sores).  
|                |                                                               | - Eye irritation (itching, watering)  
|                |                                                               | - Nose irritation (sneezing)  
| Physical       | Acute effects due to the physical action of the pesticide on the body | - Itching, stinging  
|                |                                                               | - Burning  
|                |                                                               | - Rash  
|                |                                                               | - Redness  
|                |                                                               | - Blistering  

General Symptoms of Acute Pesticide Poisoning

Many of the symptoms of acute pesticide poisoning are similar to illnesses, such as flu or food poisoning.

Anyone who has been handling pesticides and develops suspicious symptoms should see a doctor, taking the pesticide container with them.

Depending on the pesticide and amount of exposure, only some of the symptoms may appear, and individual symptoms may appear at different times after the exposure.

Initial Symptoms: Nausea, vomiting  
Headache, dizziness  
General weakness or tiredness  
Tightness in the chest

Later Symptoms: Excessive sweating, salivation  
Vomiting, diarrhoea  
Stomach cramps  
Muscle twitches, cramps, aches  
Blurred vision  
Confusion  
Fits or unconsciousness
Basic First Aid

First Aid is the initial treatment of an affected person, before seeking proper medical attention.

FOLLOW THE PRODUCT LABEL INSTRUCTIONS ON FIRST AID IF AVAILABLE

The First Action is to remove the person from the source of exposure by removing pesticide from the skin, removing contaminated clothing, or getting the person to fresh air. While doing this, be careful not to contaminate yourself.

Pesticide on the Skin (follow label instructions if available)
- Drench skin and clothing with plenty of water.
- Remove contaminated clothing.
- Wash hair and skin with soap and water. If available, a shower is the best way to thoroughly wash and rinse the whole body.
- Dry the victim, and wrap in a blanket or any clean clothing. Do not allow the victim to become chilled or overheated.
- If the skin is burned, or otherwise injured, cover immediately with a loose, clean, dry, soft cloth or bandage.
- Do not apply ointments, greases or powders to burns or injured skin.

Pesticide in the Eye (follow label instructions if available)
- Wash the eye(s) quickly but gently.
- Hold the eyelid open and wash with a gentle drip of water flowing across the eye rather than directly onto it. If a tap is not available, a tea pot, or similar, can be used.
- Rinse for 10 minutes or more.
- Do not use chemicals in the rinse water.

Pesticide Inhaled (follow label instructions if available)
- Get the victim to fresh air immediately.
- Warn other people in the area of the danger.
- Loosen tight clothing that would restrict breathing.

Pesticide Swallowed (follow label instructions if available)
- Repeatedly rinse mouth with plenty of water.
- Do not induce vomiting if you can get the victim to a doctor within one hour.
- Never induce vomiting if the victim is unconscious or having convulsions
- Never induce vomiting if the victim has swallowed a corrosive poison, as it will burn the throat and mouth as severely coming up as it did going down. It may also get into the lungs and cause burning there. Similarly, never induce vomiting if an emulsifiable or oil solution has been swallowed, as these can cause death if inhaled during vomiting.

Take the affected person to a doctor as quickly as possible, taking the pesticide container or label.

See also:
CropLife International: Guidelines for Emergency Measures in Cases of CPP Poisoning
CropLife International Guidelines for the Safe and Effective Use of Crop Protection Products
http://croplife.org/?s=guidelines
SOURCES OF INFORMATION / ADVICE ON PESTICIDE POISONING:

- The pesticide label
- The pesticide manufacturing / importing company (contact information on the label)
- Local emergency phone numbers – doctors, hospitals, etc
- Pesticide poisoning diagnostic tool (to identify pesticide from poisoning symptoms): http://www.pesticideinfo.org/Search_Poisoning.jsp#Identify
- Specific medical treatment for individual pesticides (extremely detailed, of use only by medical staff): http://www.inchem.org/pages/pims.html
SESSION 10: PERSONAL PROTECTIVE EQUIPMENT (PPE)
Lesson Plan

| Materials needed:                                                                 |  ✔  Flipchart stands.  
|                                                                                 |  ✔  Flipchart paper.  
|                                                                                 |  ✔  Markers (4 colours).  
|                                                                                 |  ✔  Notebooks, pens, and file covers for participants who have forgotten to bring them.  
|                                                                                 |  ✔  Coloured cards.  
|                                                                                 |  ✔  Glue stick or blue tack.  
|                                                                                 |  ✔  Masking tape.  
| Time needed: 80 minutes                                                         |
| Intended audience: Pesticide Retailers                                            |
| Preparation:                                                                   |
|  ✔  Flipchart with the session title “Personal Protective Equipment (PPE)”, and the Session Objectives.  
|  ✔  Examples of all types of PPE - gloves, boots, overalls, hat, dust mask, goggles, face shield, respirator, apron.  
|  ✔  Pesticide containers or labels with recommendations for the PPE to be worn, or showing a colour band with pictograms.  
|  ✔  Print off sufficient Attendance Record sheets.  
|  ✔  Print off sufficient Assessment question sheets.  
|  ✔  Print off sufficient Fact Sheets for participants.  
|  ✔  Organise venue and seating arrangements.  

Attendance Record

As participants arrive, ask them to enter their name and other information on the Attendance Record. There is also a column on the form to enter their marks from the Assessment Questions at the end of the training session.
Set up / Introduction  

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Trainer Note:</strong></td>
<td>Before the start of the session, lay out on a table the PPE and the pesticide containers or labels.</td>
</tr>
<tr>
<td><strong>Attention:</strong></td>
<td>Welcome the retailers to the session.</td>
</tr>
<tr>
<td><strong>Ask:</strong></td>
<td>- Why should handlers and users of pesticides wear protective clothing?</td>
</tr>
<tr>
<td><strong>Take</strong></td>
<td>several responses.</td>
</tr>
<tr>
<td><strong>Summarise</strong></td>
<td>by saying that function of protective clothing is to keep pesticides away from the body, and is an essential precaution to take when handling or using pesticides.</td>
</tr>
<tr>
<td><strong>Remind</strong></td>
<td>participants of the Session 8 on Risk, Harmful Effects, and First Aid where we agreed that the primary consideration is to avoid exposure to pesticides and so reduce the risk.</td>
</tr>
<tr>
<td><strong>Emphasise</strong></td>
<td>that protective clothing does not itself prevent exposure. It can reduce exposure on the skin, through the mouth, and breathing into the lungs, but should be considered as a secondary precaution to the primary consideration of avoiding exposure in the first place, such as not spraying in windy conditions or with a leaking sprayer.</td>
</tr>
<tr>
<td><strong>Title:</strong></td>
<td>Refer to the Title Flipchart and tell participants that this training session will cover Personal Protective Equipment, which is another term for protective clothing.</td>
</tr>
<tr>
<td><strong>Credibility:</strong></td>
<td>Give an example of good use of PPE, or ask participants if they know of anyone who did not wear PPE and suffered from the adverse effects of a pesticide.</td>
</tr>
<tr>
<td><strong>Objectives:</strong></td>
<td>Refer to the Title Flipchart with the Lesson Objectives.</td>
</tr>
<tr>
<td></td>
<td>By the end of the session, participants will be able to:</td>
</tr>
<tr>
<td></td>
<td>- State clearly why PPE should be worn when handling or using pesticides.</td>
</tr>
<tr>
<td></td>
<td>- Describe the appropriate PPE to wear for a given pesticide activity.</td>
</tr>
<tr>
<td></td>
<td>- Explain the potential hazards associated with wearing PPE, and how to avoid these hazards.</td>
</tr>
<tr>
<td></td>
<td>- Take proper care of PPE.</td>
</tr>
<tr>
<td><strong>Benefits:</strong></td>
<td>Knowing the benefits and hazards of wearing PPE, what PPE to wear for an activity, and how to care for the equipment, enables users to protect themselves and reduce exposure to pesticides.</td>
</tr>
<tr>
<td><strong>Direction:</strong></td>
<td>- A fishbowl activity begins the session with all participants examining PPE on show, before an interactive discussion about the appropriate PPE to wear for a pesticide activity.</td>
</tr>
<tr>
<td></td>
<td>- Another interactive discussion examines the possible hazards associated with PPE.</td>
</tr>
<tr>
<td></td>
<td>- Additional discussions look at how to wear and care for PPE, and alternatives that could be used if approved PPE is not available.</td>
</tr>
</tbody>
</table>
### Delivery

**Explanation, Demonstration, Exercise, and Guidance:**

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 15 minutes</td>
<td><strong>Fishbowl – Appropriate PPE for an Activity</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Ask</strong> participants to get up, stand round the table, and to examine the PPE and decide what it is and how it is worn.</td>
</tr>
<tr>
<td></td>
<td><strong>Allow</strong> 5 minutes for participants to look at and discuss the PPE.</td>
</tr>
<tr>
<td></td>
<td><strong>Ask:</strong> Which of these items of PPE are appropriate to the activity of:</td>
</tr>
<tr>
<td></td>
<td>• Handling</td>
</tr>
<tr>
<td></td>
<td>• Mixing</td>
</tr>
<tr>
<td></td>
<td>• Application</td>
</tr>
<tr>
<td></td>
<td><strong>Take</strong> responses for each activity.</td>
</tr>
<tr>
<td></td>
<td><strong>Ask:</strong> Who looked at the pesticide containers or labels to find out what PPE to wear for each activity with that product?</td>
</tr>
<tr>
<td></td>
<td><strong>Summarise:</strong></td>
</tr>
<tr>
<td></td>
<td>• The PPE to wear for an activity is given on the product label.</td>
</tr>
<tr>
<td></td>
<td>• Handling pesticide concentrate requires more, or different, PPE than when handling dilute product, such as mixing compared to application, or wearing a face shield rather than a dust mask when mixing liquid pesticides.</td>
</tr>
<tr>
<td></td>
<td>• Handling or applying a more toxic product requires more, or different, PPE than when handling or applying a less toxic product.</td>
</tr>
<tr>
<td></td>
<td>• If label information is not available, the absolute minimum PPE to wear in all situations is overalls, boots, and gloves.</td>
</tr>
<tr>
<td>2. 10 minutes</td>
<td><strong>Interactive Discussion – Hazards from Wearing PPE</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Say</strong> that we noted in the opening activity that although it is essential that PPE is worn, does not itself directly prevent exposure, such as when spraying with a leaking sprayer.</td>
</tr>
<tr>
<td></td>
<td>In addition, there can be hazards associated with wearing PPE.</td>
</tr>
<tr>
<td></td>
<td><strong>Ask:</strong></td>
</tr>
<tr>
<td></td>
<td>• What could be the hazards associated with wearing PPE?</td>
</tr>
<tr>
<td></td>
<td>• What would cause these hazards?</td>
</tr>
<tr>
<td></td>
<td><strong>Write</strong> responses on the flipchart.</td>
</tr>
<tr>
<td></td>
<td><strong>Emphasise:</strong></td>
</tr>
<tr>
<td></td>
<td>• PPE should be considered a secondary precaution, after the primary consideration of avoiding exposure in the first place.</td>
</tr>
<tr>
<td></td>
<td>• PPE only protects if the pesticide remains on the outside.</td>
</tr>
<tr>
<td></td>
<td>• Torn, damaged, or broken PPE must not be worn, as pesticide can enter and be trapped next to the skin.</td>
</tr>
<tr>
<td></td>
<td>• Dirty or contaminated PPE must not be worn, as pesticide is trapped next to the skin.</td>
</tr>
<tr>
<td></td>
<td>• PPE must be replaced if torn, damaged, or broken.</td>
</tr>
<tr>
<td></td>
<td>• PPE must be washed after use:</td>
</tr>
</tbody>
</table>
### Session 10: Personal Protective Equipment (PPE)

#### Interactive Discussion – Wearing PPE

**Ask** for a volunteer to put on some PPE:
- Overalls
- Gloves
- Boots
- Goggles
- Hat

**Ask** the remaining participants to observe how the volunteer puts on the PPE.
- When the volunteer has put on all the PPE, ask participants:
  - In what order was the PPE put on?
  - Is the PPE worn correctly?
    - If not, what is wrong, how should it be worn?

**Emphasise:**
- Check for any torn, damaged, or broken items.
- Overalls on first
- Boots and any other equipment
- Overall trousers over boots to prevent entry of pesticide
- Gloves last
- Gloves outside overall sleeves to protect sleeves from pesticide

**Ask:**
- How should the PPE be taken off?

**Emphasise:**
- Wash gloves, but do not remove them
- Remove goggles, boots, and any other equipment
- Finally remove gloves and overalls
- Avoid the bare skin coming into contact with contaminated surfaces of the PPE.
- Wash hands and face.

**Ask** the volunteer to remove the PPE in the correct order.

#### Interactive Discussion – Care of Protective Clothing

**Hold up** each item of PPE in turn, and **ask** participants how the item should be cared for and washed.

**Take** responses using *Care of PPE* from the Fact Sheet as a checklist.

#### Interactive Discussion – Alternatives to Approved PPE

**Say** that approved PPE is not always available.

**Ask:**
- What could be used as alternatives to approved PPE?

**Take** responses using *Alternatives to Approved PPE* from the Fact Sheet as a checklist.

**Emphasise:**
- These alternatives give only limited protection
- They should not be used if approved PPE is available
### Summary: 1 minute

**Include** as major messages:
- Wearing appropriate PPE is essential when handling or using pesticides, but is a secondary precaution after the primary consideration of avoiding exposure in the first place.
- The pesticide container label specifies the appropriate PPE to wear for different activities.
- PPE only protects if the pesticide remains on the outside.
- PPE alternatives give only limited protection, and should only be worn if approved PPE is not available.

### Questions: 1 minute

**Ask** if everyone understands or if there are any additional questions. Answer these provided they are relevant.

**Ask** if the session objectives were met.

### Evaluation: 12 minutes

**Hand out** the Assessment Sheet and ask participants to complete two of the questions.

**Collect** the Assessment Sheet for later marking and entering the marks on the Attendance Record.

### Next step: 1 minute

**Ask** participants to advice customers on the appropriate PPE to wear when using the product by showing the relevant information on the container label.

**Hand out** the Fact Sheet to participants.
BE SMART, BE SAFE
WEAR THE CORRECT
PERSONAL PROTECTIVE EQUIPMENT

WHEN MEASURING AND MIXING PESTICIDES ALWAYS WEAR
- SHIRT
- PANTS
- BOOTS
- GLOVES
- APRON
- EYE PROTECTOR

WHEN SPRAYING PESTICIDES ALWAYS WEAR
- SHIRT
- PANTS
- BOOTS
- GLOVES

WHEN WASHING/CLEANING THE SPRAYER AFTER SPRAYING
- SHIRT
- PANTS
- BOOTS
- GLOVES
- APRON
- EYE PROTECTOR

WASH PERSONAL PROTECTIVE EQUIPMENT AFTER USE
- Wear a hat for protection from the sun or when spraying tall crops
- Wear a mask for measuring and mixing dry formulations (dusts, powders, granules)
- All users should follow national regulations

WHEN HANDLING PESTICIDES ALWAYS FOLLOW THESE RULES
- Read and understand the label
- Be careful
- Exercise good personal hygiene
- Maintain sprayers in good working order
- Wear the correct Personal Protective Equipment
Answer TWO (2) only of the following questions.
You may write your answers on this question sheet or tell your trainer the answers. All questions are the same value (5 marks).

Question 1: What is the function of PPE?

..................................................................................................................

..................................................................................................................

..................................................................................................................

Question 2: Where do you find information on what PPE to wear for a particular activity?

..................................................................................................................

..................................................................................................................

..................................................................................................................

Question 3: At what stage of putting on PPE are gloves put on and how?

..................................................................................................................

..................................................................................................................

..................................................................................................................

Question 4: What is the first step of removing PPE?

..................................................................................................................

..................................................................................................................

..................................................................................................................
FACT SHEET

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Personal Protective Equipment (PPE) is another term for protective clothing.

- PPE are devices worn to keep pesticides away from the body and minimise exposure.
- PPE should be regarded as a secondary precaution, after the primary consideration of avoiding exposure in the first place, such as not causing splashes when mixing or not spraying with a leaking sprayer.
- PPE only protects if the pesticide remains on the outside.
- Torn, damaged, or broken PPE must not be worn, as pesticide can enter and be trapped next to the skin.
- Dirty or contaminated PPE must not be worn, as pesticide is trapped next to the skin.
- Do not touch any exposed part of the body (most commonly the face) with contaminated gloves during work, or removal of the PPE.
- The minimum amount to wear for an activity is given on the label.
- In the absence of label recommendations:
  - The minimum to wear for all activities is overalls, boots, and gloves.
  - For mixing, a dust mask should be worn for dry formulations, and goggles or a face shield for liquid formulations. For toxic products, an apron should also be worn in addition to the minimum.
  - For application, goggles and a face mask should be worn in addition to the minimum.

PPE FOR PROTECTION FOR DIFFERENT PARTS OF THE BODY

Body Protection
- Overalls, collar fastened.
- Cotton or canvas hat, preferably with wide brim.
- Apron made of rubber or PVC for use when mixing toxic liquid concentrates.

Hand and Foot Protection
- Rubber gloves and boots when handling concentrates.
- Gloves and boots should be unlined. Fabric lining can trap pesticide and is impossible to clean.
- Trousers outside boots, not tucked inside.
- Gloves outside overall sleeves.

Eye and Face Protection
- Safety glasses or goggles when there is a risk of dusts or mists, such as mixing dry formulations, and when spraying.
- Face shields when there is a risk of splashing, such as mixing liquid formulations.

Inhalation Protection
- Dust or mist masks that cover the nose and mouth when there is a risk of dusts or mists.
- Dust and mist masks must be disposed after use.
- Respirators (face piece with filter canisters attached) usually only needed for specialised operations, or when mixing and applying more toxic products.

All protective clothing must be washed or cleaned after use.
PUTTING ON AND TAKING OFF PPE

Putting On
• Check for any torn, damaged or broken items, which must not be worn.
• Overalls on first
• Boots and any other equipment
• Overall trousers over boots to prevent entry of pesticide
• Gloves last
• Gloves outside overall sleeves to protect sleeves from pesticide

Taking Off
• Wash gloves, but do not remove them
• Remove goggles, boots, and any other equipment
• Finally remove gloves and overalls
• Avoid the bare skin coming into contact with contaminated surfaces of the PPE
• Store PPE separately from other clothing

ALTERNATIVES TO PROPER PROTECTIVE CLOTHING

Specially made protective clothing is not always available, or is expensive. Other approaches which have been used include:

Body Protection
• Long sleeved shirt and trousers.
• Shirt collar fastened, sleeves down, cuffs buttoned.
• Baseball hat.

Hand and Foot Protection
• Strong plastic bag on each hand.
• For spraying operations only, canvas shoes.

Eye and Face Protection
• Sunglasses or glasses (only give minimal protection).

Inhalation Protection
• For spraying operations only, a cloth tied over the nose and mouth.

THESE ALTERNATIVES GIVE ONLY LIMITED PROTECTION. THEY SHOULD ONLY BE USED IF PROPER PROTECTIVE CLOTHING IS NOT AVAILABLE
## Care of Protective Clothing

<table>
<thead>
<tr>
<th>Category</th>
<th>Instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>All items</td>
<td>Inspect after use for damage.</td>
</tr>
<tr>
<td>Cotton items</td>
<td>Wash after use with soap and water. Wash and dry PPE separately from all clothing.</td>
</tr>
<tr>
<td>(overalls, hat,</td>
<td></td>
</tr>
<tr>
<td>shirt, trousers,</td>
<td></td>
</tr>
<tr>
<td>etc)</td>
<td></td>
</tr>
<tr>
<td>Gloves, Boots,</td>
<td>Gloves: Wash the outsides before removing other items of PPE.</td>
</tr>
<tr>
<td>Aprons</td>
<td>Wash inside and outside with soap and water.</td>
</tr>
<tr>
<td></td>
<td>Wash and dry PPE separately from other clothing.</td>
</tr>
<tr>
<td>Goggles, Face</td>
<td>Wash after use with soap and water. Wash and dry PPE separately from all clothing.</td>
</tr>
<tr>
<td>Shields</td>
<td></td>
</tr>
<tr>
<td>Dust, Mist Masks</td>
<td>Dispose of safely after use.</td>
</tr>
<tr>
<td></td>
<td>These masks should not be re-used.</td>
</tr>
<tr>
<td>Respirators</td>
<td>Clean according to the manufacturer’s instructions.</td>
</tr>
<tr>
<td></td>
<td>Replace canisters according to manufacturer’s instructions.</td>
</tr>
</tbody>
</table>

See also
CropLife International: Guidelines for Personal Protection when Using CPPs in Hot Climates
http://croplife.org/?s=guidelines
SESSION 11: HAND SPRAYERS
Lesson Plan

<table>
<thead>
<tr>
<th>Materials needed:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>☑ Flipchart stands.</td>
<td></td>
</tr>
<tr>
<td>☑ Flipchart paper.</td>
<td></td>
</tr>
<tr>
<td>☑ Markers (4 colours).</td>
<td></td>
</tr>
<tr>
<td>☑ Notebooks, pens, and file covers for participants who have Forgotten to bring them.</td>
<td></td>
</tr>
<tr>
<td>☑ Coloured cards.</td>
<td></td>
</tr>
<tr>
<td>☑ Glue stick or blue tack.</td>
<td></td>
</tr>
<tr>
<td>☑ Masking tape.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Time needed:</th>
<th>105 minutes</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Intended audience:</th>
<th>Pesticide Retailers</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Preparation:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>☑ Flipchart with the session title “Hand Sprayers” and the Session Objectives.</td>
<td></td>
</tr>
<tr>
<td>☑ Examples of different types of hand sprayers in local use, eg compression, knapsack, mistblower, ULV, foot pump, wheelbarrow, etc.</td>
<td></td>
</tr>
<tr>
<td>☑ If possible, sufficient manual knapsack sprayers of the same type for one between each 3-4 participants.</td>
<td></td>
</tr>
<tr>
<td>☑ Printed copies of Visual 1, Sprayer Components Diagram.</td>
<td></td>
</tr>
<tr>
<td>☑ Print off sufficient Attendance Record sheets.</td>
<td></td>
</tr>
<tr>
<td>☑ Print off sufficient Assessment question sheets.</td>
<td></td>
</tr>
<tr>
<td>☑ Print off sufficient Fact Sheets for participants.</td>
<td></td>
</tr>
<tr>
<td>☑ Organise venue and seating arrangements.</td>
<td></td>
</tr>
<tr>
<td>☑ An outside area for testing sprayers after reassembly.</td>
<td></td>
</tr>
</tbody>
</table>

Attendance Record

As participants arrive, ask them to enter their name and other information on the Attendance Record. There is also a column on the form to enter their marks from the Assessment Questions at the end of the training session.
### Session 11: Hand Sprayers

#### Set up / Introduction

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Attention:</strong></td>
<td>Welcome the retailers to the session.</td>
</tr>
</tbody>
</table>
| **Ask:**   | - How many participants sell sprayers as well as pesticides?  
- Do you think you know enough about the different types, how they work, and the situation where each type is most suitable? |
| **Take**   | several responses.                                                                                                                         |
| **Title:** | Refer to the Title Flipchart and tell participants that this training session will cover *Hand Sprayers*.                                   |
| **Credibility:** | Give an example of personal experience seeing the wrong type of sprayer being used in a situation, for example a compression sprayer in wheat or cotton. |
| **Objectives:** | Refer to the Title Flipchart with the Lesson Objectives.  
By the end of the session, participants will be able to:  
- Explain to a customer the most suitable type of sprayer to use for their situation.  
- Describe the major components of a sprayer and their function.  
- Disassemble a sprayer into the component parts and reassemble. |
| **Benefits:** | Sprayers are tools, and to be able to use the correct type for a specific situation, and knowing how they work, will ensure that pesticide applications are effective. |
| **Direction:** | - The session begins with an interactive discussion comparing different sprayer types.  
- The trainer then demonstrates the different sprayer components and their function.  
- A practical activity on sprayer disassembly and reassembly is undertaken either by small groups if sufficient sprayers are available, or by a fishbowl activity if only one sprayer is available.  
- The session concludes with an interactive discussion on common sprayer faults. |
## Delivery

### Explanation, Demonstration, Exercise, and Guidance:

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Interactive Discussion - Comparison of Different Sprayer Types</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Ask:</strong></td>
</tr>
<tr>
<td></td>
<td>• What are the most common types of hand sprayers used by farmers in this area?</td>
</tr>
<tr>
<td></td>
<td><strong>Write</strong> the answers as <strong>headings</strong> on <strong>separate</strong> flip charts.</td>
</tr>
<tr>
<td></td>
<td><strong>Write Advantages and Disadvantages</strong> under the heading</td>
</tr>
<tr>
<td></td>
<td>Show the a sprayer type from the example sprayers and <strong>ask:</strong></td>
</tr>
<tr>
<td></td>
<td>What are the advantages of this type of sprayer?</td>
</tr>
<tr>
<td></td>
<td>What are disadvantages?</td>
</tr>
<tr>
<td></td>
<td><strong>Write</strong> the responses on the relevant sprayer flipchart under the two headings.</td>
</tr>
<tr>
<td></td>
<td><strong>Repeat</strong> for the other types of sprayer.</td>
</tr>
<tr>
<td></td>
<td><strong>Summarise</strong> the results, using <strong>Advantages and Disadvantages of Different Sprayer Types</strong> from the Fact Sheet as a checklist to fill in any gaps.</td>
</tr>
<tr>
<td></td>
<td><strong>Ask:</strong></td>
</tr>
<tr>
<td></td>
<td>• What criteria should a farmer use when deciding to buy a sprayer?</td>
</tr>
<tr>
<td></td>
<td>• What points should he look for?</td>
</tr>
<tr>
<td><strong>Trainer Note:</strong></td>
<td>There is no ‘correct’ answer to this question – it depends on the farmer’s situation and resources. The objective of the question is for participants to reflect on the different criteria to consider when buying (or selling) a sprayer.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Demonstration – Sprayer Components and Function</strong></td>
</tr>
<tr>
<td></td>
<td>Explain that when we use a tool, it always helps to know how it works, and the functions of the different parts.</td>
</tr>
<tr>
<td></td>
<td>We will look at a manual knapsack sprayer as this is one of the most common types used by farmers. Other types of sprayers have similar components and functions, although they may work in different ways to a manual knapsack sprayer.</td>
</tr>
<tr>
<td></td>
<td><strong>Distribute</strong> Visual 1, <strong>Sprayer Components Diagram</strong>, to participants.</td>
</tr>
<tr>
<td></td>
<td><strong>Using</strong> a manual knapsack sprayer, point out and explain the function of the main sprayer components, using <strong>Sprayer Components and Function</strong> from the Fact Sheet as a checklist.</td>
</tr>
<tr>
<td></td>
<td><strong>Ask</strong> participants to write the names of the components against the indicator lines on the handout diagram as you describe them.</td>
</tr>
<tr>
<td>3.</td>
<td><strong>Small Groups / Fishbowl – Sprayer Disassembly and Assembly</strong></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>
| **30 minutes** | **Trainer Note:** If there are sufficient manual knapsack sprayers available, follow the *small groups activity*. If there is only one knapsack sprayer, follow the *fishbowl activity*. **Say** that as sellers of sprayers, participants need to be able to give advice to customers on how to take a sprayer apart and reassemble for repair and maintenance. **Small Groups:** **Divide** participants into groups of 3-4 and **provide** each group with a manual knapsack sprayer. **Explain** that their task is to disassemble the sprayer into the major components, and then re-assemble. During this, they should be careful not to:  
  • Break any parts  
  • Lose any small parts, such as washers  
  • Cross any screw threads **Emphasise that:**  
  • The sprayers come apart very easily  
  • If they are having difficulty in removing any part, then they are doing it incorrectly  
  • They should proceed slowly with disassembly, and note how the parts are fitted together **Work Group Task:**  
  • Disassemble the sprayer into the major components.  
  • Lay out these components on the table. These separate components should be:  
    • Tank  
    • Carrying straps  
    • Pump and pressure chamber  
    • Pump lever  
    • Hose  
    • The parts of the trigger valve  
    • Lance  
    • The parts of the nozzle  
  • Re-assemble the sprayer.  
  • The straps should be adjusted so that the sprayer sits firmly and comfortably high on the back of the operator. **Walk round** the groups to provide any necessary help, and ensure that they do not break or lose any parts, or cross any screw threads. |
When all groups have finished re-assembling their sprayers, take them outside, ask them to put 2-3 litres of water in the tank and to spray this water.

Check if there are any leaks from joints or the nozzle.

**Fishbowl:**

Ask all participants to come and stand around the table.

Say that we are going to disassemble a manual knapsack sprayer into the component parts, and then reassemble the sprayer.

Ask for a volunteer to start disassembling the sprayer and lay the parts out on the table.

Ask the other participants which component to take apart first.

Ask the volunteer to take the component apart. If the volunteer is unsure of how to proceed, the other participants can give advice. If necessary, the trainer should provide guidance.

Ask for volunteers in turn for the next step of disassembly.

Repeat until all parts of the sprayer are laid out on the table.

Ask for volunteers in turn to put the sprayer back together.

Repeat until the sprayer is reassembled.

Put 2-3 litres of water in the tank, and spray this water to ensure there are no leaks from joints or the nozzle.
<table>
<thead>
<tr>
<th>4.</th>
<th><strong>Interactive Discussion – Sprayer Faults</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>15 minutes</td>
<td>If there were any leaks after participants had re-assembled the sprayer(s) in the last activity, <strong>explain</strong> that leaks are one of the most common sprayer faults.</td>
</tr>
</tbody>
</table>

**Ask:**
- What do you think are other common faults that can occur with sprayers?

**Write** responses on the flipchart, and **point out** the locations on an example sprayer.

Use the **headings** from *Common Sprayer Faults and Repair* from the Fact Sheet as a check list to fill in any gaps.

**Review** the responses, and **emphasise** that the most common faults are leaks from the nozzle or joints, and blockages of the nozzle or filters.

**Say** that the Fact Sheet has a section on repair of the common sprayer faults we have identified.

**Ask:**
- As a result of our discussions, what do you think are the two most important things for farmers to do to prevent faults and breakdowns?

**Trainer Note:**
Use clean water for spraying, and thoroughly clean the sprayer and parts after each use. These aspects will be covered in a later session.

**Say** that the Fact Sheet has additional information which we have not covered in this session on a **Checklist for a Good Quality Sprayer**, and which participants should study.

**Emphasise** that sprayers vary widely in quality, many do not have the majority of the characteristics in the Fact Sheet, and that the cheapest sprayers of each type should generally be avoided.
### Finish

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Summary:</strong></td>
<td>Include as major messages:</td>
</tr>
<tr>
<td>1 minute</td>
<td>• Each type of sprayer has advantages and disadvantages, and</td>
</tr>
<tr>
<td></td>
<td>selection of a sprayer type must be based on the use situation.</td>
</tr>
<tr>
<td></td>
<td>• The function of the major components of a sprayer</td>
</tr>
<tr>
<td><strong>Questions:</strong></td>
<td>Ask if everyone understands or if there are any additional questions.</td>
</tr>
<tr>
<td></td>
<td>Answer these provided they are relevant.</td>
</tr>
<tr>
<td>1 minute</td>
<td>Ask if the session objectives were met</td>
</tr>
<tr>
<td><strong>Evaluation:</strong></td>
<td>Hand out the Assessment Sheet and ask participants to complete two</td>
</tr>
<tr>
<td></td>
<td>of the questions.</td>
</tr>
<tr>
<td>12 minutes</td>
<td>Collect the Assessment Sheet for later marking and entering the marks</td>
</tr>
<tr>
<td></td>
<td>on the Attendance Record.</td>
</tr>
<tr>
<td><strong>Next step:</strong></td>
<td>Say that in this session we learned about the different types of sprayer,</td>
</tr>
<tr>
<td></td>
<td>their components, and their different functions. Participants can now</td>
</tr>
<tr>
<td>1 minute</td>
<td>give appropriate advice to customers on sprayer purchase for the</td>
</tr>
<tr>
<td></td>
<td>customer’s situation, and how to take a sprayer apart and reassemble.</td>
</tr>
<tr>
<td></td>
<td>Participants should also study the Checklist for a Good Quality Sprayer</td>
</tr>
<tr>
<td></td>
<td>in the Fact Sheet.</td>
</tr>
<tr>
<td></td>
<td>Hand out the Fact Sheet to participants.</td>
</tr>
</tbody>
</table>
Main Sprayer Components Diagram
Maintenance of sprayers

1. Check hose for wear
2. Check hose clips and replace broken clips
3. Check on/off switch for smooth operation
4. Check and replace all damaged seals
5. Lubricate piston seal with light oil
6. Replace damaged valves
7. Replace damaged nozzle
8. Wash sprayer after use

The benefits of maintaining sprayers are:
- It saves you money
- It reduces the risk of skin exposure
- It reduces the risk of environmental pollution

[Diagram of sprayer parts]
Assessment Questions

Name: ..............................................  Date: ......................  Mark: □

Answer TWO (2) only of the following questions. You may write your answers on this question sheet or tell your trainer the answers. All questions are the same value (5 marks).

Question 1: Describe two disadvantages of a compression sprayer.
...........................................................................................................................................................................................
...........................................................................................................................................................................................
...........................................................................................................................................................................................

Question 2: Describe two advantages of a manual knapsack sprayer.
...........................................................................................................................................................................................
...........................................................................................................................................................................................
...........................................................................................................................................................................................

Question 3: What is the function of the pressure chamber in a sprayer?
...........................................................................................................................................................................................
...........................................................................................................................................................................................
...........................................................................................................................................................................................

Question 4: Where should the three filters be located in a manually operated sprayer?
...........................................................................................................................................................................................
...........................................................................................................................................................................................
...........................................................................................................................................................................................
## Comparison of Sprayer Types

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pressure (Compression) Sprayer</strong></td>
<td></td>
</tr>
<tr>
<td>Cheap purchase cost</td>
<td>Pressure rapidly drops, with reduction in output and increase in droplet size</td>
</tr>
<tr>
<td>Can be used for insecticides, fungicides, herbicides</td>
<td>Requires frequent stopping and re-pumping to maintain pressure</td>
</tr>
<tr>
<td></td>
<td>Variable coverage of plants and field</td>
</tr>
<tr>
<td></td>
<td>Very low work rate (ha / day)</td>
</tr>
<tr>
<td><strong>Manual Knapsack Sprayer</strong></td>
<td></td>
</tr>
<tr>
<td>Cheap to moderate purchase cost</td>
<td>Cheaper versions are prone to breakdowns and leaks, and have a short working life</td>
</tr>
<tr>
<td>Relatively low volume of water</td>
<td>Not suitable for use in orchards unless extension fitted to lance</td>
</tr>
<tr>
<td>Good coverage of plants and field</td>
<td>Moderate work rate (ha / day)</td>
</tr>
<tr>
<td>Low operating costs</td>
<td></td>
</tr>
<tr>
<td>Can be used for insecticides, fungicides, herbicides</td>
<td></td>
</tr>
<tr>
<td><strong>Foot Pump / Rocker Sprayer</strong></td>
<td></td>
</tr>
<tr>
<td>Moderate price</td>
<td>Requires two operators</td>
</tr>
<tr>
<td>High pressure</td>
<td>Only suitable for orchards</td>
</tr>
<tr>
<td>Long spray throw</td>
<td>Usually supplied with variable nozzle</td>
</tr>
<tr>
<td>High volume output</td>
<td>Risk of drift from long spray throw</td>
</tr>
<tr>
<td>Low operating costs</td>
<td>Moderate work rate (ha / day)</td>
</tr>
<tr>
<td>Orchards are often inaccessible to other types of powerful sprayer</td>
<td>Not suitable for application of herbicides</td>
</tr>
</tbody>
</table>
### Wheelbarrow Sprayer

- Can be fitted with a boom and several nozzles
- Can be fitted with hand lance(s) for taller crops
- Larger tank capacity than other hand sprayers
- Can be used for insecticides, fungicides, herbicides
- Moderate to high work rate (ha / day)
- Moderate to high cost
- Spray pressure depends on land wheel rotation
- Booms can only be used on low crops
- Hand lance use requires 2-3 operators
- Difficulty of moving down the row with taller crops due to width of wheelbarrow
- Difficult to push on soft soil

### Motorised Knapsack Mistblower

- Low volume of water
- Good coverage of plants and field
- High work rate (ha / day)
- High purchase cost
- Understanding of drift spraying technique essential for obtaining good coverage
- High operating costs (fuel, oil)
- Requires high levels of maintenance
- Higher risk of spray drift
- Not suitable for use in tall crops or orchards unless spray pump fitted
- Not suitable for application of herbicides

### ULV Sprayer

- Cheap to moderate purchase cost
- No water needed (or very little)
- Good coverage of plants and field
- High work rate (ha / day)
- Moderate operating costs (batteries)
- Hazards associated with application of concentrated formulation / spray mix
- Understanding of drift spraying technique essential for obtaining good coverage
- Higher risk of spray drift
- Application of herbicides requires special ULV sprayer with lower disc speed
- Cannot be used in orchards
Main Sprayer Components and Function
TANK
- The tank is the reservoir to hold the spray mix. It may be from 10 to 20 litres capacity.
- The tank lid is the opening for filling the sprayer. It must have a breather vent to allow air to enter the tank during spraying.

PUMP
- The pump pressurises the spray mix. The most common type is a piston pump.
- The pump is operated by a pump lever.
- On one stroke of the lever spray liquid is drawn into the pump, on the reverse stroke the liquid is forced out of the pump into the pressure chamber.
- The pressure chamber contains air which is then compressed as liquid is pumped in, and which helps to even out pressure fluctuations at the nozzle caused by the operation of the pump lever.

LANCE
- The hose provides a flexible connection between the pressure chamber and the lance.
- The trigger valve provides positive on-off control of the flow of spray mix.
- The lance is rigid, about 50cm long, and ensures that the nozzle is held away from the operator.
- The lance should have an angle at the end so that the nozzle can be directed in different directions.
- The nozzle breaks the spray mix up into droplets. Different nozzles are used for different types of pesticides.

FILTERS
- Filters remove debris which may block the pump valves or nozzle.
- Filters should be located in the tank opening, the trigger valve, and nozzle.
- Filters should be coarse, medium, and fine from the tank opening to the nozzle.

Checklist for a Good Quality Sprayer

GENERAL
- Robustly constructed from strong, durable materials.
- Constructed so that the bottom of the tank is not in direct contact with the ground when the sprayer is stood upright.
- Sprayer when stood upright and full should be stable on slopes up to 1 in 10.
- Integral carrying handle.
- No special tools required for maintenance or repair.

SPRAY TANK
- 16-20 litre tank capacity.
- UV stabilised / resistant polypropylene tank.
- Semi-transparent with volume markings.
- No sharp corners.
- Able to withstand a drop of 1m without damage or leaking.
- Large tank fill opening with strainer recessed deeply in opening.
- Spray mix agitation system within tank.

CARRYING STRAPS
- Carrying straps at least 5cm wide, or with shoulder pads of at least 5cm width.
- Straps and pads non-absorptive and UV resistant.
- Pads should remain fixed in place on straps during use.
- Straps of adjustable length.
- Quick release catches – operable when sprayer is full.
PUMP
- Piston or diaphragm pump
- Capable of both left and right handed lever operation
- Pressure regulation system from 1 to 3 bar

HOSE AND LANCE
- Hose non-flattening when bent unsupported through 180 degrees with 5cm radius.
- Hose length sufficient to allow free movement and positioning of lance for spraying.
- Lance at least 0.5m long.
- Lance with elbow to allow spraying downwards or sideways.
- Positive on/off trigger mechanism.
- In-line filters above both trigger mechanism and nozzle

NOZZLES
- Sprayer supplied with both hollow cone, and flat fan or deflector nozzles.
- Nozzle flow rates at different pressures should be specified.
- Adjustable nozzles are not acceptable.

OTHER
- Supplied with spare washers / gaskets.
- Instruction manual in local language giving details of assembly, use, maintenance, nozzle flow rates, and safety as a minimum.
# Common Sprayer Faults and Repair

## Leaks

<table>
<thead>
<tr>
<th>Cause</th>
<th>Repair</th>
</tr>
</thead>
</table>
| Worn or damaged seals | • Check seals and seatings at point of leak.  
                          • Replace worn or damaged parts.  
                          • Some joins rely only on surface to surface contact for the seal and there is no washer.  
                          • Check that there is no dirt or scratches on the faces of the join.  
                          • Clean or replace as necessary. |
| Joins incorrectly assembled | • Check at point of leak to ensure that all parts are present and assembled correctly.                                               |
| Crossed threads     | • Check that the screw threads are not crossed.                                                                                       |

## No Spray

<table>
<thead>
<tr>
<th>Cause</th>
<th>Repair</th>
</tr>
</thead>
</table>
| Nozzle or filter blocked           | • Resistance will be felt on the pump lever when the cut-off valve is open.  
                          • Remove nozzle, check for blockage and clean if necessary.  
                          • Remove filters at nozzle and cut-off valve, check for blockage and clean if necessary.        |
| Dirty or worn pump                  | • Check that the pump valves are not dirty, sticking, worn or damaged.  
                          • Clean or replace as necessary.                                                                 |
| Entry holes to pump blocked         | • Check that the holes where liquid passes from the tank to pump are not blocked.  
                          • Clean as necessary.                                                                                                                                     |
| Nozzle swirl plate fitted wrongly  | • On some hollow cone nozzles, if the swirl plate is fitted wrongly it blocks off the nozzle.  
                          • Check and reverse the swirl plate if necessary.                                                                                                       |

## No Pressure

<table>
<thead>
<tr>
<th>Cause</th>
<th>Repair</th>
</tr>
</thead>
</table>
| Leak from pressure chamber         | • Operate the pump lever several times and then look inside the tank to see if air bubbles are appearing on the liquid surface or if spray liquid is coming out of the chamber.  
                          • If so, check the pressure chamber gasket and the pressure chamber body for damage.  
                          • Replace if necessary.                                                                                                                                     |
| Worn or dirty pump                  | • Check that the pump valves are not dirty, sticking, worn or damaged.  
                          • Clean or replace as necessary.                                                                                                                             |
### Entry holes to pump blocked
- Check that the holes where liquid passes from the tank to pump are not blocked.
- Clean if necessary.

### Piston pump - worn piston washer
- Check that the piston seal is not worn or damaged, and that there are no deep scratches on the piston cylinder wall.
- Replace as necessary.
- If this is the cause of no pressure, liquid will be rapidly leaking from the pump.

### Breather hole blocked
- Check that the breather hole in the filler cap of the tank is not blocked, as this will prevent the entry of air and cause a vacuum in the tank.

### Pressure Drops Quickly

<table>
<thead>
<tr>
<th>Cause</th>
<th>Repair</th>
</tr>
</thead>
</table>
| Leak from pressure chamber         | • Operate the pump lever several times and then look inside the tank to see if air bubbles are appearing on the liquid surface, or if spray liquid is coming out of the pressure chamber.  
• If so, check the pressure chamber gasket and the pressure chamber body for damage.  
• Replace as necessary.         |
| Not enough air in pressure chamber | • Repeated fillings of the tank before it is empty can reduce the volume of air in the pressure chamber.  
• Drain the sprayer completely, and operate the pump lever several times to replace the air in the pressure chamber. |

### Liquid Emerges from Nozzle as Jet Instead of Spray

<table>
<thead>
<tr>
<th>Cause</th>
<th>Repair</th>
</tr>
</thead>
</table>
| Swirl plate missing          | • Hollow cone nozzles only.  
• Replace swirl plate         |
| Nozzle excessively worn      | • Fan nozzles - liquid tends to emerge as jet.  
• Replace nozzle.  
• Hollow cone nozzles - spray droplets noticeably increase in size.  
• Replace nozzle.          |

**See Also:**
CropLife International Guidelines for the Safe and Effective Use of Crop Protection Products
http://croplife.org/?s=guidelines
SESSION 12:
IDENTIFYING THE CAUSES OF FAILURE OF PESTICIDE APPLICATIONS
Session 12: Identifying the Causes of Failure of Pesticide Applications
Lesson Plan

<table>
<thead>
<tr>
<th>Materials needed:</th>
</tr>
</thead>
<tbody>
<tr>
<td>✔ Flipchart stands.</td>
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<td>✔ Masking tape.</td>
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<table>
<thead>
<tr>
<th>Time needed:</th>
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<tbody>
<tr>
<td>100 minutes</td>
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</table>

<table>
<thead>
<tr>
<th>Intended audience:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pesticide Retailers</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Preparation:</th>
</tr>
</thead>
<tbody>
<tr>
<td>✔ Flipchart with the session title “Causes of Failure of Pesticide Applications”, and the Session Objectives.</td>
</tr>
<tr>
<td>✔ Flipchart with Work Group task questions for Activity 1.</td>
</tr>
<tr>
<td>✔ Print off sufficient Attendance Record sheets.</td>
</tr>
<tr>
<td>✔ Print off sufficient Assessment question sheets.</td>
</tr>
<tr>
<td>✔ Print off sufficient Fact Sheets for participants.</td>
</tr>
<tr>
<td>✔ Organise venue and seating arrangements.</td>
</tr>
</tbody>
</table>

Attendance Record

As participants arrive, ask them to enter their name and other information on the Attendance Record. There is also a column on the form to enter their marks from the Assessment Questions at the end of the training session.
Set up/Introduction  

<table>
<thead>
<tr>
<th>Module</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attention:</td>
<td>Welcome the retailers to the session.</td>
</tr>
</tbody>
</table>
| Ask:         | Who has had experience of farmers complaining that a pesticide application has not worked properly?  
|              | What possible reason(s) have you given for the failure?                  |
|              | Take several responses.                                                   |
| Say:         | that in most cases farmers blame the pesticide, or pesticide resistance.  
|              | While these are possible, there are many other possible causes, and in this session we will be looking at all of these. |
| Title:       | Refer to the Title Flipchart and tell participants that this training session will cover Causes of Failure of Pesticide Applications. |
| Credibility: | Give an example of poor performance or failure of a pesticide application that was blamed on the wrong cause, for example a sub-standard pesticide or pesticide resistance. |
| Objectives:  | Refer to the Title Flipchart with the Lesson Objectives.                  |
|              | By the end of the session, participants will be able to:  
|              | • State clearly the different possible reasons for the poor performance or failure of a pesticide application.  
|              | • Identify the reason for a pesticide failure.  
|              | • Explain to a farmer what to do in such a case.                        |
| Benefits:    | There are several possible reasons for the poor performance or failure of a pesticide application, and if retailers know these possible reasons they are able to provide appropriate advice to farmers, and so provide a better service. |
| Direction:   | • A work group activity to identify the possible causes of poor performance or failure of a pesticide application forms the bulk of the session.  
|              | • How a retailer should identify the cause of poor performance or failure is then examined in a role play between a “farmer” and a “retailer”. |
# Delivery

**Explanation, Demonstration, Exercise, and Guidance:**

<table>
<thead>
<tr>
<th>Module/Time</th>
<th>Activity</th>
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</table>
| 1. 30 minutes | **Work Groups – Causes of Failure of Pesticide Applications**  
*Trainer Note:* Avoid extended technical discussions in this procedure – the emphasis should be on determining what could cause a pesticide application to fail, not what are the detailed recommendations for the control of a particular pest.  
*Divide* participant into 4 groups.  
*Give* one Crop / Pest combination to each work group.  
*Work Group task:* For the crop and pest assigned to your table, agree as a group on the following:  
- Cotton / Aphid  
- Tomato / Whitefly  
- Rice / Brown Plant Hopper  
- Maize / Stemborer  
- Cucumber / Mildew  
- Citrus / Leaf miner  
*Say* that groups have 30 minutes for the activity. |
| 2. 30 minutes | **Work Group Reports – Causes of Failure of Pesticide Applications**  
After 30 minutes, *ask* the table groups to report for the crop / pest combination assigned to their table.  
All groups should give their reports before there is any discussion.  
*Trainer Note:* The emphasis of this activity is to bring out the causes of failure, so *do not* get involved in technical discussions, for example on what is the correct pesticide for a particular pest. However, if for example, the participants cannot agree on the correct pesticide for a particular pest, *say* that this is a possible cause of failure – use of the wrong pesticide, and the retailers should ensure that they know the recommended pesticides to use for all local pests.  
*Review* and *summarise* the possible causes of poor performance or failure, adding where necessary from the Fact Sheet.  
*Emphasise* that many of the possible causes are due to something that the pesticide user has done, or has not done, during the application, and is therefore under their control. |
3. **20 minute**

**Role Play – Identifying the Causes of Failure of Pesticide Applications**

Ask participants to individually note down responses to the following situation and questions:

A farmer comes into the shop and complains that a pesticide which you sold to him did not work,
- What questions would you ask the farmer?
- What approach would you take with the farmer to ensure that you keep his trust and his business?

After 4-5 minutes, say that in fact this farmer is coming to the classroom now, so they’ll be able to try out some questions.

**Role Play Set-Up:**

Ask one participant to play the farmer.

Remind the “farmer” that he is not a difficult farmer, but he has a complaint to make.

Remind the group and the “farmer” that the purpose for the role plays is to practice question-asking and advice-giving, so the farmer should be reasonable.

Ask him to step outside the classroom and prepare his “complaint.” What crop, what pest, what pesticide, what happened.

Ask participants if any of them are ready to play the “retailer” and try out his or her questions and approach.

Select one participant to start. (There is time for 2-3 participants to try out their approach.)

**Conducting the Role Plays:**

**Trainer Note:**
These 2-3 role plays are meant to be quick and spontaneous, with opportunities to debrief after each role play ends, and before the next one begins. Follow these steps:

Ask the participant who volunteered to try out his or her approach as the retailer to stand in the front of the room.
**Conducting the Role Plays:**

**Trainer Note:**
These 2-3 role plays are meant to be quick and spontaneous, with opportunities to debrief after each role play ends, and before the next one begins. Follow these steps:

**Ask** the participant who volunteered to try out his or her approach as the retailer to stand in the front of the room.

**Set the stage** by explaining that a farmer is about to come into the shop with a complaint. Ask participants to take notes about what they like in the “retailer’s” approach and what they might do differently.

**Tell** the “farmer” to come in to begin.

**Allow** the role play to run for 4-5 minutes, at least until the retailer has had a chance to ask some questions.

**Then stop** the action, but keep the two role players in front of the group.

**Role Play #1 Debrief:**

**First ask** participants what they liked about the retailer’s approach.

**Then ask** the “farmer” what the retailer did that was helpful? Not helpful?

**Then ask** the retailer what he or she was trying to do, and how was it working.

**Then ask** the participants what they would do differently?

**Role Play #2:**

**Ask one** of the participants who is assertive about what he or she would do differently to try it out. Invite the participant to the front of the room to play the retailer, and ask the “farmer” to continue where the last role play ended.

**Allow** 4-5 minutes for “retailer #2” to give the farmer advice.

**Debrief** as before.

**Invite** another participant to try his or her approach, and repeat for a third role play if there is time.

**Trainer Note:**
The “retailer” should find out if:
- The pest was correctly identified
- The correct pesticide was used for the pest
- The correct stage of the pest life cycle was treated.
- The correct pesticide dose was used
- The pesticide was applied correctly

The retailer should then advise the farmer to correct any mistakes found as a result of the questioning. If no mistakes were apparent, the farmer should try a pesticide from a different chemical group, and come back to the retailer with the results.
**Finish**

(10% of time)

<table>
<thead>
<tr>
<th>Module/Time</th>
<th>Activity</th>
</tr>
</thead>
</table>
| **Summary:** 1 minute | **Include** as major messages:  
  • The four main causes of poor performance or failure of a pesticide application.  
  • The other possible causes of poor performance or failure.  
  • That in the majority of instances, the cause of poor performance or failure was under the control of the user. |
| **Questions:** 1 minute | **Ask** if everyone understands or if there are any additional questions.  
Answer these provided they are relevant.  
**Ask** if the session objectives were met |
| **Evaluation:** 12 minutes | **Hand out** the Assessment Sheet and ask participants to complete two of the questions.  
**Collect** the Assessment Sheet for later marking and entering the marks on the Attendance Record. |
| **Next step:** 1 minute | **Say** that in this session we learned about the possible causes of poor performance or failure of a pesticide application. Participants now have additional knowledge with which to give good advice to farmers and so improve the service they provide.  
**Hand out** the Fact Sheet to participants. |
Assessment Questions

Name: ……………………………………………………… Date: ………………… Mark: 

*Answer TWO (2) only of the following questions.*
You may write your answers on this question sheet or tell your trainer the answers. All questions are the same value (5 marks).

**Question 1:** Give the four main possible causes of poor performance or failure of a pesticide application.

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**Question 2:** Give two other possible causes of poor performance or failure of a pesticide application.

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**Question 3:** Give three possible causes of poor application.

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**Question 4:** How should the cause of poor performance or failure of a pesticide application be identified?

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FACT SHEET

THE CAUSES OF FAILURE OF PESTICIDE APPLICATIONS

There are many possible causes for the poor performance or failure of a pesticide application. In the majority of instances, the cause is due to something that the pesticide uses has done, or has not done, during the application, and is therefore a factor under their control.

The four most common causes of poor performance or failure are:

Wrong Pesticide Used
• The pest was identified correctly, but the wrong pesticide for the control of the pest was selected and used.
• The pest was not identified correctly, but the correct pesticide was selected for the mis-identified pest, a pesticide which has no effect on the actual pest present. For example, Tomato Yellow Leaf Curl virus was identified as Blight, and a fungicide applied for blight control, when a pesticide should have been used against whitefly, which transmits the disease causing virus.

Wrong Timing of Application
• The pest population was not at a susceptible stage. For example, adults were treated when the pesticide label recommendation is to treat the larval stages, or a disease is too far advanced.

Wrong Dose Rate
• The dose rate used was below the label recommendation, and was too low to kill the pests.
• This can occur either by using a lower than recommended dose in the spray mix, or by poor application leading to poor coverage and/or areas of under-dosing.

Poor Application
• The pesticide was not applied to the right place (e.g. poor underleaf cover for aphid control)
• The pesticide was not applied evenly to the target area, with areas of over- and under-dosing.
• The application equipment was poorly calibrated, or not calibrated at all.
• The wrong type of nozzle was used. For example using a hollow cone nozzle for herbicide application, which should be by a flat fan nozzle.
• The wrong pressure was used so that droplets were the wrong size. For example, the pressure was too low when using a hollow cone nozzle so that large droplets were produced with consequent poor canopy coverage.
• The application equipment was badly maintained. For example hose, filter and nozzle blockages had not been cleaned.
• The application took place in adverse weather conditions. For example, it was too hot, or too windy, or it rained soon after the application. Some herbicides require to be activated by rainfall after application.
The following may also cause a pesticide application to fail:

**Sub-Standard Pesticide**
- A counterfeit pesticide was used, with one or more of:
  - Poor quality formulation.
  - A concentration of active ingredient in the formulation lower than that indicated on the label.
  - No active ingredient in the formulation.
  - No or poor information on the label regarding use recommendations.
  - The pesticide has exceeded the expiry date, and the concentration of active ingredient in the formulation has deteriorated.

**Pest Resistance to Pesticide**
- The target pest has developed resistance to the pesticide

**Poor Quality of Spray Mix Water**
- Excessively acidic, alkali, or brackish water used in the spray mix can affect the performance of the pesticide.
- In such instances, poor performance will occur with all farmers using the same water source and pesticide.

**Incompatibility of Pesticide Formulations Used in a Tank Mix**
- This can cause one or more of the pesticides to precipitate out of the spray mix. In such instances, there will probably also be nozzle blockages.
- In some cases there can be chemical or physiological antagonism between the spray mix components.

**Plants Under Stress**
- This only applies to systemic pesticides, where if the plant is under stress, such as a shortage of water, the pesticide is not translocated through the plant to reach the insect pest or site of action within the weed.

The pesticide container label should carry all the information required to avoid the above problems, such as the recommended dosage, the timing of the application with regard to the pest life cycle, etc. The label should also include cautionary warnings, such as incompatibility with other pesticides, or the spray mix water quality required.

**IDENTIFYING THE CAUSES OF FAILURE OF PESTICIDE APPLICATIONS**

If a pesticide application has not given the level of control anticipated, or has failed completely, all the above possible causes should be examined one by one, starting with the four most common, until a possible reason has been identified.

In most instances, the poor control can be attributed to using the wrong pesticide, applying the pesticide at the wrong time, using the wrong dose rate, or poor application. These are all under the control of the pesticide user.

If the user has the required knowledge, which can be given by the retailer, poor performance or failure of a pesticide application will be avoided.
SESSION 13: PESTICIDE APPLICATION (THEORY)
Lesson Plan

<table>
<thead>
<tr>
<th>Materials needed:</th>
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<tbody>
<tr>
<td>☑ Flipchart stands.</td>
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<tr>
<td>☑ Masking tape.</td>
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</table>

| Time needed:                                          | 95 minutes (100 minutes including activity 5) |

| Intended audience:                                    | Pesticide Retailers |

<table>
<thead>
<tr>
<th>Preparation:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>☑ Flipchart with the session title “Spray Application (Theory)” and the Session Objectives.</td>
<td></td>
</tr>
<tr>
<td>☑ Flipchart with Importance of Pesticide Application / Spraying from the Fact Sheet.</td>
<td></td>
</tr>
<tr>
<td>☑ Flipchart with blank table Advantages and Disadvantages of Large and Small Droplets.</td>
<td></td>
</tr>
<tr>
<td>☑ Sufficient printed copies of Visual 1, Droplet Sizes, for all participants</td>
<td></td>
</tr>
<tr>
<td>☑ Several examples of each nozzle type – flat fan, even flat fan, full cone, hollow cone, deflector/flood.</td>
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<tr>
<td>☑ Print off sufficient Attendance Record sheets.</td>
<td></td>
</tr>
<tr>
<td>☑ Print off sufficient Assessment question sheets.</td>
<td></td>
</tr>
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<td>☑ Print off sufficient Fact Sheets for participants.</td>
<td></td>
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<tr>
<td>☑ Organise venue and seating arrangements.</td>
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</table>

Attendance Record

As participants arrive, ask them to enter their name and other information on the Attendance Record. There is also a column on the form to enter their marks from the Assessment Questions at the end of the training session.
### Set up / Introduction

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<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Attention:</strong></td>
<td>Welcome the retailers to the session. <strong>Ask:</strong> • How many participants give advice on pesticide application or spraying, or are directly involved in spraying? • If participants do not undertake these activities, ask what is the reason: is it because they do not have enough knowledge? <strong>Take</strong> several responses. <strong>Say</strong> that in this session we will discuss the theory of spray application. In the following session we will look at spray mixing and application in practical activities.</td>
</tr>
<tr>
<td><strong>Title:</strong></td>
<td>Refer to the Title Flipchart and tell participants that this training session will cover</td>
</tr>
<tr>
<td><strong>Credibility:</strong></td>
<td>Give an example of when a pesticide did not work properly because of incorrect application.</td>
</tr>
<tr>
<td><strong>Objectives:</strong></td>
<td>Refer to the Title Flipchart with the Lesson Objectives. By the end of the session, participants will be able to: • State clearly the importance of application / spraying when using a pesticide to prevent crop damage. • Explain the relationship between plant coverage, droplet size, and spray volume. • Describe the common types of nozzles and their characteristics. Explain the factors which affect droplet size.</td>
</tr>
<tr>
<td><strong>Benefits:</strong></td>
<td>One of the common reasons for the failure of a pesticide is poor application. Knowing the theory of pesticide application will enable participants to give appropriate advice to farmers, and when applying a pesticide themselves, ensure that the application is effective.</td>
</tr>
<tr>
<td><strong>Direction:</strong></td>
<td>• The session opens with a trainer presentation, which leads into an interactive discussion about the function of a sprayer. • Another interactive discussion examines the relationship between plant coverage, droplet size, and spray volume. • Work groups next examine the advantages and disadvantages of large and small droplets. • Additional discussions look at different nozzle types and their characteristics, and the factors which affect droplet size.</td>
</tr>
</tbody>
</table>
## Delivery

### Explanation, Demonstration, Exercise, and Guidance:

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 15 minutes</td>
<td><strong>Presentation / Interactive Discussion – Function of a Sprayer in Pesticide Application</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Present</strong> the flipchart Importance of Pesticide Application / Spraying.</td>
</tr>
<tr>
<td></td>
<td><strong>Ask</strong> the following three questions in turn, writing responses to each question on the flipchart:</td>
</tr>
<tr>
<td></td>
<td>• What are we really trying to do when we apply a pesticide to a crop?</td>
</tr>
<tr>
<td></td>
<td>• What is the target we are trying to reach when we apply a pesticide?</td>
</tr>
<tr>
<td></td>
<td>• What basic function does a sprayer perform in helping us to achieve these objectives?</td>
</tr>
<tr>
<td></td>
<td>Use <em>Function of a Sprayer in Pesticide Application</em> from the Fact Sheet as a checklist.</td>
</tr>
<tr>
<td></td>
<td><strong>Conclude</strong> the activity by <strong>presenting</strong> the <em>Function of a Sprayer in Pesticide Application</em> from the Fact Sheet.</td>
</tr>
<tr>
<td></td>
<td><strong>Emphasise:</strong> That pesticides cost the farmer money. They must be applied effectively to give a return on his investment.</td>
</tr>
<tr>
<td>2. 15 minutes</td>
<td><strong>Interactive Discussion - Plant Coverage, Droplet Size and Spray Volume</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Ask</strong> the following questions one by one:</td>
</tr>
<tr>
<td></td>
<td>• Is it better to use large or small amounts of water when spraying?</td>
</tr>
<tr>
<td></td>
<td>• Why?</td>
</tr>
<tr>
<td></td>
<td>• Can we apply the same amount of pesticide to a crop in a smaller volume of water?</td>
</tr>
<tr>
<td></td>
<td>• Why would we want to use a smaller volume of water?</td>
</tr>
<tr>
<td></td>
<td>• How could we use a smaller volume of water?</td>
</tr>
<tr>
<td></td>
<td><strong>Take</strong> responses to each question in turn, using <em>Plant Coverage, Droplet Size and Spray Volume</em> from the Fact Sheet as a checklist.</td>
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<tr>
<td></td>
<td>When appropriate, distribute Visual 1, <em>Droplet Sizes</em>, to illustrate the effect on droplet numbers of halving droplet size with the same volume of water.</td>
</tr>
<tr>
<td></td>
<td><strong>Emphasise:</strong></td>
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<tr>
<td></td>
<td>• It is best to use the smallest amount of water possible as this reduces the labour and effort required for water collection and spraying.</td>
</tr>
<tr>
<td></td>
<td>• Obtaining adequate coverage with a small amount of water requires consideration of appropriate droplet size.</td>
</tr>
<tr>
<td></td>
<td>• Other factors also need to be considered with regard to appropriate droplet size for an application, which we will examine during the session.</td>
</tr>
</tbody>
</table>
3. 20 minutes

Work Groups – Advantages and Disadvantages of Large and Small Droplets

Divide participants into 3-4 groups depending on numbers.

Put up the flipchart with the blank tableAdvantages and Disadvantages of Large and Small Droplets.

Work Group Task:
Discuss among the group answers to the following questions:
• What are the advantages of large droplets?
• What are the disadvantages of large droplets?
• What are the advantages of small droplets?
• What are the disadvantages of small droplets?
• Jot answers down.

Take an answer for the first question from the first group and write the response in the table on the flipchart. Repeat for each group in turn until there are no more responses.

Repeat for each question on turn.

Review the results, using Advantages and Disadvantages of Large and Small Droplets, from the Fact Sheet to fill in any gaps.

Trainer Note:
Refer back to Session 4 on Pesticide Classification to link droplet sizes and plant coverage with the Mode of Action of pesticides. For example, aphids feeding on under-leaf surfaces require good under leaf coverage with a contact pesticide, which is provided by smaller droplets.

Ask:
• Is it important to use a large or small droplet size for the application of a herbicide? Why
• An insecticide? Why?

4. 15 minutes

Interactive Discussion – Nozzles

Distribute the examples of the first nozzle type (e.g. hollow cone) to each group and ask participants to examine them.

Ask:
• What type of nozzle is this?
• What are its characteristics?

Write responses on the flipchart until there are no further answers, and then add any missing points using Nozzles from the Fact Sheet as a checklist.

Repeat for the other nozzle types.

Trainer Note:
Ensure all the example nozzles are returned at the end of the activity.
### 5. Interactive Discussion – Other Nozzle Types

**5 minutes**

**Trainer Note:** Include the following activity only if appropriate to sprayers used locally.

**Say** that the nozzles we have discussed are known as hydraulic nozzles as they use the energy of the liquid to produce droplets.

**Ask:**
- Are there other common types of nozzles?

**Write** responses on the flipchart.

**Ask:**
- What are the characteristics of these other nozzles?

**Write** responses on the flipchart against the nozzle type, using *Other Nozzle Types* from the Fact Sheet as a checklist.

### 6. Interactive Discussion – Factors Affecting Droplet Size

**10 minutes**

**Say** that in the previous activities we have seen the importance of using an appropriate droplet size for a pesticide application.

**Ask:**
- What do you think are the factors which affect the size of droplets produced by a nozzle?

**Write** responses on the flipchart, using *Factors Affecting Droplet Size* from the Fact Sheet as a checklist.
Summary:
1 minute
Include as major messages:
• The importance of good spray application for a pesticide to be effective.
• The relationship between plant coverage, droplet size and volume of water.
• Smaller droplets are used for insecticides and fungicides, larger droplets are used for herbicides.
• Different types of nozzles produce droplets in different ways, and have different droplet sizes.
• Droplet size is also affected by the size of the nozzle orifice and spray pressure.

Questions:
1 minute
Ask if everyone understands or if there are any additional questions. Answer these provided they are relevant.
Ask if the session objectives were met

Evaluation:
12 minutes
Hand out the Assessment Sheet and ask participants to complete two of the questions.
Collect the Assessment Sheet for later marking and entering the marks on the Attendance Record.

Next step:
1 minute
Say that in this session we learned the theory of pesticide application / spraying, which is essential as the effectiveness of a pesticide depends on the quality of the application. In the next session we will put this theory into practice.
Hand out the Fact Sheet to participants.
Advantages and Disadvantages of Large and Small Droplets

<table>
<thead>
<tr>
<th>Large Droplets</th>
<th>Small Droplets</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Advantages</strong></td>
<td><strong>Advantages</strong></td>
</tr>
<tr>
<td><strong>Disadvantages</strong></td>
<td><strong>Disadvantages</strong></td>
</tr>
</tbody>
</table>
Visual 1

Droplet Sizes

1 micron (Q) = 1/1,000mm, or 400Q = 0.4mm. A human hair is 100Q in diameter.
Assessment Questions

Name: ........................................... Date: .................. Mark: 

*Answer TWO (2) only of the following questions.*

*You may write your answers on this question sheet or tell your trainer the answers.*

*All questions are the same value (5 marks).*

Question 1: What is the basic function of a sprayer in pesticide application?

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Question 2: Give two advantages of small droplets.

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Question 3: What are the three factors which affect droplet size?

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Question 4: For what type of pesticide is a flat fan nozzle used for application?

...........................................................................................................................................................................................
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FACT SHEET

THE IMPORTANCE OF PESTICIDE APPLICATION / SPRAYING

- Pesticides are applied to protect the crop from economic damage or loss.

- There are four main reasons for a pesticide failing to work properly, of which two are concerned with application:
  - Wrong pesticide dose rate, of which one cause is poor spraying.
  - Incorrect application / spraying

- Pesticide application / spraying is often neglected when considering pest management.
  - If the pesticide is not applied in the right amount in the right place, its effectiveness in protecting the crop from loss or damage is reduced.
  - The farmer loses thus loses money in two ways - from crop loss or damage due to poor pest control, and from cost of the pesticide.
  - To compensate for poor levels of control, a repeat spray is often made, which is also poorly applied, and costs even more money.
  - Over the season, the losses add up, and can cost the farmer a considerable amount.

- Correct pesticide application / spraying is thus essential for a pesticide to work correctly, protect the crop from loss or damage, and ensure that the farmer makes the best profit from pesticide use.

THE FUNCTION OF A SPRAYER IN PESTICIDE APPLICATION

- The ultimate target of the pesticide is the pest, with an intermediate target of the surface of the plants.

- The function of the sprayer is to break the spray mix up into droplets to be deposited on the plant surfaces so as to give adequate and even coverage.

For a Pesticide to Have the Best Effect:

- There must be even coverage of the pesticide droplets over both individual plants and the whole field.
- If the pesticide is not applied evenly, there will be areas of over- and under-dosing, which are ineffective and increase losses and costs.
- Particularly with underleaf pests (aphids, whitefly, some diseases, etc) there must be good coverage of the lower leaf surface for contact pesticides to be effective.
- If the target area is limited, for example aphids only in certain parts of the field or application to young seedlings, then spot- and band-spraying can save pesticide, water, and time.
PLANT COVERAGE, DROPLET SIZE, AND SPRAY VOLUME

• The objective of using a sprayer is to get the pesticide to the target pest, not to drown the pests with water.

• To achieve even plant and field coverage:
  • It is the number of pesticide droplets deposited per unit area on the plant which is important, not the volume of water applied.

• If droplet diameter is halved, eight times as many droplets are formed from the same volume of spray mix.

• If large droplets are produced by the sprayer:
  • A large volume of water is needed to achieve the required number of droplets on the plant.

• If small droplets are produced by the sprayer:
  • A small volume of water is needed to achieve the required number of droplets on the plant.

It is best to use the smallest amount of water possible as this reduces the labour and effort required for water collection and spraying.

Obtaining adequate coverage with the smallest amount of water requires consideration of appropriate droplet size.
Advantages and Disadvantages of Large and Small Droplets

<table>
<thead>
<tr>
<th></th>
<th>Large Droplets</th>
<th>Small Droplets</th>
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</thead>
<tbody>
<tr>
<td><strong>Advantages</strong></td>
<td></td>
<td></td>
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<tr>
<td>Less liable to drift</td>
<td></td>
<td>More liable to drift</td>
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<tr>
<td>Less likely to</td>
<td></td>
<td>More likely to</td>
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<tr>
<td>evaporate before</td>
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<td>hitting plant</td>
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<tr>
<td>surface</td>
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<tr>
<td>Poor coverage of</td>
<td></td>
<td>Better coverage of</td>
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<tr>
<td>lower leaves and</td>
<td></td>
<td>lower leaves and</td>
</tr>
<tr>
<td>under-leaf surfaces</td>
<td></td>
<td>under-leaf surfaces</td>
</tr>
<tr>
<td>More liable to</td>
<td></td>
<td>More even field</td>
</tr>
<tr>
<td>uneven field coverage</td>
<td></td>
<td>coverage</td>
</tr>
<tr>
<td>Need larger volume of</td>
<td></td>
<td>Need smaller</td>
</tr>
<tr>
<td>water</td>
<td></td>
<td>volume of water</td>
</tr>
<tr>
<td>Risk of run-off from</td>
<td></td>
<td>No run-off from</td>
</tr>
<tr>
<td>plant surfaces</td>
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<td>plant surfaces</td>
</tr>
</tbody>
</table>

- The smaller a droplet, the higher is the risk of drift outside the target area.
- Large droplets are used for the application of herbicides so as to minimise drift.
- Small droplets are used for the application of insecticides, acaricides, and fungicides to optimise crop penetration and underleaf coverage.

**FACTORS AFFECTING DROPLET SIZE**

Droplet size is affected by the nozzle type, the size of the nozzle orifice and the pressure of the spray liquid.
- Different nozzle types (see below) produce different droplet sizes.
- For hydraulic nozzles, a small nozzle orifice produces small droplets, a large nozzle orifice produces large droplets.
- For hydraulic nozzles, high pressure of the spray liquid produces small droplets, low pressure produces large droplets.
Hydraulic Nozzles

Hydraulic nozzles are fitted to most sprayers, and rely on the energy given to the spray liquid by the pump to break the liquid into droplets. Hydraulic nozzles produce a relatively wide range of droplet sizes for a given nozzle type, size, and pressure.

| Full Cone / Hollow Cone | • Produce a cone shaped spray. With a cone nozzle, the full area of the cone has spray droplets, with a hollow cone nozzle the droplets are only on the outside of the cone.  
• Full cone nozzles are usually fitted only to air-blast sprayers or tractor boom sprayers, hollow cone nozzles are used with hand operated equipment.  
• Droplet size tends to be small, and there is a risk of spray drift.  
• Used at higher pressures than flat fan or deflector nozzles.  
• Most commonly used for application of insecticides, acaricides and fungicides. |
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<tbody>
<tr>
<td><img src="image.png" alt="Full Cone / Hollow Cone" /></td>
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</tbody>
</table>

| Flat Fan / Even Spray Flat Fan | • Produce a fan shaped spray.  
• Droplet size tends to be large, with a low risk of spray drift.  
• Flat fan nozzles deposit most spray directly under the nozzle tip, so are used on tractor mounted boom sprayers, where several nozzles can overlap, producing an even spray pattern.  
• “Even spray” flat fan nozzles produce an even deposit of spray across the fan, and are thus suitable for single nozzle hand operated equipment.  
• Most commonly used for the application of herbicides.  
• May reduce the effectiveness of insecticide, acaricide and fungicide application. |
<table>
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<tbody>
<tr>
<td><img src="image.png" alt="Flat Fan / Even Spray Flat Fan" /></td>
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</tbody>
</table>

| Deflector | • Also known as “flooding” or “anvil” nozzles.  
• Droplet size tends to be large, with a low risk of spray drift.  
• Give a relatively even deposit of spray across the fan.  
• Most commonly used for the application of herbicides.  
• May reduce the effectiveness of insecticide, acaricide and fungicide application. |
<table>
<thead>
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</thead>
<tbody>
<tr>
<td><img src="image.png" alt="Deflector" /></td>
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</tbody>
</table>

Adjustable hollow cone nozzles should not be used as the output and droplet size cannot be adequately controlled.
## Other Nozzle Types

| **Centrifugal** | • Also referred to as spinning discs, or rotary atomisers, or Controlled Droplet Application (CDA).
• Produce droplets from the edge of a toothed, spinning disc.
• Produce a narrow range of droplet sizes.
• The faster the disc spins, the smaller the droplet size.
• Used for Low Volume and Ultra Low Volume application.
• Different sprayers are required for insecticides and fungicides, and for herbicides. |

| **Air Shear** | • Fitted to motorised knapsack mistblowers.
• Produce droplets from high speed wind passing over an orifice / tube feeding spray liquid into the air blast.
• Produce small droplet sizes, with a risk of spray drift.
• Flow rate of the spray liquid is determined by an in-line restrictor between the spray tank and ‘nozzle’ orifice. |

**See also:**
CropLife International Guidelines for the Safe and Effective Use of Crop Protection Products
http://croplife.org/?s=guidelines
SESSION 14:
PESTICIDE MIXING AND APPLICATION (PRACTICAL)
## Lesson Plan

| Materials needed: | ☑ Flipchart stands.  
| | ☑ Flipchart paper.  
| | ☑ Markers (4 colours).  
| | ☑ Notebooks, pens, and file covers for participants who have forgotten to bring them.  
| | ☑ Coloured cards.  
| | ☑ Glue stick or blue tack.  
| | ☑ Masking tape.  
| Time needed: | 125 minutes  
| Intended audience: | Pesticide Retailers  
| Preparation: | ☑ Flipchart with the session title “Pesticide Mixing and Application Practical”, and the Session Objectives.  
| | ☑ If possible, sufficient manual knapsack sprayers of the same type for one between each 3-4 participants.  
| | ☑ Graduated cylinders, syringes, electronic scales for measuring.  
| | ☑ Appropriate measures for farmers – cut down plastic bottles, graduated specimen containers - sufficient for the number of sprayers available plus for mixing/creaming dry formulations  
| | ☑ Milk powder and milk as substitutes for powder and liquid pesticide formulations.  
| | ☑ A supply of water for spraying.  
| | ☑ Buckets for water.  
| | ☑ An outside area adjacent to the training venue for practical activities.  
| | ☑ Print off sufficient Attendance Record sheets.  
| | ☑ Print off sufficient Assessment question sheets.  
| | ☑ Print off sufficient Fact Sheets for participants.  
| | ☑ Organise venue and seating arrangements.  

## Attendance Record

As participants arrive, ask them to enter their name and other information on the Attendance Record. There is also a column on the form to enter their marks from the Assessment Questions at the end of the training session.
Set up / Introduction  5 minutes

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Trainer Note:</strong></td>
<td>For the practical activities of this session, an open area adjacent to the training classroom will be needed. The area should have a bare, flat area of concrete or hard earth for ‘herbicide’ application, and also some plants that can be sprayed with ‘insecticides’ and ‘fungicides’.</td>
</tr>
<tr>
<td><strong>Attention:</strong></td>
<td>Welcome the retailers to the session.</td>
</tr>
<tr>
<td><strong>Remind</strong> participants of the previous session on <em>Pesticide Application (Theory)</em>.</td>
<td></td>
</tr>
<tr>
<td><strong>Ask:</strong></td>
<td>Why is application / spraying so essential to the effectiveness of a pesticide?</td>
</tr>
<tr>
<td><strong>Take</strong> several responses.</td>
<td></td>
</tr>
<tr>
<td><strong>Say</strong> that in the last session we looked at the theory of spray application, in this session we will put that theory into practice.</td>
<td></td>
</tr>
<tr>
<td><strong>Title:</strong></td>
<td>Refer to the Title Flipchart and tell participants that this training session will cover <em>Pesticide Mixing and Application (Practical)</em>.</td>
</tr>
<tr>
<td><strong>Credibility:</strong></td>
<td>Give an example of when a pesticide did not work properly because of incorrect application.</td>
</tr>
</tbody>
</table>
| **Objectives:** | Refer to the Title Flipchart with the Lesson Objectives.  
By the end of the session, participants will be able to:  
• Explain how to avoid, and how to clean, nozzle and filter blockages.  
• Safely measure and mix liquid and dry pesticide formulations ready for spraying.  
• Safely apply herbicides, and insecticides and fungicides.  
• Safely dispose of excess spray mix.  
• Describe the procedure for cleaning a sprayer after use. |
| **Benefits:** | One of the common reasons for the failure of a pesticide is poor application. Knowing the theory of pesticide application will enable participants to give appropriate advice to farmers, and when applying a pesticide themselves, ensure that the application is safe and effective. |
| **Direction:** | An interactive discussion on avoiding and cleaning nozzle and filter blockages begins the session.  
The trainer then demonstrates appropriate measures for use by farmers.  
The practical sessions take place outside, where the trainer demonstrates how to mix and apply liquid and powder formulations, following which small participant groups practice mixing and spraying.  
The concluding outside activities are a trainer demonstration and group work on disposal of excess spray mix and cleaning the sprayer. |
## Delivery

### Explanation, Demonstration, Exercise, and Guidance:

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 15 minutes</td>
<td><strong>Interactive Discussion – Blockages and Sprayer Cleaning</strong>&lt;br&gt;<strong>Say</strong> that before we go outside and practice mixing and spraying, we need to know how to remove a nozzle or filter blockage, and how to clean the sprayer after use.&lt;br&gt;<strong>Ask</strong> in turn:&lt;br&gt;• What are the best ways to avoid nozzle or filter blockages?&lt;br&gt;• How should we clean a nozzle or filter blockage during spraying?&lt;br&gt;<strong>Write</strong> responses on the flipchart, using <em>Nozzle and Filter Blockages and Blockages During Spraying</em> as checklists for each question, and adding to responses as necessary.&lt;br&gt;<strong>Say</strong> that the other way to prevent blockages is to thoroughly clean the sprayer after use. This not only prevents blockages, but also ensures that the sprayer is maintained properly.&lt;br&gt;<strong>Present</strong> the contents of <em>Cleaning After Spraying</em> from the Fact Sheet.&lt;br&gt;<strong>Say</strong> that participants will put <em>Cleaning After Spraying</em> into practice later in the session.</td>
</tr>
<tr>
<td>2. 5 minutes</td>
<td><strong>Demonstration - Measures</strong>&lt;br&gt;<strong>Demonstrate</strong> to participants the equipment commonly assumed to be necessary for measuring:&lt;br&gt;• Graduated / Measuring cylinders for liquids&lt;br&gt;• Syringes for liquids&lt;br&gt;• Electronic scale for powders&lt;br&gt;<strong>Explain</strong> that:&lt;br&gt;• These are not suitable or will not be available for farmers.&lt;br&gt;• However, pesticide retailers should have such equipment in their shop so that they can prepare appropriate measures for farmers from other items as part of their customer service.&lt;br&gt;<strong>Demonstrate</strong> measures appropriate for farmers, such as:&lt;br&gt;• Cut down water bottles.&lt;br&gt;• Graduated specimen containers.&lt;br&gt;<strong>Emphasise</strong> that these measures should be washed out into the spray tank after each use, and kept safely locked up with the pesticide containers when not in use.</td>
</tr>
</tbody>
</table>

**Trainer Note:**<br>Move outside to the open area for the next activities.
### 3. 30 minutes

**Fishbowl / Demonstration - Spraying Practical: Mixing and Application**

*Explain* that we are using milk powder and milk as substitutes for powder and liquid pesticide formulations.

*Say* we are going to mix up 10 litres of spray mix, with a mixing rate of 3g of powder formulation per litre of water, and 1ml of liquid formulation per litre of water.

*Demonstrate* to the participants how to mix both powder and liquid pesticide formulations for spraying, using *Mixing and Procedures for Measuring Out and Mixing Liquid Formulations* and *Wettable Powders* from the Fact Sheet as references.

*Emphasise* that the first activity when mixing a pesticide is to **read the label**.

*Emphasise* also that:

- Mixing is the most hazardous activity when handling pesticides as they are in their most concentrated form.
- Appropriate PPE must be worn.
- The precautions that must be taken to AVOID exposure to pesticides during mixing and spraying,

**Using Spraying** from the Fact Sheet for reference:

- **Fit** a flat fan nozzle to the sprayer and **demonstrate** how to spray a herbicide on the flat part of the area.
- **Point out** the swath width of the nozzle on the ground, and how to slightly overlap the swaths on the return path.
- **Change** the nozzle to a hollow cone and **demonstrate** how to spray an insecticide / fungicide on the plants in the area.
- **Point** out how to use the bend in the lance to ensure good plant coverage, particularly under the leaves.

*Ask* if participants have any questions.

*Say* that participants are now going to mix and apply ‘pesticides’ themselves in their small groups.
### 4. Group Work - Spraying Practical: Mixing and Application

**Divide** participants into groups depending on the number of sprayers available.

**Provide** each small group with a knapsack sprayer.

**Give** each small group a powder or liquid ‘pesticide’ formulation and appropriate measuring equipment.

**Say** that first we will first spray a herbicide, and then an insecticide / fungicide.

Each small group task is to:
- Prepare 10 litres of spray mix, either using a powder or liquid formulation.
- Mixing rates are 3g of powder formulation per litre of water, and 1ml of liquid formulation per litre of water.
- Fit a flat fan nozzle to the spray lance.
- Spray the ‘herbicide’ on the flat area.
- Each group member should take a turn at spraying.
- Change the nozzle to a hollow cone.
- Spray the ‘insecticide / fungicide’
- Each group member should take a turn at spraying.

**Walk** round each small group during all stages of the activity to ensure that they are mixing and spraying correctly.

---

### 5. Demonstration / Group Work - Disposal and Cleaning

**After** all participants have had an opportunity to spray both a herbicide and an insecticide / fungicide, **say** that we now need to dispose of any excess spray mix left in the sprayer.

**Demonstrate** how to spray the excess on the crop, walking faster than usual so as to spread the excess over as large an area as possible.

**Ask** the participants to do the same with their excess spray mix.

After all excess spray mix has been disposed, **ask** participants to clean their sprayers.

**Remind** participants of the After Spraying cleaning procedure we discussed earlier in the session.

**Walk** round the small groups to ensure that the correct cleaning procedure is followed.

After all the sprayers have been cleaned, **ensure** that participants wash themselves.

---

**Trainer Note:**
Return to the classroom for the finishing activities.
Session 14: Pesticide Mixing and Application (Practical)

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
</table>
| **Summary:** 1 minute | Include as major messages:  
• Avoiding nozzle and filter blockages, and how to clean blockages.  
• Mixing liquid and powder formulations for spraying.  
• Triple rinsing of empty pesticide containers  
• The differences between spraying a herbicide and spraying an insecticide or fungicide  
• Cleaning of the sprayer after use.  

| Ask if everyone understands or if there are any additional questions. Answer these provided they are relevant.  
Ask if the session objectives were met  
| Hand out the Assessment Sheet and ask participants to complete two of the questions.  
Collect the Assessment Sheet for later marking and entering the marks on the Attendance Record.  
| Say that in this session we have put our theoretical knowledge from the previous session into practice. Participants can now give farmers practical information on spray application so as to ensure that a pesticide treatment is effective.  
Hand out the Fact Sheet to participants.  

Next step: 1 minute

Finish
Assessment Questions

Answer TWO (2) only of the following questions. 
You may write your answers on this question sheet or tell your trainer the answers. 
All questions are the same value (5 marks).

Question 1: How can nozzle and filter blockages be avoided?
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Question 2: How should you dispose of excess spray mix?
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Question 3: What is the first action to take when mixing a pesticide?
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Question 4: Give three ways of avoiding exposure to pesticides during mixing and spraying.
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FACT SHEET

NOZZLE AND FILTER BLOCKAGES

Nozzle and filter blockages are one of the commonest sprayer breakdowns. They can be avoided by:

- Only using clean water.
  - Dirty water not only blocks filters and nozzles, but also causes nozzle wear.
  - If necessary, filter water before using, or allow to stand for several hours before using to allow particles to settle out.
  - Thoroughly cleaning the sprayer after use to remove any pesticide deposits.

BLOCKAGES DURING SPRAYING

<table>
<thead>
<tr>
<th>Blockages</th>
<th>Commonly caused by:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nozzle blockage</td>
<td>Use of dirty water, Use of wettable powders, Inadequate cleaning of the sprayer, filters, and nozzle after use</td>
</tr>
<tr>
<td>Filter blockage</td>
<td>Wash in clean water. If necessary, leave to soak overnight in water. Use a piece of stiff grass to remove the blockage. NEVER put the filter to the mouth and blow. NEVER clean with hard objects such as wire or a nail.</td>
</tr>
</tbody>
</table>

CLEANING AFTER SPRAYING

- Any remaining insecticide should be sprayed onto the crop. Excess insecticide must NEVER be dumped in or near rivers, canals or ponds.
- Remove and dismantle the nozzle and clean in fresh water.
- Wash out the sprayer thoroughly with clean water, and pump clean water through the lance. It is better to use several washings of a small amount of water than filling the tank only once with a large amount. Spray the washings in the crop area, and ensure that the tank is empty afterwards.
- Open the trigger valve to release the air pressure in the pressure chamber.
- Spray mixture must not be left in the tank as the solvents used in emulsifiable concentrate formulations can affect rubber and leather parts, while wettable powders can settle out and cause blockages.
- Wipe down the outside of the sprayer to remove any pesticide deposits.
- Replace the nozzle.
- Store the sprayer out of direct sunlight, which can cause the plastic parts to become brittle or to warp. The sprayer should also be stored where it is protected from rats, which can chew the plastic parts.
“MIXING” IN THIS CONTEXT MEANS THE PREPARATION OF A PESTICIDE FORMULATION FOR APPLICATION, SUCH AS WHEN A PESTICIDE IS “MIXED” WITH WATER READY FOR SPRAYING. IT DOES NOT MEAN THE MIXING OF TWO PESTICIDE FORMULATIONS TOGETHER. THIS PRACTICE IS NOT RECOMMENDED BECAUSE OF POTENTIAL ADVERSE EFFECTS, AND SHOULD BE AVOIDED.

- Mixing is the most hazardous operation - pesticides are handled in their most concentrated form. Personal and environmental precautions are needed.
- Mixing should never be done without reference to the label or Government recommendations.
- PPE is needed.
  - Gloves, face shield / dust mask, overalls, boots, apron
- Opening containers
  - Do not rip plastic/paper bags
  - Mix on level surface
  - Close container or replace cap immediately the pesticide has been poured out

AVOID PESTICIDE EXPOSURE BY:

- Mixing is the most hazardous operation as pesticides are handled in their most concentrated form
- Avoiding splashes and dust clouds when mixing
- Not using leaking sprayers
- Point nozzle downwind when spraying
- Keep nozzle below waist height
- Not spraying in windy conditions
- Not walking through the sprayed area
- Common contamination during spraying is on the hands from leaking trigger assemblies

MEASURES

Graduated cylinders, syringes, electronic scales, and similar equipment are often assumed to be essential for measuring out pesticides when mixing. Pesticide retailers should have this type of measuring equipment, which is not that expensive – even electronic scales are relatively cheap. However, these measures are often not available to farmers, so alternatives need to be used.

Pesticide retailers should identify any measures used by local farmers, and determine the quantities of liquid and powders these hold using their own measuring equipment. Advice can then be provided to farmers on the correct amount of pesticide to put in the local measure for their sprayer capacity.

If no such local measures exist, they will have to be improvised. For example, an old plastic bottle can be cut to a suitable size and the correct level marked, or medical graduated specimen containers can be held in stock and sold to farmers.

Providing this type of support to farmers will improve the reputation of the retailer among customers, and so enhance Good Service = Good Business.
PROCEDURES FOR MEASURING OUT AND MIXING

Measuring out and Mixing Liquid Formulations
- Read the label.
- Put on the necessary protective clothing.
- Half fill sprayer tank with water (through tank filter).
- Measure out the required quantity of liquid concentrate for one tank-full using a graduated measure or calibrated local measure.
- Replace the cap on the container immediately after pouring out the required quantity.
- Keeping face and body well back, pour the concentrate into tank. Wash out the measuring container (and the pesticide bottle if it is empty) three times with water and add the washings to the sprayer tank.
- Replace the tank lid, and shake the sprayer.
- Fill the tank up to the required level with water (through tank filter).
- Replace the tank lid, and shake the sprayer.

Measuring out and Mixing Wettable Powders
- Read the label.
- Put on the necessary protective clothing.
- Half fill sprayer tank with water (through tank filter).
- Rotate package two or three times to loosen contents and ensure that the product is free flowing.
- Measure out the required quantity of wettable powder for one tank-full using a measure of known capacity.
- Cream this with a small quantity of water in a small container, and empty this into the sprayer through the tank filter. Wash out the container three times with water, and add the washings to the sprayer tank.
- If the pesticide bag is empty, carefully shake out into the spray tank.
- Replace the tank lid, and shake the sprayer.
- Fill the tank up to the required level with water (through the tank filter).
- Replace the tank lid, and shake the sprayer.

SPRAYING
- Check the wind direction - Start spraying from the downwind side of the field, working upwind with each successive swath as to avoid walking through the sprayed area.
- As far as possible, walk / spray at right angles to the wind direction.
- With the trigger valve closed, operate the pump lever several times to pressurize the sprayer.
- Maintain a constant steady speed of walking and pumping.
- Hold the nozzle a constant distance away from the target.
- Hold the spray lance / nozzle steady relative to the target, do not wave it backwards and forwards.
- Hold / point the nozzle downwind.

Herbicides:
- Hold the nozzle over the ground / weeds, and pointing down.
- The nozzle should held be approximately 50cm above the ground / weeds so as to allow the droplets to spread to the full swath.
Insecticides

- Hold the nozzle pointing upwards or sideways into the crop (use the elbow in the lance or nozzle body).
- (With many crops, the leaves form an ‘umbrella’, and when sprayed from above the pesticide is deposited on the top outer leaves with poor penetration into the crop).
- The nozzle should be held away from the foliage so as to allow distance for the spray cloud to expand.
- If the nozzle is held too close to the foliage, the spray is deposited in a restricted area (causing over-dosing), and the spray cloud cannot form and adequately penetrate the crop (causing under-dosing).

See also:
CropLife International Guidelines for the Safe and Effective Use of Crop Protection Products
http://croplife.org/?s=guidelines
SESSION 15: TRANSPORT AND DISPOSAL OF PESTICIDES
Lesson Plan

<table>
<thead>
<tr>
<th>Materials needed:</th>
</tr>
</thead>
<tbody>
<tr>
<td>☑ Flipchart stands.</td>
</tr>
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</tr>
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<td>☑ Markers (4 colours).</td>
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<td>☑ Notebooks, pens, and file covers for participants who have forgotten to bring them.</td>
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<tr>
<td>☑ Masking tape.</td>
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<table>
<thead>
<tr>
<th>Time needed:</th>
</tr>
</thead>
<tbody>
<tr>
<td>90 minutes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Intended audience:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pesticide Retailers</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Preparation:</th>
</tr>
</thead>
<tbody>
<tr>
<td>☑ Flipchart with the session title “Transport and Disposal of Pesticides”, and the Session Objectives.</td>
</tr>
<tr>
<td>☑ Empty clear water bottle containing a small amount of milk.</td>
</tr>
<tr>
<td>☑ Full bottle of water, and an empty container large enough to hold the milk and water.</td>
</tr>
<tr>
<td>☑ Print off sufficient Attendance Record sheets.</td>
</tr>
<tr>
<td>☑ Print off sufficient Assessment question sheets.</td>
</tr>
<tr>
<td>☑ Print off sufficient Fact Sheets for participants.</td>
</tr>
<tr>
<td>☑ Organise venue and seating arrangements.</td>
</tr>
</tbody>
</table>

Attendance Record

As participants arrive, ask them to enter their name and other information on the Attendance Record. There is also a column on the form to enter their marks from the Assessment Questions at the end of the training session.
### Set up / Introduction

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<th>Time</th>
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</table>
| **Attention:** | Welcome the retailers to the session.  
**Ask:**  
• Who has seen empty pesticide containers lying in fields?  
• Is this the correct way to dispose of containers?  
**Say** that in this session we will look at both safe transport of pesticides and at safe disposal of pesticide containers. |
| **Title:** | Refer to the Title Flipchart and tell participants that this training session will cover *Transport and Disposal of Pesticides.* |
| **Credibility:** | Give an example of dangerous transport of pesticides or dangerous disposal of pesticide containers. |
| **Objectives:** | Refer to the Title Flipchart with the Lesson Objectives.  
By the end of the session, participants will be able to:  
• State clearly the Do and Do Not points to remember when transporting, loading and unloading pesticides.  
• Describe the procedure to follow when Triple Rinsing empty liquid pesticide containers.  
• Explain how to prepare pesticide containers for disposal, and the preferred and alternative methods of disposal. |
| **Benefits:** | Pesticide containers can be easily damaged if not transported correctly, and improper disposal of containers risks the health of people in the community and contaminates the environment. |
| **Direction:** | • The session begins with a work group activity on transport, loading and unloading of pesticides.  
• The Triple Rinsing procedure for empty liquid containers is then demonstrated in a fishbowl, followed by a short interactive discussion on preparation of powder pesticide containers for disposal.  
• A concluding work group activity looks at procedures for the disposal of empty pesticide containers and other pesticide waste. |
Delivery

Explanation, Demonstration, Exercise, and Guidance:

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 30</td>
<td>Work Groups – Transport of Pesticides</td>
</tr>
<tr>
<td>minutes</td>
<td>Divide participants into 4 groups depending on numbers.</td>
</tr>
<tr>
<td></td>
<td>Say we are going to look at safe transport of pesticides.</td>
</tr>
<tr>
<td></td>
<td>Allocate the first three points in the Work Group task to groups 1 and 2,</td>
</tr>
<tr>
<td></td>
<td>and the other three points to groups 3 and 4.</td>
</tr>
<tr>
<td></td>
<td><strong>Work Group Task:</strong></td>
</tr>
<tr>
<td></td>
<td>What are the Do’s and the Do Not’s when transporting pesticides with</td>
</tr>
<tr>
<td></td>
<td>regard to:</td>
</tr>
<tr>
<td></td>
<td>Groups 1 and 2:</td>
</tr>
<tr>
<td></td>
<td>• The type of transport used</td>
</tr>
<tr>
<td></td>
<td>• Passengers</td>
</tr>
<tr>
<td></td>
<td>• Other goods on the vehicle</td>
</tr>
<tr>
<td></td>
<td>Groups 3 and 4:</td>
</tr>
<tr>
<td></td>
<td>• Loading</td>
</tr>
<tr>
<td></td>
<td>• Unloading</td>
</tr>
<tr>
<td></td>
<td>• Emergency equipment</td>
</tr>
<tr>
<td></td>
<td>Allow 20 minutes for the activity.</td>
</tr>
<tr>
<td></td>
<td><strong>Write</strong> Do and Do Not as headings on the flipchart.</td>
</tr>
<tr>
<td></td>
<td>Ask groups 1 and 2 in turn for a Do or Do Not with regard to the type of</td>
</tr>
<tr>
<td></td>
<td>transport used.</td>
</tr>
<tr>
<td></td>
<td><strong>Write</strong> the answers on the flipchart until there are no further</td>
</tr>
<tr>
<td></td>
<td>responses.</td>
</tr>
<tr>
<td></td>
<td><strong>Fill in</strong> any gaps using Transport, and Loading and Unloading of</td>
</tr>
<tr>
<td></td>
<td>Pesticides from the Fact Sheet as a checklist.</td>
</tr>
<tr>
<td></td>
<td><strong>Repeat</strong> for the other two points</td>
</tr>
<tr>
<td></td>
<td><strong>Repeat</strong> for groups 3 and 4 with the last three points.</td>
</tr>
</tbody>
</table>
2. **Fishbowl Demonstration – Cleaning of Liquid Pesticide Containers: Triple Rinsing**

Ask participants to come and stand round the table. **Ensure** that everyone can see.

Show the water bottle with the milk, and say we are in the field spraying a crop that this is an almost empty pesticide container. The milk is the ‘pesticide’.

Pour the milk into the empty container, until only drops come out of the bottle.

Hold up the empty bottle so that participants can see it, and ask if there is any ‘pesticide’ left in the bottle.

Say that there is always a little pesticide left, and all the empty containers seen in the field and elsewhere still contain pesticide, which is a risk to humans and the environment.

**Demonstrate** the **Triple Rinsing** procedure:

- **Fill** the empty ‘pesticide’ container one quarter full of water, **replace** the bottle cap, **shake**, and **empty** the washings into the container.
- **Explain** that we are putting the washings into the spray tank, **NOT** pouring the washings onto the ground, or into a stream or river.
- **Repeat** the rinsing twice more.

Pass the empty bottle around the participants, and ask if there is any pesticide in the bottle now.

Say that the Triple Rinsing technique removes almost all the pesticide from a container. The washings should be poured into the spray tank.

Say that after Triple Rinsing, the container should be destroyed by puncturing and crushing to ensure it cannot be used for another purpose.

Emphasise that empty pesticide containers, even if they have been cleaned, must **never** be used for other purposes.

Ask participant to return to their seats / tables.
<table>
<thead>
<tr>
<th>3.</th>
<th>Interactive Discussion - Cleaning of Powder Pesticide Containers</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 minutes</td>
<td>Say that triple rinsing is for cleaning containers which held liquid pesticide.</td>
</tr>
<tr>
<td></td>
<td><strong>Ask</strong></td>
</tr>
<tr>
<td></td>
<td>• How do we clean a container which held a powder pesticide?</td>
</tr>
<tr>
<td></td>
<td><strong>Take</strong> several responses, using <em>Cleaning of Empty Pesticide Containers, Powder Formulations</em>, from the Fact Sheet as a checklist.</td>
</tr>
<tr>
<td></td>
<td><strong>Say</strong> that after emptying the container, it should be destroyed by puncturing and tearing to ensure it cannot be used for another purpose.</td>
</tr>
<tr>
<td></td>
<td><strong>Emphasise</strong> that precautions should be taken to avoid exposure to the dust left in the container when destroying.</td>
</tr>
<tr>
<td></td>
<td><strong>Emphasise</strong> that empty pesticide containers, even if they have been cleaned, must never be used for other purposes.</td>
</tr>
</tbody>
</table>
### Session 15: Transport and Disposal of Pesticides

<table>
<thead>
<tr>
<th>4. Work Groups – Safe Disposal of Empty Containers</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ask:</strong></td>
</tr>
<tr>
<td>• What materials are liquid pesticide containers made of?</td>
</tr>
<tr>
<td>• What materials are powder pesticide containers made of?</td>
</tr>
</tbody>
</table>

**Write** responses on the flipchart.

**Give** each group one of the following container type groups to discuss.

**Work Group Task:**
What would be the steps to take to safely dispose of your container type, either:
- Metal and plastic containers
- Cardboard and paper containers

Allow 10 minutes for the task.

**Ask** a group to present their results for metal and plastic containers.

**Ask** the second metal and plastic container group for their comments and additions.

**Use** *Disposal of Clean Empty Pesticide Containers* from the Fact Sheet as a checklist.

**Repeat** for cardboard and plastic containers.

**Say** that more detailed information on burning and burying of clean empty containers, and other pesticide waste, is given in the Fact Sheet.

**Emphasise:**
- Many countries have now banned on-farm burning and burying.
- Participants must comply with local regulations on disposal of empty pesticide containers and other pesticide waste, either when they undertake this activity or advise customers.
- The preferred method of disposal is through a licensed contractor or incinerator.
- If burying is permitted in the country, a dedicated disposal pit must be used. Details are in the Fact Sheet.
- If burning is permitted in the country, a proper incinerator must be used, not a bonfire. Details are in the Fact Sheet.
### Finish

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
</table>
| **Summary:** 1 minute | **Include** as major messages:  
  - *Do and Do Not* points when transporting pesticides  
  - The Triple Rinsing procedure for cleaning empty liquid pesticide containers  
  - Following local regulations for safe disposal of empty pesticide containers and other pesticide waste |
| **Questions:** 1 minute | **Ask** if everyone understands or if there are any additional questions. Answer these provided they are relevant.  
**Ask** if the session objectives were met |
| **Evaluation:** 12 minutes | **Hand out** the Assessment Sheet and ask participants to complete two of the questions.  
**Collect** the Assessment Sheet for later marking and entering the marks on the Attendance Record. |
| **Next step:** 1 minute | **Say** that in this session we learned about transporting pesticides, and disposal of empty containers. Participants should advise their customers on these aspects as part of their customer service.  
**Hand out** the Fact Sheet to participants. |
Container management

FOLLOW THESE RECOMMENDATIONS TO ENSURE THE PROPER DISPOSAL OF EMPTY PESTICIDE CONTAINERS

- Treated seed and seed treatment containers
  - Non-rinsable
  - Incineration

- Plastic containers
  - Rinsable
  - Recyclable

- Foil/flexible packaging
  - Non-rinsable
  - Incineration

- Metal containers
  - Rinsable
  - Recyclable

All empty triple rinsed containers, as well as non-rinsable containers, should be returned to an authorized collection point where they will be disposed of in an environmentally sound manner.

Containers SHOULD NEVER be re-used or disposed of through indiscriminate dumping, open air incineration of any kind or incineration in unauthorized facilities.

www.croplife.org

Helping Farmers Grow
Answer TWO (2) only of the following questions.

You may write your answers on this question sheet or tell your trainer the answers. All questions are the same value (5 marks).

**Question 1:** Give two Do and two Do Not points when transporting pesticides.

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**Question 2:** Describe the Triple Rinse procedure for cleaning empty liquid pesticide containers.

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**Question 3:** What is the preferred method of disposal of empty pesticide containers?

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**Question 4:** Describe how metal and plastic containers should be prepared for disposal.

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FACT SHEET

TRANSPORT, AND LOADING AND UNLOADING OF PESTICIDES

Do
• A pick-up or truck is the preferred vehicle type.
• Transport pesticides only in intact, undamaged containers with readable labels.
• Check the containers for leaks or loose bungs.
• Wear protective clothing when loading and unloading - strong gloves, boots, and overalls.
• Carry a list / manifest of the pesticides on the vehicle.
• Carry a fire extinguisher, a shovel, spill clean-up equipment, soap and water.
• Have emergency telephone numbers – the pesticide manufacturer / distributor / local agent, local hospital and doctor, police.
• Load the containers carefully.
• Tie the containers down, and cover from sun and rain.
• Unload carefully. If drums are heavy, roll them down planks to the ground.

Do Not
• Have nails in the load bed which can puncture containers.
• Throw or slide the pesticide containers onto the load bed when loading.
• Throw, slide, or drop the pesticide containers when unloading.
• Carry pesticides in the driver’s cab or passenger compartment.
• Carry pesticides with children or animals.
• Carry pesticides with foodstuffs, clothing, animal feed, etc.
• Carry pesticides inside buses, taxis, etc.

CLEANING OF EMPTY PESTICIDE CONTAINERS

Liquid Formulations - Triple Rinsing

Empty liquid pesticide containers should be Triple Rinsed before disposal to remove pesticide residues.
• Drain the container into the spray tank until the flow has slowed to a drip.
• Fill the container a quarter full with water.
• Replace the container cap and shake well.
• Empty the container into the spray tank until the flow has slowed to a drip.
• Repeat the rinsing procedure two more times.
• Puncture the container so that it cannot be re-used and dispose it safely

Powder Formulations

Empty powder pesticide containers should be carefully shaken into the spray tank until no more powder comes out, and then safely burnt.
DISPOSAL OF CLEAN EMPTY PESTICIDE CONTAINERS

Liquid pesticide containers usually are made from metal and plastic, while powder pesticide containers usually are made from cardboard and paper. These require different steps in disposal.

Many countries are now banning on-farm burying or burning of used pesticide containers. Any local legal regulations for the disposal of empty containers must be followed, and on-farm disposal used only if permitted in the country.

The preferred method of disposal of empty pesticide containers and other pesticide waste is through a licenced contractor or incinerator.

Metal and Plastic Containers.

• Prepare the container for disposal by triple rinsing and then destroying through puncturing and crushing so that it cannot be used for other purposes.
• NEVER use empty pesticide containers for another purpose.
• Keep in a large, closed container, and locked in the pesticide store until time for disposal.
• If these exist in the country, dispose through licenced hazardous waste disposal contractors, licenced landfill sites, or licenced incinerators for containers that can be burnt.
• If permitted in the country, burn plastic containers in an incinerator and bury the ashes, or bury the containers in a special disposal pit.

Cardboard and Paper Containers

• Prepare the container for disposal by destroying through puncturing or tearing so that it cannot be used for other purposes.
• NEVER use empty pesticide containers for another purpose.
• Keep in a large, closed container, and locked in the pesticide store until time for disposal.
• If these exist in the country, dispose through licenced hazardous waste disposal contractors, licenced landfill sites, or licenced incinerators for containers that can be burnt.
• If permitted in the country, burn the containers in an incinerator and bury the ashes, or bury the containers in a special disposal pit.

Burning

Only burn empty pesticide containers if permitted in the country.

Destruction of the pesticide remaining in a container requires a hot fire. A normal bonfire is not sufficient, as the temperature is only 300-500oC. A proper incinerator should be used, which provides a temperature of 800-950oC.

An incinerator can be made from a 210 litre oil drum, with the top removed, a removable grid placed about 20cm above the base of the drum to allow ash to fall through, a row of equally spaced 5cm holes around the drum at the same height as the grid, and a second row of holes about 45cm above the base.

• The incinerator should be on a level, hard standing (preferably concrete), away from water sources, domestic houses, and animals.
• Use the incinerator only in calm wind conditions, not in windy weather.
• Start a fire on the grid, and when burning well, add the pesticide containers.
• When working properly, the incinerator should produce light coloured smoke
• Avoid over-filling the incinerator
• Avoid poking the fire.
• When burning properly, the incinerator will be very hot. Care must be taken when placing containers in the incinerator.
• Avoid the smoke, approach the incinerator from upwind.
• Do not leave the incinerator burning unattended.
• When the fire has cooled, empty the ashes and bury.

**Burying**

Only bury empty pesticide containers and other pesticide waste if permitted in the country.

A disposal pit should be specially constructed for the purpose. Several farmers can cooperate in building and using the pit, but each placement of empty containers in the pit should be a group activity with all farmers bringing their empty containers for burial.

• The site should have room for several disposal pits, so that a new one can be dug at the site when an old one is full.
• The pit should be sited at least 250m away from water sources used for drinking (such as a well), and not in an area liable to flooding.
• Areas to be avoided are those with sandy soils, and / or a high water table, as residues are easily leached into ground water.
• The pit should be 2-3m wide and at least 1.5m deep. The soil dug out should be used to make a bund around the pit so as to prevent flooding and washing pesticide waste out of the pit.
• The pit should be lined with clay to reduce seepage into the surrounding soil. A layer of lime can also be added to assist in de-activation of the pesticide residues.
• A strong fence must be erected around the pit to prevent unauthorised entry of humans and animals.
• Signs should be erected ‘Danger. Toxic Waste. No Unauthorised Entry’.
• Clean, punctured and crushed empty containers, and other pesticide waste, should be added in layers not more than 15cm deep. Lime can also be added to assist in de-activation of the pesticide residues. The pesticide waste should then be covered with a layer of soil about 15cm deep.
• When within 50cm of ground level, the pit should be filled in with soil, and bushes which are not grazed by animals planted on top.
• Records should be kept of the date and the pesticide name and container size.

**See also:**
CropLife International Guidelines for the Safe Transport of Crop Protection Products
CropLife International Guidelines for the Safe and Effective Use of Crop Protection Products
http://croplife.org/?s=guidelines
SESSION 16: SPILL CLEAN-UP
Lesson Plan

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<tr>
<td>✓ Glue stick or blue tack.</td>
</tr>
<tr>
<td>✓ Masking tape.</td>
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<tr>
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</table>

<table>
<thead>
<tr>
<th>Preparation:</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓ Flipchart with the session title “Spill Clean-Up”, and the Session Objectives.</td>
</tr>
<tr>
<td>✓ Full set of spill clean-up equipment, refer to Fact Sheet for details.</td>
</tr>
<tr>
<td>✓ Cards with the names of the spill clean-up equipment.</td>
</tr>
<tr>
<td>✓ Full set of PPE from which items can be selected.</td>
</tr>
<tr>
<td>✓ Empty clean 5 litre pesticide container with a small hole in the bottom, just large enough for water to slowly leak out.</td>
</tr>
<tr>
<td>✓ Small paper bag of flour.</td>
</tr>
<tr>
<td>✓ Print off sufficient Attendance Record sheets.</td>
</tr>
<tr>
<td>✓ Print off sufficient Assessment question sheets.</td>
</tr>
<tr>
<td>✓ Print off sufficient Fact Sheets for participants.</td>
</tr>
<tr>
<td>✓ Organise venue and seating arrangements.</td>
</tr>
</tbody>
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Attendance Record

As participants arrive, ask them to enter their name and other information on the Attendance Record. There is also a column on the form to enter their marks from the Assessment Questions at the end of the training session.
**Set up / Introduction**

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<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Trainer Note:</strong></td>
<td>The hole in the bottom of the empty clean container should be just large enough for water to slowly leak out. Fill the empty 5 litre pesticide container with water just before the start of the lesson. Place the container on the floor to one side of the training room, so that it forms a puddle of leaked ‘pesticide’ on the floor. Place the PPE on a table, and the spill clean-up equipment on the opposite side of the room to the leaking pesticide container. The training room should have a hard floor that can be cleaned, not carpet or other material, as water and flour will be spilt onto the floor to represent pesticide spills.</td>
</tr>
</tbody>
</table>

**Attention:** Welcome the retailers to the session. **Point out** the leaking pesticide container with a puddle of ‘pesticide’. **Say** we have a leaking pesticide container in our shop or store. **Ask:** • Who knows how to safely clean up this leaking pesticide container and the pesticide spill? **Take** several responses – do not allow participants to go into detail at this stage. **Say** that in this session we will learn how to safely deal with leaking containers and pesticide spills.

**Title:** Refer to the Title Flipchart and tell participants that this training session will cover Spill Clean-Up.

**Credibility:** **Give** an example of a pesticide spill and the consequences.

**Objectives:** Refer to the Title Flipchart with the Lesson Objectives. By the end of the session, participants will be able to: • State the appropriate PPE to wear when cleaning up a pesticide spill. • Describe the equipment and how it is used to clean up a pesticide spill. • Safely clean up a pesticide spill • Explain the precautions to take in different situations to avoid pesticide spills.

**Benefits:** **Say** that despite all our precautions, accidental pesticide spills will still occur. These pose a risk to humans and the environment, and as sellers of pesticides participants need to know how to deal with a spill, and be able to advise their customers on the procedures to clean-up a spill.

**Direction:** • The session begins with an interactive discussion of the appropriate PPE to wear when cleaning up a pesticide spill. • Participant pairs then explain the functions of different items of spill clean-up equipment, with the trainer adding as necessary. • Following a short presentation of the steps to follow in spill clean-up, the participants then demonstrate to themselves how to clean up a liquid and a dry spill. • The session concludes with a work group activity on avoiding spills.
Delivery

Explanation, Demonstration, Exercise, and Guidance:

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 5 minutes</td>
<td>Interactive Discussion – Appropriate PPE for a Pesticide Clean-Up</td>
</tr>
<tr>
<td></td>
<td><strong>Point out</strong> the PPE on the table.</td>
</tr>
<tr>
<td></td>
<td><strong>Ask:</strong></td>
</tr>
<tr>
<td></td>
<td>• What PPE should be worn when cleaning-up this pesticide spill in our</td>
</tr>
<tr>
<td></td>
<td>shop or store?</td>
</tr>
<tr>
<td></td>
<td><strong>Take</strong> responses from participants.</td>
</tr>
<tr>
<td></td>
<td><strong>Say</strong> that the product should always be treated as hazardous. The</td>
</tr>
<tr>
<td></td>
<td>appropriate PPE is the same as for when mixing that product, as the</td>
</tr>
<tr>
<td></td>
<td>pesticide is in a concentrated form.</td>
</tr>
<tr>
<td></td>
<td>If it is possible, <strong>Read The Label</strong>. Otherwise as minimum wear</td>
</tr>
<tr>
<td></td>
<td>overalls, gloves, boots, and a face shield for liquids or dust mask for</td>
</tr>
<tr>
<td></td>
<td>powders.</td>
</tr>
<tr>
<td></td>
<td>The same principles apply for cleaning up a dilute pesticide spill - the</td>
</tr>
<tr>
<td></td>
<td>same PPE should be worn as for application.</td>
</tr>
<tr>
<td>2. 15 minutes</td>
<td>Participant Pairs – Spill Clean-Up Equipment</td>
</tr>
<tr>
<td></td>
<td><strong>Divide</strong> participants into pairs.</td>
</tr>
<tr>
<td></td>
<td><strong>Give</strong> each pair one of the cards with the name of an item of spill</td>
</tr>
<tr>
<td></td>
<td>clean-up equipment.</td>
</tr>
<tr>
<td></td>
<td><strong>Ask</strong> each pair in turn to go to the spill-clean up equipment, identify</td>
</tr>
<tr>
<td></td>
<td>the item on their card, and explain what the item is used for.</td>
</tr>
<tr>
<td></td>
<td><strong>Add</strong> to each explanation as necessary, using Spill Clean-Up Equipment</td>
</tr>
<tr>
<td></td>
<td>from the Fact Sheet as a checklist.</td>
</tr>
<tr>
<td></td>
<td><strong>Say</strong> that this equipment must be kept in the shop or store in case of</td>
</tr>
<tr>
<td></td>
<td>a spill. Obtaining the equipment after a spill has occurred is too late.</td>
</tr>
<tr>
<td>3. 5 minutes</td>
<td>Presentation – The Steps to Take When Dealing With a Spill</td>
</tr>
<tr>
<td></td>
<td><strong>Say</strong> that to clean up a spill, steps need to be taken in the correct</td>
</tr>
<tr>
<td></td>
<td>order.</td>
</tr>
<tr>
<td></td>
<td><strong>Present</strong> the contents of The Steps to Take When Dealing With a Spill</td>
</tr>
<tr>
<td></td>
<td>from the Fact Sheet.</td>
</tr>
</tbody>
</table>
4. **Demonstration – Clean-Up of a Liquid Spill**

10 minutes

**Say** that with the information from the last three activities, we are now ready to practice cleaning up a pesticide spill.

**Ask** for a volunteer to clear up the liquid pesticide spill from the leaking container.

Ask the other participants to give the volunteer instructions on the steps and actions to take to clean up the spill.

**Half way** through the procedure, ask another volunteer to take over and continue.

**Ensure** that the correct steps are taken in the correct order.

5. **Demonstration – Clean-Up of a Dry Spill**

10 minutes

**Tear** a hole in the paper bag containing flour, and drop the bag on the floor so that flour comes out.

**Say** that we now have a spill of a dry pesticide formulation.

**Ask** for a volunteer to clear up the dry pesticide spill from the leaking container.

Ask the other participants to give the volunteer instructions on the steps and actions to take to clean up the spill.

**Half way** through the procedure, **ask** another volunteer to take over and continue.

**Ensure** that the correct steps are taken in the correct order.

6. **Work Groups – Avoiding Spills**

25 minutes

**Say** that although we now know how to clean up a spill, we should avoid spills in the first place.

**Divide** participants into three groups. **Give** each group one of the following tasks.

**Work Group Task:**
How can we avoid pesticide spills:
- When transporting pesticides
- In pesticide shops and stores
- In the field

Allow 10 minutes for the activity.

**Ask** each group to present their results in turn.

**Allow** the other groups to comment or add.

**Use** Avoiding Spills in the Fact Sheet as a checklist.
## Finish

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
</table>
| **Summary:** 1 minute | **Include** as major messages:  
* Appropriate PPE  
* Spill clean-up equipment  
* The steps in spill clean-up  
* Avoiding spills  

**Ask** if everyone understands or if there are any additional questions. Answer these provided they are relevant.  
**Ask** if the session objectives were met  

**Hand out** the Assessment Sheet and ask participants to complete two of the questions.  
**Collect** the Assessment Sheet for later marking and entering the marks on the Attendance Record. |
| **Next step:** 1 minute | **Say** that in this session we learned about spill clean-up. Participants should go back to their shops and ensure that suitable equipment is available in case of a spill.  
**Hand out** the Fact Sheet to participants. |
Assessment Questions

Name: ........................................... Date: ............... Mark: 

Answer TWO (2) only of the following questions. 
You may write your answers on this question sheet or tell your trainer the answers. 
All questions are the same value (5 marks).

**Question 1:** What is the appropriate PPE to wear when cleaning up a pesticide spill?
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**Question 2:** Give six items of spill clean-up equipment which should be in the shop or store.
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**Question 3:** Describe all the steps to take when cleaning up a liquid spill.
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**Question 4:** Give three ways of avoiding spills in pesticide shops and stores.
...........................................................................................................................................................................................
...........................................................................................................................................................................................
...........................................................................................................................................................................................
FACT SHEET

PERSONAL PROTECTIVE EQUIPMENT

- Treat all spills as hazardous. PPE must be worn during clean-up operations.
- If possible, read the label to identify the PPE to wear. If spills are not specifically given on the label, use the same PPE as for mixing.
- In the absence of label information, as a minimum wear overalls, gloves, boots, and face shield for liquids or dust mask for powders.

SPILL CLEAN-UP EQUIPMENT

- Bucket of absorbent material, such as clay, sand, or sawdust.
  - To surround, brush over, and absorb the pesticide spill.
- Additional bucket of sand, or sand bags, to make a dam.
  - To make a dam around the spill and contain it so it does not spread further
- Stiff broom
  - To mix the absorbent material into the spill, and brush it up.
- Flat shovel.
  - To pick up the mixture of absorbent material and pesticide.
- Bucket
  - To hold water for washing the contaminated area
- Soap
  - To clean the contaminated area
- Cloth
  - To wash and wipe the contaminated area.
- Empty containers, or strong plastic bags
  - To hold the sweepings.
- Large, empty, open topped drum(s).
  - To hold leaking pesticide containers.
- Empty clean pesticide containers.
  - Into which to decant a leaking container. The new container must be labelled afterwards with the contents.

THE STEPS TO TAKE WHEN DEALING WITH A SPILL

- Put on appropriate protective clothing.
  - Keep others away from the spill area.
- Stop the source of the spill.
  - Turn the container so that the point of leak is above the content level.
  - Replace / tighten the cap if the leak is from that source.
  - Place the ruptured or damaged container in a larger, open top container, or strong plastic bag.
- Confine a large liquid spill with a dam of sand or other absorbent material
- Stop a dry pesticide from blowing away by covering with damp sand.
- Liquid spills:
  - Cover the spill with absorbent material, sweep up the absorbent material, and place in a drum or strong plastic bag.
- Dry spills:
  - If it is windy, stop a dry spill from blowing away by covering with damp sand.
  - Sweep up the spill, place in a drum or strong plastic bag.
- Wash down the affected area with soap and water.
  - Do not use too much water, or spread the contamination over a larger area.
- Soak up water with absorbent material, and place in drum or bag.
- Wash all equipment and yourself.
- Dispose of the drum or plastic bag according to local hazardous waste regulations.
AVOIDING SPILLS

In Transport
• Ensure there are no exposed nails or other sharp objects in the load bed or pallets.
• Do not load leaking or damaged containers.
• Do not throw, slide, or drop containers when loading and unloading.
• Do not place heavy drums on top of cardboard containers.
• Containers of liquids should be stowed with the opening uppermost.
• Secure containers so they do not move about during transit.
• Protect containers from sunlight and rain.
• Drive carefully.

In Shops and Stores
• Do not accept delivery of damaged or leaking containers.
• Ensure shelves and other storage areas do not have exposed nails or other sharp objects.
• Ensure shelves are sufficiently strong to hold containers.
• Use a First In – First Out system of stock control.
• Check containers regularly for damage or leaks.
• Handle all containers carefully, do not drop.
• Ensure that only shop staff have access to the pesticide area – customers may drop or knock containers off shelves.

In the Field
• Keep pesticide containers in a box to protect them from being knocked over.
• Keep bystanders and animals away from the mixing area – they may knock containers over.
• Pour liquids and dusts carefully during mixing.
• Replace caps and close containers after pouring.
• Place containers on a flat surface when not in the box.

See also:
CropLife International Guidelines for the Safe and Effective Use of Crop Protection Products.
CropLife International Guidelines for the Safe Transport of Crop Protection Products.
CropLife International Guidelines for the Safe Warehousing of Crop Protection Products
http://croplife.org/?s=guidelines
SESSION 17: LAWS AND REGULATIONS
Lesson Plan

| Materials needed:                                      | ☑ Flipchart stands.       |
|                                                      | ☑ Flipchart paper.         |
|                                                      | ☑ Markers (4 colours).     |
|                                                      | ☑ Notebooks, pens, and file covers for participants who have forgotten to bring them. |
|                                                      | ☑ Coloured cards.          |
|                                                      | ☑ Glue stick or blue tack. |
|                                                      | ☑ Masking tape.            |

| Time needed:                                         | 90 minutes                |
| Intended audience:                                   | Pesticide Retailers       |

| Preparation:                                        | ☑ Flipchart with the session title “Laws and Regulations”, and the Session Objectives. |
|                                                    | ☑ Flipchart with contents of ‘Private’ Rules and Regulations from the Fact Sheet.   |
|                                                    | ☑ Print off sufficient Attendance Record sheets.                                 |
|                                                    | ☑ Print off sufficient Assessment question sheets.                             |
|                                                    | ☑ Print off sufficient Fact Sheets for participants.                           |
|                                                    | ☑ Organise venue and seating arrangements.                                    |

Attendance Record

As participants arrive, ask them to enter their name and other information on the Attendance Record. There is also a column on the form to enter their marks from the Assessment Questions at the end of the training session.
## Session 17: Laws and Regulations

### Set up / Introduction  

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Attention:</strong></td>
<td><strong>Welcome the retailers to the session.</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Say</strong> that in this country we drive on the left / right, and there is a government Law to enforce this.</td>
</tr>
<tr>
<td></td>
<td><strong>Ask:</strong> • What would happen if there was no law, and everyone drove on which side they liked?</td>
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<tr>
<td></td>
<td><strong>Take</strong> several responses.</td>
</tr>
<tr>
<td><strong>Title:</strong></td>
<td><strong>Refer</strong> to the Title Flipchart and tell participants that this training session will cover <em>Laws and Regulations</em>.</td>
</tr>
<tr>
<td><strong>Credibility:</strong></td>
<td><strong>Give</strong> a local example of breaking the law with detrimental results to a person or society as a whole – for example mixing maize flour with wheat to make cheap, poor quality bread, but sold at the full price.</td>
</tr>
<tr>
<td><strong>Objectives:</strong></td>
<td><strong>Refer</strong> to the Title Flipchart with the Lesson Objectives.</td>
</tr>
<tr>
<td></td>
<td>By the end of the session, participants will be able to:</td>
</tr>
<tr>
<td></td>
<td>• Explain clearly why pesticide laws and regulations are needed.</td>
</tr>
<tr>
<td></td>
<td>• Describe the aspects which pesticide laws and regulations include.</td>
</tr>
<tr>
<td></td>
<td>• Explain why retailers should follow the laws and regulations.</td>
</tr>
<tr>
<td></td>
<td>• Explain to farmers the importance of complying with the laws and regulations, both in regard to safety and in regard to meeting market requirements for produce.</td>
</tr>
<tr>
<td><strong>Benefits:</strong></td>
<td><strong>When all persons involved with pesticides know, understand, and follow the laws and regulations, then pesticides are manufactured, transported, stored, sold, used, and disposed safely and effectively. Persons involved with pesticides are also protected from dishonest people.</strong></td>
</tr>
<tr>
<td><strong>Direction:</strong></td>
<td>• An interactive discussion on the need for laws and regulations in society begins the session.</td>
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<tr>
<td></td>
<td>• Work groups then investigate why pesticide laws and regulations are needed, and what aspects are included in the laws and regulations.</td>
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<td></td>
<td>• The final session activity starts with a presentation on ‘private’ laws and regulations, which is followed by an interactive discussion on the role of retailers and how retailers can help farmers meet the rules and regulations.</td>
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</tbody>
</table>
# Delivery

## Explanation, Demonstration, Exercise, and Guidance:

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 10 minutes</td>
<td><strong>Interactive Discussion – Why Do We Need Laws and Regulations?</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Trainer Note:</strong></td>
</tr>
<tr>
<td></td>
<td>During this and the following procedures, try to get the participants to</td>
</tr>
<tr>
<td></td>
<td>think about Laws and Regulations as mechanisms that are intended to</td>
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<tr>
<td></td>
<td>benefit society, rather than as restrictions on their activities.</td>
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<td></td>
<td><strong>Remind</strong> participants of introduction and the example of driving on the</td>
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<tr>
<td></td>
<td>left / right of the road which is enforced by government regulation.</td>
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<tr>
<td></td>
<td><strong>Ask:</strong></td>
</tr>
<tr>
<td></td>
<td>• Why do we need such laws and regulations that tell us what to do?</td>
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<tr>
<td></td>
<td><strong>Write</strong> responses on the flipchart</td>
</tr>
<tr>
<td></td>
<td><strong>Add</strong> as necessary from <em>Why Laws and Regulations are Needed</em> from the</td>
</tr>
<tr>
<td></td>
<td>Fact Sheet.</td>
</tr>
<tr>
<td>2. 45 minutes</td>
<td><strong>Work Groups – Why Pesticide Laws and Regulations are Needed</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Explain</strong> that now we have a general background on why laws and</td>
</tr>
<tr>
<td></td>
<td>regulations are needed, we will discuss the legal and regulatory</td>
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<tr>
<td></td>
<td>frameworks of pesticides.</td>
</tr>
<tr>
<td></td>
<td><strong>Work Group Task:</strong></td>
</tr>
<tr>
<td></td>
<td>On separate flipcharts, record the group responses to the following</td>
</tr>
<tr>
<td></td>
<td>questions:</td>
</tr>
<tr>
<td></td>
<td><strong>Question 1</strong></td>
</tr>
<tr>
<td></td>
<td>• What do you consider would be the most important reasons for having</td>
</tr>
<tr>
<td></td>
<td>pesticide laws and regulations?</td>
</tr>
<tr>
<td></td>
<td><strong>Question 2</strong></td>
</tr>
<tr>
<td></td>
<td>• Indicate some specific aspects that you think should be included in</td>
</tr>
<tr>
<td></td>
<td>pesticide laws and regulations.</td>
</tr>
<tr>
<td></td>
<td>Allow 20 minutes for the activity.</td>
</tr>
</tbody>
</table>
Responses to Question 1:

Ask each table group in turn to provide their answers to Question 1.

After each additional group presents their response, Ask what did this group add that was different?

After all groups have presented their answers to Question 1,

Emphasize:
- Pesticides are hazardous products, which need to be regulated to ensure safe manufacture, transport, storage and use, and to minimise risks to handlers, users, bystanders, consumers of agricultural products, and the environment.
- Laws and regulations also ensure the quality of pesticides.
- Laws and regulations provide the framework for these activities.

Responses to Question 2:

Ask table groups in turn for one aspect that they think should be included in pesticide laws and regulations.

Repeat again for all groups until there are no more responses.

Complete any missing aspects using Why Pesticide Laws and Regulations are Needed from the Fact Sheet as a checklist.

Ask:
- On the basis of what we have discussed, do fair and effective pesticide laws and regulations benefit or obstruct a pesticide retailer?

Take several responses.

Emphasise that fair and effective pesticide laws and regulations:
- Ensure equal opportunities for all retailers.
- Protect retailers from dishonest pesticide manufacturers, importers, and wholesalers.
- Protect sincere retailers from dishonest retailers.
- Ensure products are correctly labelled, with all the necessary information on the label.
- Can provide training and learning opportunities for retailers.
<table>
<thead>
<tr>
<th>3.</th>
<th><strong>Presentation / Interactive Discussion - ‘Private’ Rules and Regulations</strong></th>
</tr>
</thead>
</table>
| 15 minutes | **Put up** and **present** the contents of the ‘Private’ Rules and Regulations flipchart. **Ask:**  
• How can pesticide retailers help farmers meet these rules and regulations?  
**Write** responses on the flipchart, using *The Role of Pesticide Retailers in Helping Farmers Meet Local and Export Requirements* from the Fact Sheet as a checklist.  
**Emphasise** again:  
• Farmers will need to meet these requirements, and possibly be GlobalGAP certified, if they wish to supply these supermarket chains.  
• Pesticide retailers can help the farmers by supplying only appropriate high quality pesticides and providing suitable advice on their use.
## Finish

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
</table>
| **Summary:** 1 minute | **Include** as major messages:  
• Why laws and regulations are needed  
• The benefits of laws and regulations for retailers  
• How retailers can help farmers comply with the laws and regulations |
| **Questions:** 1 minute | **Ask** if everyone understands or if there are any additional questions. Answer these provided they are relevant.  
**Ask** if the session objectives were met |
| **Evaluation:** 12 minutes | **Hand out** the Assessment Sheet and ask participants to complete two of the questions.  
**Collect** the Assessment Sheet for later marking and entering the marks on the Attendance Record. |
| **Next step:** 1 minute | **Say** that in this session we learned about laws and regulations, and why we need laws and regulations for the benefit and safety of society. Retailers have an important role to play in stocking and selling only registered products, and advising farmers on the correct use of these products.  
**Hand out** the Fact Sheet to participants. |
Assessment Questions

Answer TWO (2) only of the following questions.
You may write your answers on this question sheet or tell your trainer the answers.
All questions are the same value (5 marks).

**Question 1:** Give three reasons why laws and regulations are needed.

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**Question 2:** Give four aspects which might be included in pesticide laws and regulations.

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**Question 3:** Give three benefits to retailers of the laws and regulations.

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**Question 4:** Give three ways in which retailers can help farmers in respect of the laws and regulations.

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FACT SHEET

WHY LAWS AND REGULATIONS ARE NEEDED

• Laws are the framework for all people living in a community.
• Laws set the rules and boundaries for the community, what is and what is not allowed or tolerated in the community.
• Without laws and regulations, we could simply do as we please, with little regard for others.
• Laws protect every person’s freedom and rights under the law.
• Laws help provide for our general safety.
• Laws protect property.
• Laws ensure our rights as citizens against abuses by other people, by organizations, and by the government itself.
• Laws provide a remedy when someone takes unfair advantage of another person.
• Laws can be a deterrent for those who would violate the rights of others.
• Laws allow a person to know the consequences of their behavior before they act.
• Laws enable people to be punished when they commit certain acts.
• Laws can exist at local, state/province, national, and international levels.

We do not always like these laws and regulations, since they often mean that someone is telling us what to do, or keeping us from doing what we want to do. However, to ensure that we live in a safe and peaceful society, we must have rules to follow.

WHY PESTICIDE LAWS AND REGULATIONS ARE NEEDED

• Pesticides are dangerous chemicals. Laws and regulations are needed to ensure safe manufacture, packaging, transport, storage, sales, and use, and to protect handlers, users, consumers, water sources, domestic animals, wildlife, and the environment.
• The quality of pesticides available on the market must be ensured.
• Laws and regulations provide the frameworks for these aspects.

Pesticide Laws and Regulations include, among other aspects:
• International trade in pesticides
• Roles and responsibilities of national regulating authorities
• Requirements for manufacturing and storage facilities, and licensing procedures for such premises
• Requirements for the registration of a pesticide
• Requirements for container labelling and materials
• Control of pesticides imported and sold based on the above criteria
• Transport of pesticides
• Disposal of pesticides
• Use recommendations for crops and pests for each pesticide
• Training, certification and licensing of pesticide retailers
• Requirements for pesticide retail premises and licensing procedures
• Training, certification and/ licensing of handlers, applicators, and users
• Establishment of pesticide Maximum Residue Levels (MRLs) on produce
• Record keeping for manufacture, transport, sale, use, and disposal
• Control of pesticide advertising and effectiveness claims
• Offences and penalties for breaking the laws and regulations
International Laws and Agreements may be legally binding on signatory countries. Examples are:

- General Agreement on Tariffs and Trade (GATT) – Legally binding.
- International Code of Conduct on the Distribution and Use of Pesticides (FAO) – Not legally binding, but supported by all FAO member country governments, the pesticide industry, and consumer organisations.

‘PRIVATE’ RULES AND REGULATIONS

- All the major supermarket chains in Europe, the Americas, the Arabian Gulf, and Asia, have their own requirements for produce quality.
- These are even stricter than national regulations with regard to pesticide residues.
- This is because of consumer concerns in those countries about pesticide residues on food.
- They also usually require producers to be certified under such programmes as GlobalGAP.
- GlobalGAP is a pre-farmgate standard, covering all aspects of production, from inputs such as seed or animal feed, together with all the production activities until the produce leaves the farm.
- GlobalGAP requires extensive documentation to be completed during the production process.
- Local producers will need to meet these requirements if they wish to export and supply these overseas markets and supermarket chains.
- Use of pesticides which are not acceptable in the importing country, or if MRLs are exceeded, will result in the consignment being rejected at the cost of the supplier.
- Rejection of a consignment adversely affects the image of the exporting country, the exporters, and the farmers.

BENEFITS TO RETAILERS OF LAWS AND REGULATIONS

- They ensure equal opportunities for all retailers.
- They protect retailers from dishonest manufacturers, importers, and wholesalers.
- They protect sincere retailers from dishonest retailers.
- They ensure products are correctly labelled, with all the necessary information on the label.
- They can include opportunities for training and learning.

THE ROLE OF PESTICIDE RETAILERS IN HELPING FARMERS MEET LOCAL AND EXPORT REQUIREMENTS

Together with suppliers of seeds and fertilisers, farmers, buyers of the produce, processors, distributors, and exporters, pesticide retailers are part of the chain from seed to local consumption or export of agricultural produce. Like all of the other stakeholders, pesticide retailers can make or break this chain.
PESTICIDE RETAILERS CAN FULFIL THEIR PART OF THE CHAIN, AND HELP FARMERS MEET LOCAL AND EXPORT REQUIREMENTS FOR PESTICIDE RESIDUES AND MRLS BY:

- Knowing and understanding the laws, regulations and agreements concerning pesticides that apply in the country.
- Supplying only appropriate, high quality, registered pesticides.
- Providing suitable advice on the use of these pesticides, including:
  - The crop-pest combinations for which a pesticide is registered.
  - The dosage and application rates and methods for these crops and pests.
  - The correct post-harvest interval for the crop and pesticide.
- Not selling counterfeit or other sub-standard products.
- This will ensure that the farmers' produce meets the required market standards, and can be sold, and possibly exported at a higher price.
SESSION 18:
PESTICIDE SHOP / WAREHOUSE
LOCATION AND CONSTRUCTION
Lesson Plan

Materials needed:
- ☑ Flipchart stands.
- ☑ Flipchart paper.
- ☑ Markers (4 colours).
- ☑ Notebooks, pens, and file covers for participants who have forgotten to bring them.
- ☑ Coloured cards.
- ☑ Glue stick or blue tack.
- ☑ Masking tape.

Time needed: 95 minutes

Intended audience: Pesticide Retailers

Preparation:
- ☑ Flipchart with the session title “Pesticide Shop / Warehouse Location and Construction”, and the Session Objectives.
- ☑ Flipchart with diagram of a town with river, lake, houses, etc (see diagram at end of Lesson Plan).
- ☑ 2 Cards labelled ‘Pesticide Shop’.
- ☑ 2 Cards labelled ‘Pesticide Warehouse’.
- ☑ Print off sufficient copies of the example shop and warehouse layouts from the Fact Sheet. Not the ventilation example.
- ☑ Print off sufficient Attendance Record sheets.
- ☑ Print off sufficient Assessment question sheets.
- ☑ Print off sufficient Fact Sheets for participants.
- ☑ Organise venue and seating arrangements.

Attendance Record

As participants arrive, ask them to enter their name and other information on the Attendance Record. There is also a column on the form to enter their marks from the Assessment Questions at the end of the training session.
### Set up / Introduction

#### Time Activity

**Attention:** Welcome the retailers to the session.

Remind participants of the session on The Environment and the Sensitive Areas activity of that session.

**Ask:**
- What were the areas identified during the session that were particularly sensitive to contamination by pesticides?

**Take** several responses.

**Say** that during that session we were largely considering contamination from pesticide application to crops. However, pesticide shops and warehouses are also potential sources of contamination, so we need to consider how to avoid contamination from these sources.

As sellers of pesticides, participants bring pesticides into the community, and so have a responsibility with their shop (and warehouse if they have one) to avoid potential adverse effects from this activity as a result of location or construction of the shop.

**Title:** Refer to the Title Flipchart and tell participants that this training session will cover Pesticide Shop and Warehouse Location and Construction.

**Credibility:** Say that in many countries the location and construction of pesticide shops and warehouses is strictly regulated.

**Objectives:** Refer to the Title Flipchart with the Lesson Objectives.

By the end of the session, participants will be able to:
- State clearly where pesticide shops and warehouses should and should not be located.
- Describe the basic principles of pesticide shop and warehouse construction and layout.

**Benefits:** Correct location and construction of pesticide shops and warehouses minimises the possible adverse effects to the community of a pesticide spill, fire, or other accident.

**Direction:**
- A work group activity begins the session with participants deciding on the location of a new pesticide shop and a new pesticide warehouse in a town.
- Another work group activity then examines the basic principles of pesticide shop and pesticide warehouse construction and layout.
- The session concludes with a trainer presentation of example layouts for small pesticide shops and a pesticide warehouse.
Delivery

Explanation, Demonstration, Exercise, and Guidance:

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 25 minutes</td>
<td><strong>Work Groups - Pesticide Shop and Warehouse Location</strong></td>
</tr>
</tbody>
</table>

**Say** that we will refer to pesticide shops and pesticide warehouses during the session. For simplicity:
- Shops are places in which moderate quantities of pesticides are stored to be sold to users.
- Warehouses are places where pesticides are stored in larger quantities for later distribution.

The basic principles are the same for both, but there are some differences in location and construction.

**Put up** the flipchart with the diagram of the town. Explain the various parts of the town – the lake and river, houses, shops, fish factory, hospital, etc.

**Divide** participants into four groups, and give each group one of the cards labelled Pesticide Shop or Pesticide Warehouse.

**Say** that each group is a pesticide retailer who is going to build a new shop or warehouse in the town.

**Work Group Task:**
- Discuss the best location for your new shop or warehouse.
- Note down the reasons for your decision.

Allow 5 minutes for discussion

**Ask** each group in turn to stick its card at their location in the town, and to **explain** why they have selected that location.

**Ask** the other groups if they agree or disagree, and why.

**Guide** the discussions, using *Pesticide Shop and Warehouse Location* from the Fact Sheet as a checklist.

**Ask:**
- Which of these principles of location are difficult to implement in practice?
- Why?
- How can these difficulties be overcome?
<table>
<thead>
<tr>
<th>Activity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Work Groups – Shop and Warehouse Construction</strong></td>
<td>Say that now we have decided on the location for our shop and warehouse, we are now going to build it. Keep the same groups for the shop and warehouse. <strong>Work Group Task:</strong> Decide on the basic construction and layout principles for your shop or warehouse with regard to: • Walls and roof • Internal surfaces of walls and floors • Shelving • Lighting • Ventilation • Security • Hygiene Allow 20 minutes for the activity <strong>Ask</strong> the first shop group to present their results, <strong>followed</strong> by the second group. <strong>Write</strong> responses on the flipchart. <strong>After</strong> both shop groups have presented, <strong>add</strong> as necessary using <em>Pesticide Shop and Warehouse Construction and Layout</em> from the Fact Sheet as a checklist. <strong>Repeat</strong> the activity with the two warehouse groups</td>
</tr>
</tbody>
</table>
3. **Presentation – Example Shop and Warehouse Layouts**

**Distribute** the example shop and warehouse layout diagrams from the Fact Sheet. **Not** the ventilation example as there is a question on ventilation in the Assessment Questions.

**Say** that there are two examples of possible layouts for a small shop.
- One shop layout has a ‘closed’ frontage – for example a glass window, with a door for entry.
- The other shop layout has an ‘open’ frontage – where the front of the shop is completely open, and closed at the end of the day with a metal shutter.

**Point out:**
- The separation by the counter of customers from the pesticide display and staff area.
- The small store at the rear of the shop for keeping additional stock.
- The washbasin.
- The ventilation through the front of the shop, roof vent, window, or air brick.
- The wall area for the display of posters – pest and disease identification, products, government advice, etc.
- For larger shops, the same principles will apply.

**Say** there are also two examples of layouts for a pesticide warehouse.

**Point out:**
- The bunds, ramps and sump to contain spills, wash water, and firefighting water.
- The separation of administration and washing facilities from the storage area.
- The area within the warehouse boundary for loading and unloading.
Finish

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
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<tbody>
<tr>
<td><strong>Summary:</strong></td>
<td><strong>Include</strong> as major messages:</td>
</tr>
<tr>
<td>1 minute</td>
<td>• Areas to avoid with pesticide shop and warehouse location</td>
</tr>
<tr>
<td></td>
<td>• Principles of construction and layout of pesticide shops and</td>
</tr>
<tr>
<td></td>
<td>warehouses, particularly separation of customers from the display</td>
</tr>
<tr>
<td></td>
<td>area, cleaning, ventilation, and hygiene</td>
</tr>
<tr>
<td><strong>Questions:</strong></td>
<td><strong>Ask</strong> if everyone understands or if there are any additional questions.</td>
</tr>
<tr>
<td>1 minute</td>
<td>Answer these provided they are relevant.</td>
</tr>
<tr>
<td></td>
<td><strong>Ask</strong> if the session objectives were met</td>
</tr>
<tr>
<td><strong>Evaluation:</strong></td>
<td><strong>Hand out</strong> the Assessment Sheet and ask participants to complete two of</td>
</tr>
<tr>
<td>12 minutes</td>
<td>the questions.</td>
</tr>
<tr>
<td></td>
<td><strong>Collect</strong> the Assessment Sheet for later marking and entering the marks</td>
</tr>
<tr>
<td></td>
<td>on the Attendance Record.</td>
</tr>
<tr>
<td><strong>Next step:</strong></td>
<td><strong>Say</strong> that in this session we learned the location, construction and</td>
</tr>
<tr>
<td>1 minute</td>
<td>layout of pesticide shops and warehouses. Participants should return to</td>
</tr>
<tr>
<td></td>
<td>their premises and look at them with regard to what they have learned</td>
</tr>
<tr>
<td></td>
<td>today. In particular, what needs to be improved, and how will they do it?</td>
</tr>
<tr>
<td></td>
<td><strong>Hand out</strong> the Fact Sheet to participants.</td>
</tr>
</tbody>
</table>
Answer TWO (2) only of the following questions. You may write your answers on this question sheet or tell your trainer the answers. All questions are the same value (5 marks).

Question 1: Give three locations where pesticide shops should not be located.

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Question 2: Why are plain brick, mud, or earth walls and floors not acceptable in a pesticide shop or warehouse?

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Question 3: How is adequate ventilation ensured in the shop or warehouse?

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Question 4: What materials should be used for the shelves in a shop or warehouse and why?

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FACT SHEET

PESTICIDE SHOP AND WAREHOUSE LOCATION

Pesticide shops and warehouses both store pesticides, which are a potential contamination risk to the local area and community from spills, fires, and other accidents. Shops and warehouses must thus be located so as to minimise these risks.

Pesticide shops should be located away from:
Shops selling any form of food, clothing and other materials, or animal feed.
• Pharmacies.
• Schools.
• Hospitals.
• Open air markets.
• Recreational areas, such as playgrounds.
• Water sources, open water, or where there is a high water table or possible flooding

Pesticide warehouses, in addition should be located:
• In an industrial area, where few people visit.
• Away from other warehouses which stock any form of human or animal feed,
• Away from other warehouses which stock fuel, fertilizer, and other combustible goods.

PESTICIDE SHOP AND WAREHOUSE CONSTRUCTION AND LAYOUT

The following are the basic, general principles for the construction of any pesticide shop or warehouse.

General
• The walls, roof, and shelving should be of non-combustible material. Fire is one of the biggest hazards of pesticide storage.
• The inside walls and floor should be of non-permeable material (concrete or tiles), smooth, and without cracks, so that they can be easily cleaned. Brick, mud, or earth walls and floors are not acceptable as they absorb pesticide and cannot be cleaned properly.
• Shelves should be robust and of non-permeable material (metal or plastic), and without cracks, so that they can be easily cleaned. Wooden shelves absorb pesticide spills and cannot be cleaned properly.
• There must be adequate lighting, either natural or artificial, so that container labels can be read.
• The premises must be secure so as to prevent unauthorized entry – locks on all doors and gates, bars on windows.

Shops
• There must be adequate ventilation, preferably opposing doors or windows, air bricks, or roof vents.
• Customers should be separated from the pesticide display and sales area by a counter.
• Ideally, there should be an area separate to the main part of the shop for storing stock not on display.
• If physically separated from the shop, the store must meet all the necessary requirements for storing pesticides.
• Stock for sale should not be kept in the window, or where it is exposed to sunlight. If this is not possible, there should be a sun-shade over the front of the shop.
• Washing facilities must be available for staff and customers. A washbasin, water, soap and clean towel as a minimum.
Warehouses and Bulk Stores

- The roof should be of light-weight material that will collapse in the event of a fire, so as to allow firefighters access to the interior from above.
- There must be adequate clearance (10m or more) on at least two sides of the building to allow access for firefighting vehicles and personnel.
- Delivery vehicles must have good access, with a dedicated area for the vehicles to unload and load.
- Adequate ventilation is essential. There should be at least one of: opposing doors, opposing windows, roof vents, and upper and lower wall vents.
- Washing facilities must be available, preferably with a shower area, separate from the storage area.
- Office and administration facilities should be separate from the storage area.
- Containment bunds and ramps, drains, and a sump should be provided to contain firefighting water, spills, and washings. These should not drain to public waterways or sewers.
Example Layout for a Small Shop with a Closed Frontage
Example Layout for a Small Shop with an Open Frontage
Example Layouts of a Pesticide Warehouse
Shop and Warehouse Ventilation

Sunshade Over Shop Frontage

See also:
CropLife International Guidelines for the Safe Warehousing of Crop Protection Products.
CropLife International Guidelines for the Safe Formulation and Packing of Crop Protection Products.
http://croplife.org/?s=guidelines
SESSION 19:
COUNTERFEIT PESTICIDE PRODUCTS
Lesson Plan

| **Materials needed:** | ✓ Flipchart stands.  
| ✓ Flipchart paper.  
| ✓ Markers (4 colours).  
| ✓ Notebooks, pens, and file covers for participants who have forgotten to bring them.  
| ✓ Coloured cards.  
| ✓ Glue stick or blue tack.  
| ✓ Masking tape. |

| **Time needed:** | 100 minutes |
| **Intended audience:** | Pesticide Retailers |

| **Preparation:** | ✓ Flipchart with the session title “Counterfeit and Fraudulent Pesticide Products”, and the Session Objectives.  
| ✓ Examples of different genuine pesticide products.  
| ✓ Examples of different counterfeit pesticide products.  
| ✓ Print off sufficient Attendance Record sheets.  
| ✓ Print off sufficient Assessment question sheets.  
| ✓ Print off sufficient Fact Sheets for participants.  
| ✓ Organise venue and seating arrangements. |

**Attendance Record**

As participants arrive, ask them to enter their name and other information on the Attendance Record. There is also a column on the form to enter their marks from the Assessment Questions at the end of the training session.
### Session 19: Counterfeit Pesticide Products

#### Set up / Introduction  

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
</table>
|      | **Trainer Notes:**  
|      | - The opening activity refers to counterfeit DVDs. This example may not be suitable in all countries, and a local equivalent will need to be used. However, the principles of the question / answer session are the same for all counterfeit products.  
|      | - Activity 3, *Recognising Counterfeit Pesticide Products*, requires examples of counterfeit products. These may not be readily available, so an alternative activity is provided for this situation.  
|      | **Attention:**  
|      | Welcome the retailers to the session.  
|      | **Say** that both expensive and cheap DVDs are available in the market.  
|      | **Ask:**  
|      | - What are the differences between the expensive and cheap DVDs?  
|      | **Take** several responses.  
|      | Possible answers are:  
|      | - There is a difference in the packaging between the expensive and cheap DVDs.  
|      | - The cheap DVDs often do not play properly, or not play at all.  
|      | - The cheap DVDs are counterfeit copies of the expensive originals.  
|      | - The cheap DVDs are sold by unlicensed and dishonest market traders.  
|      | **Say** that the same applies to pesticide products – counterfeit products exist, which are sold cheaply by dishonest dealers and traders.  
|      | **Title:** Refer to the Title Flipchart and tell participants that this training session will cover *Counterfeit and Fraudulent Pesticide Products*.  
|      | **Credibility:** Say that in Kenya coffee crops destined for export were treated with a counterfeit pesticide product. The product was ineffective, the crop was destroyed, and farmers lost their livelihood. The ingredients in the product were simply calcium carbonate or magnesium carbonate. This is one example of many where counterfeit products have had severe effects on farmers and the agricultural industry.  
|      | **Objectives:** Refer to the Title Flipchart with the Lesson Objectives.  
|      | By the end of the session, participants will be able to:  
|      | - Define what is meant by a counterfeit pesticide.  
|      | - Describe the consequences of counterfeit pesticide products to farmers, consumers, the environment, pesticide retailers, and the pesticide industry.  
|      | - Identify a counterfeit pesticide product by looking at the container and label.  
|      | **Benefits:** Counterfeit pesticide products have severe consequences to humans, the environment, and the economy of the country. Knowing about these consequences will enable retailers to advise their customers of the dangers associated with the use of these products.
Direction:

• The session begins with an interactive discussion to define what is meant by a counterfeit pesticide.
• Work groups then investigate the consequences of counterfeit products in a range of sectors.
• Two alternatives are provided for the third activity, depending on whether or not examples of counterfeit pesticide products are available. If they are available, then a work group activity evaluates how to recognise counterfeit products. If not available, a role play achieves the same objective.
• A final short interactive discussion identifies the types of person that purchases a counterfeit product.

Delivery

Explanation, Demonstration, Exercise, and Guidance:

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 minutes</td>
<td>Interactive Discussion – What Exactly Do We Mean by Counterfeit Pesticide Products?</td>
</tr>
</tbody>
</table>

Say that for our discussions in this session, we need to know exactly what is meant when we describe a pesticide product as counterfeit.

Ask:
• What exactly do we mean when we describe a pesticide product as counterfeit?
• In other words, how can we define a counterfeit pesticide product?

Write responses on the flipchart.

Guide the discussion using Definition of Counterfeit Pesticides from the Fact Sheet as a reference.

Explain the time and costs of agro-chemical companies from Development of a Completely New Pesticide Active Ingredient in the Fact Sheet.

Ask:
• Are all cheap pesticide products counterfeit?

Take several responses, and then explain that not all cheap products are counterfeit.
Generic products are those pesticides which are no longer under patent, and are manufactured by several or many genuine manufacturers. Because of this they are generally cheaper than products still under patent.
<table>
<thead>
<tr>
<th>2.</th>
<th><strong>Work Groups – Consequences of Counterfeit Pesticide Products</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>30 minutes</strong></td>
<td>Say that in the introduction activity we said that counterfeit DVDs often did not play properly, or not play at all.</td>
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<tr>
<td></td>
<td>Divide participants into four groups. Allocate to each group one of the sectors below.</td>
</tr>
<tr>
<td></td>
<td><strong>Work Group Task:</strong></td>
</tr>
<tr>
<td></td>
<td>What do you think are the consequences of counterfeit products for your sector?</td>
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<tr>
<td></td>
<td>• Farmers</td>
</tr>
<tr>
<td></td>
<td>• Consumers and the Environment</td>
</tr>
<tr>
<td></td>
<td>• Pesticide retailers</td>
</tr>
<tr>
<td></td>
<td>• The pesticide industry</td>
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<td></td>
<td>• Write the group responses on a flipchart.</td>
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<td></td>
<td><strong>Allow</strong> 10 minutes for the activity</td>
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<td></td>
<td>Ask each group to report in turn.</td>
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<td></td>
<td>After each group has reported, ask the other participants if they have any comments or anything to add.</td>
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<tr>
<td></td>
<td>Add as necessary using <em>Consequences of Counterfeit Pesticide Products</em> from the Fact Sheet as a checklist.</td>
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</tbody>
</table>

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<tr>
<th>3.</th>
<th><strong>Work Groups – Recognising Counterfeit Pesticide Products</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>30 minutes</strong></td>
<td><strong>Trainer Note:</strong> For this activity, the example pesticides should be randomly distributed among the groups. Allow 4-5 minutes for them to examine them and note their conclusions. The examples should then be passed around the groups in turn until all groups have examined all examples.</td>
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<tr>
<td></td>
<td>Distribute the example genuine and counterfeit pesticide products among the groups.</td>
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<tr>
<td></td>
<td><strong>Work Group Task:</strong></td>
</tr>
<tr>
<td></td>
<td>• Decide which of the pesticide products is genuine and which is counterfeit.</td>
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<tr>
<td></td>
<td>• Note down the reasons for your decision.</td>
</tr>
<tr>
<td></td>
<td>• Do not tell the other groups your decision or reasons.</td>
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<tr>
<td></td>
<td><strong>Allow</strong> 4-5 minutes, and then ask the groups to pass the pesticides onto the next group. They must <strong>not tell</strong> the next group their decisions on the products.</td>
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<tr>
<td></td>
<td>Repeat until all groups have examined all the example pesticides.</td>
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<tr>
<td></td>
<td>Show one of the pesticide products and write the name on the flipchart. Ask each group in turn if they thought the product was genuine or counterfeit.</td>
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<tr>
<td></td>
<td>Write responses on the flipchart against the name of the product.</td>
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<tr>
<td></td>
<td>Ask each group in turn for one reason for their decision. If correct, write the reason on the flipchart.</td>
</tr>
</tbody>
</table>
Repeat for all the example pesticides, both genuine and counterfeit. When all products have been discussed, add as necessary using Recognising Counterfeit Pesticide Products from the Fact Sheet as a checklist.

### Alternative Activity 3

**Role Play – Recognising Counterfeit Pesticide Products**

**Trainer Note:**
Follow this activity if no counterfeit pesticide products are available.

**Role Play set-up:**
The trainer plays the role of a representative of a reputable local manufacturer, importer or distributor, or a government representative dealing with pesticides.

**Ask** a participant to play the role of a retailer who is not sure if his pesticide product is genuine or counterfeit.

**Give** the volunteer a pesticide container.
The volunteer should come to the representative’s office and ask if the product is genuine or not, and how he can tell the difference.

**Ensure** that all the other participants can clearly see the role play. If necessary, they should all come and stand round the two persons in the role play.
The trainer should go through the points in Recognising Counterfeit Pesticide Products from the Fact Sheet, showing the ‘retailer’ each point in turn on the container, and ensuring that the other participants can see.

### 4.

**Interactive Discussion – Who Buys Counterfeit Pesticide Products?**

**Ask:**
- What type of person buys counterfeit pesticide products?

**Take** several responses.

**Summarise** by saying there are two types of person:
- Those that buy the counterfeit product thinking that it is genuine.
- Those that know the product is counterfeit, but think that they are getting a bargain as it is cheap.

**Emphasise** that although counterfeit products may be cheap, the costs involved in their use – crop loss or damage, health hazards, loss of markets for produce, etc – are extremely high. Participants should strongly pass on this message to their farmer customers.
Finish

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
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</table>
| **Summary:** 1 minute | Include as major messages:  
• The investment of time and money that reputable agro-chemical companies put into the development of a new pesticide active ingredient  
• The definition of counterfeit products  
• The serious consequences of counterfeit pesticides  
• The essential differences when recognising counterfeit products |
| **Questions:** 1 minute | Ask if everyone understands or if there are any additional questions. Answer these provided they are relevant.  
Ask if the session objectives were met |
| **Evaluation:** 12 minutes | Hand out the Assessment Sheet and ask participants to complete two of the questions.  
Collect the Assessment Sheet for later marking and entering the marks on the Attendance Record. |
| **Next step:** 1 minute | Say that in this session we learned about counterfeit products, what they are, the serious consequences of their use, and how to recognise them. Of direct concern to participants as sellers of pesticides is the sometimes catastrophic effect on farmers who use counterfeit products.  
What would be the effect on their business if they sold a counterfeit product which completely failed to work and their customer farmers lost their livelihood?  
Participants can enhance their service to farmers by not selling counterfeit products, and by advising farmers against their use and how to recognise them.  
Hand out the Fact Sheet to participants. |
Counterfeit and illegal pesticides are often mislabeled and not registered for sale or use. They can pose a risk to human health and the environment, and can lead to severe damages or even a total loss of the crop.

**ORIGINAL PESTICIDES**

- Protect yields due to effective pest control.
- Allow a sustainable production of high quality produce.
- Enable farmers to freely trade their produce.
- Pose no unacceptable risks when applied according to the label instructions.

**COUNTERFEIT AND ILLEGAL PESTICIDES**

- Pose a significant risk to human health and the environment.
- Can result in trade bans for the produce.
- Damage the reputation and image of the farmers.
- Can lead to a full destruction of the crop.

**9 TIPS FOR RECOGNIZING COUNTERFEIT AND ILLEGAL PESTICIDES**

1. The product is offered by a non-authorized dealer, on the street or sold directly from a truck.
2. The seller refuses to provide a proper invoice for the purchase.
3. The price of the product is significantly lower compared to the original.
4. The container is not properly sealed.
5. The shape of the container is different from the original.
6. The cap of the container is different from the original.
7. The logo/trademark on the container or label looks different from the original.
8. The holograms do not exist or are different from the original.
9. The label is not written in the local language and/or shows mistakes in grammar or spelling.

**DO NOT PURCHASE OR USE COUNTERFEIT OR ILLEGAL PESTICIDES. BE ATTENTIVE AND ALERT. SAFEGUARD YOUR CROPS, PROTECT HUMAN HEALTH AND THE ENVIRONMENT.**

REPORT ANY COUNTERFEIT AND ILLEGAL PESTICIDES TO YOUR LOCAL CROP PROTECTION ASSOCIATION OR TO THE RELEVANT AUTHORITIES.
Assessment Questions

Name: ........................................... Date: .............. Mark: 

Answer TWO (2) only of the following questions.
You may write your answers on this question sheet or tell your trainer the answers.
All questions are the same value (5 marks).

Question 1: Describe what is meant by a counterfeit pesticide.
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Question 2: Give three consequences of counterfeit pesticides to farmers.
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Question 3: Give three consequences of counterfeit pesticides to pesticide retailers and the pesticide industry.
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Question 4: Give four ways of recognising a counterfeit pesticide product.
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FACT SHEET

DEVELOPMENT OF A COMPLETELY NEW PESTICIDE ACTIVE INGREDIENT

Every pesticide active ingredient on the market was originally developed by a reputable agro-chemical company. This development involves:

• Synthesis of thousands of new chemicals with possible insecticidal activity
• Initial testing for the level and range of insecticidal activity in the laboratory.
• Toxicological and environmental testing in the laboratory.
• Formulation chemistry.
• Establishment of a pilot plant to produce sufficient product for field trials.
• Efficacy, toxicology, and environmental field trials.
• Registration of the new pesticide active ingredient/product in different countries.

Tens of thousands of possible new chemicals start the process for each single active ingredient finally registered and sold on the market. The whole process takes about 10 years and costs about 250 million US dollars for each new pesticide. Much of the testing involves toxicological, environmental, and safety effects.

Genuine products have thus been extensively and thoroughly laboratory and field tested so that the company can provide accurate recommendations for use of the product, while the toxicological, safety, and environmental aspects are intensively tested. Submission of this information is also a requirement by national pesticide registration authorities for the pesticide to be registered for use in the country.

Agro-chemical companies thus invest a huge amount of money and time in the development of a new pesticide active ingredient. To enable them to recover this investment, the pesticide will be patented, which usually lasts 20 years including the development period. During this time the company has exclusive rights to the active ingredient.

Once the patent has expired, other companies can manufacture and sell the active ingredient. These pesticides are known as generics. Companies producing generic pesticide products do not have the high development costs involved with a completely new active ingredient, and so generic products are generally cheaper.

Genuine products from reputable companies, both under patent and generic, are produced under a strictly controlled manufacturing process, which ensures high quality of the active ingredient, with minimal unwanted by-products of the process, and with high quality formulations.

DEFINITION OF COUNTERFEIT PESTICIDES:

CropLife International agrees with the World Health Organization’s definition of counterfeit medicines and adopts a similar definition with reference to counterfeit pesticides, with additions specific to pesticide industry:

1. Counterfeit pesticides are ones which are deliberately and fraudulently mislabeled with respect to identity and/or source, or are not authorized for sale or use by relevant national authorities, or are lacking the manufacturer’s name and address.
2. Counterfeit pesticides can apply to both branded and generic products.
3. Counterfeit pesticides may include products with the correct ingredients, or with the wrong ingredients, without active ingredient, with correct quantity of active ingredients, or with fake packaging.
Counterfeit pesticide products are often manufactured with inferior facilities and inferior quality control. The product is often sub-standard, with poor quality active ingredient, with additional, often highly toxic, by-products of the manufacturing process, and a poor quality formulation.

A point to note is that not all cheap products are counterfeit. As noted above in Development of a Completely New Pesticide Active Ingredient, generic products are pesticides which are no longer under patent, and are manufactured by several or many genuine manufacturers. Because of this they are generally cheaper than products still under patent. Even so, they can still be counterfeited.

All counterfeit products are illegal in many ways. They infringe property rights, they are fraudulent, they have not been officially registered in any country, they may have been smuggled, no taxes have been paid on them, and they are a risk to health.

**CONSEQUENCES OF COUNTERFEIT PESTICIDE PRODUCTS**

Since counterfeit products are often sub-standard, and do not have the correct amount of active ingredient, the wrong or no active ingredient, and/or toxic by-products, they pose extensive risks.

**Farmers**
- Loss or damage to the crop due to poor effect on pests.
- Loss or damage to the crop due to adverse physical effects of the product.
- Loss of income from both crop loss or from damage, and from the cost of purchasing and applying the product.
- If the crop loss is complete, then the farmer’s livelihood is destroyed.
- Buyers of export crops may refuse to deal with farmers, farmer’s marketing organisations, or produce from the country due to illegal residues.
- Risks to health from the unknown toxic effects of the product.

**Consumers**
- Risks to health from the unknown toxic effects of the product residues on the food consumed.

**Environment**
- Environmental contamination of soil and water from the unknown toxic effects of the product.
- Subsequent consequences of this environmental contamination to all wildlife, domestic animals, and humans.

**Pesticide Retailers**
- Loss of business due to lack of trust from customers as a result of selling products that do not effectively control pests.
- Closure of the business, fines, or a prison sentence due to breaking the law of the country.

**The Pesticide Industry**
- Loss of sales to counterfeit products discourages agro-chemical companies from identification, testing, and marketing of completely new pesticide active ingredients.
- Loss of sales to counterfeit products removes incentives to manufacture genuine products.
- Unfair competition from counterfeit products discourages local entrepreneurs from investing in local genuine manufacturing and formulation facilities.
RECOGNISING COUNTERFEIT PESTICIDE PRODUCTS

There are two main types of counterfeit pesticides:
- Those that mimic the genuine product as much as possible in that the container and label look exactly the same as the genuine product.
- Those that use the company name, company logo, product name, or some other form of mislabelling or misbranding so as to appear to be from that company or to contain an implied active ingredient.

The first can be extremely difficult to recognise as counterfeit, while the second is much easier. Points to check for both types are:

**Container**
- May be of thinner or poorer quality materials, or a slightly different colour to the genuine product.
- The closure cap may be different.
- Any markings on the container from the container manufacture process may be different.
- The type face of any direct stamping or printing on the container, such as the batch number or expiry date, may be different.

**Label**
- May be very simple and badly stuck onto the container.
- The grammar and spelling of the label language may be poor.
- An extended shelf life may be quoted (the difference between the manufacturing and expiry date, or period until the expiry date). Most genuine products have a quoted shelf life of 2-3 years, counterfeit products may give an expiry date of up to 5 years.
- The label may use the company name, company logo, or product name of a genuine product, but the label is completely different in design or the information provided.
- The label must contain information on the product registration number from the national registration authority, the manufacturer, importer or distributor and their contact details, the date of expiry, and directions for use. All, most, or some of this information may be missing.
- Information on directions for use, safety, and first aid may be poor or missing.
- An excessive number of pictograms may be on the label for the toxicity of the claimed product.
- The pictograms may be badly laid out – Incorrect order and distribution, and misaligned.
- There may be pictures of pests and diseases which are claimed to be controlled. Most registration authorities do not allow this. In addition, space on the label is limited, and pictures take up space which should be devoted to essential information on the product.

Many of the above points require comparison with, or knowledge of, a genuine product. Retailers should ensure that they are aware of the appearance of genuine product containers and labels.

If a retailer is unsure whether a pesticide product is genuine or counterfeit, the product should be checked with a representative of the local manufacturer, importer, or distributor, the pesticide registration authority, or a pesticide specialist from the department of agriculture or other relevant government department.
Examples of Counterfeit Pesticide Products

- Product name is actually an active ingredient, while the indicated active ingredient is the registered product name of a reputable company.
- Pictures of crops and pests.
- No pictograms.

- Cheap cardboard packaging.
- Pictures of crops.
- Use of the registered product name of a reputable company.
- Use of the logo of the same reputable company. A container such as this would never be marketed by such a company.
• Poor English grammar and spelling.
• Active ingredient is not specified.
• No registration number from the national pesticide registration authority.
• No contact details for the manufacturer.
• No use details for crops and diseases for which the product is registered.
• No pictograms.
• Use of the registered product name of a reputable company.
• Use of the logo of a reputable company. A container such as this would never be marketed by such a company.

• Two on the left are counterfeit, one on the right is genuine.
• Different label design and layout to genuine product.
• Pictures of crops and pests.
• Pictograms not in correct groups or order.

• Containers are cheap plastic. One is similar to a soft drink bottle.
• Label on left has many pictures, but no essential information.
• Label on right has little essential information.
• All labels poorly stuck to container.

See also:
CropLife International Guidelines for the Safe and Effective Use of Crop Protection Products
http://croplife.org/?s= guidelines
SESSION 20:
PURCHASING, STOCK CONTROL, AND SHOP ORGANISATION
Lesson Plan

| Materials needed: | ✓ Flipchart stands. |
|                 | ✓ Flipchart paper. |
|                 | ✓ Markers (4 colours). |
|                 | ✓ Notebooks, pens, and file covers for participants who have forgotten to bring them. |
|                 | ✓ Coloured cards. |
|                 | ✓ Glue stick or blue tack. |
|                 | ✓ Masking tape. |
| Time needed:     | 100 minutes |
| Intended audience: | Pesticide Retailers |
| Preparation:     | ✓ Flipchart with the session title “Purchasing, Stock Control, and Shop Organisation”, and the Session Objectives. |
|                 | ✓ 3 Flipcharts marked out as shop ‘shelves’ (see example at end of lesson plan). |
|                 | ✓ Coloured cards cut into container shapes (see examples at end of lesson plan). |
|                 | • 24 x KillPest 35% EC (to represent a liquid pesticide). |
|                 | • 18 cards with this year’s expiry date, 6 with next year’s expiry date. |
|                 | • 24 x PestGone 50% WP (to represent a powder pesticide) |
|                 | • 18 cards with this year’s expiry date, 6 with next year’s expiry date. |
|                 | • 24 x NoWeed 40% EC (to represent a herbicide) |
|                 | • 18 cards with this year’s expiry date, 6 with next year’s expiry date. |
|                 | • 24 x Vegetable Seed (to represent packages of seed) |
|                 | • There should be more cards than ‘space’ on shelves, so that containers will have to be placed on top of each other. |
|                 | ✓ Print off sufficient Attendance Record sheets. |
|                 | ✓ Print off sufficient Assessment question sheets. |
|                 | ✓ Print off sufficient Fact Sheets for participants. |
|                 | ✓ Organise venue and seating arrangements. |

Attendance Record

As participants arrive, ask them to enter their name and other information on the Attendance Record. There is also a column on the form to enter their marks from the Assessment Questions at the end of the training session.
Set up / Introduction

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
</table>
| Attention: | Welcome the retailers to the session.  
Ask: What happens if the local bakery makes too much bread one day?  
Take several responses.  
Ask: • Can the bakery sell the bread the next day? The next week?  
Take several responses.  
Say that the bakery knows how much bread is sold on average each day, and so makes just that amount.  
It is the same for pesticide retailers. Pesticide purchases should be not too much, nor too little, which requires planning according to anticipated sales. |
| Title: | Refer to the Title Flipchart and tell participants that this training session will cover Purchasing, Stock Control, and Shop Organisation. |
| Credibility: | Give an example of a retailer who has purchased too little stock and so had to turn customers away, or has purchased too much stock and so has a large excess at the end of the season. |
| Objectives: | Refer to the Title Flipchart with the Lesson Objectives.  
By the end of the session, participants will be able to: • State clearly the principles for purchasing pesticides in terms of the types and amounts to purchase, and when to place orders with suppliers. • Demonstrate the correct organisation in the shop and on shelves of different pesticide types and other inputs. • Explain the importance of keeping records, the information to be recorded, and the information that records can provide. |
| Benefits: | Pesticide stock is money. When retailers manage their stock purchases and sales effectively, the best use is made of the money invested, and money is not tied up in unsold stock. |
| Direction: | • The session begins with a workgroup activity on pesticide purchasing, using a picnic as an illustrative example. • A second workgroup activity examines the organisation in the shop and on shelves of different pesticide types and other stock. • A final interactive discussion looks at the importance of keeping records. |
## Delivery

### Explanation, Demonstration, Exercise, and Guidance:

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>35 minutes</td>
<td><strong>Work Groups – Pesticide Purchasing</strong></td>
</tr>
</tbody>
</table>

Divide participants into 3-4 work groups depending on numbers.

**Work Group Task:**
Imagine as a group that you are going on a picnic next week with your families.
- What foods and drinks will you need take with you?
- Will hot food be needed? What sorts?
- How much of each type of food and drink will be needed for all those on the picnic?
- Write your ‘shopping list’ of food and drink on a flipchart.

Allow 15 minutes for the activity.

**Ask** each group to present their shopping lists.

**Trainer Note:**
Do not spend too long on the following questions. The objective should be to bring out the principles given in *Pesticide Purchasing* from the Fact Sheet.

After all groups have presented, **ask** all groups:
- How did you decide which types of food and drink were needed?
- How did the group find out what type of food and drink each group member liked?
- How did you decide what quantities of each type of food and drink were needed?
- Did you take into consideration food and drink you already had in the house when deciding how much more to buy for the picnic?
- How do you avoid taking too much or too little food and drink?
- Do you buy everything on the morning of the picnic, or do you buy some items in advance?

**Note** the answers on a flipchart.

**Say** that the same principles apply when ordering pesticides for their shops.
- You need to know what the other people like and how much they are likely to eat or drink. For farmers it is the same, you need to know your customers, what pesticides they will use, and how much of each type.
- You need to know when to buy different items. For pesticides and other inputs, different ones are needed at different times of the year, and need to be ordered in plenty of time before they are needed by the farmer.
- You do not want to buy too much or too little of anything. You need to know what will be needed and how much, and to take current stock into account when ordering.
<table>
<thead>
<tr>
<th><strong>Session 20: Purchasing, Stock Control, and Shop Organisation</strong></th>
</tr>
</thead>
</table>

**Emphasise** the points in *Quality Products* from the Fact Sheet:
- Purchase only from reputable manufacturers, importers and distributors.
- Be aware of, and do not buy counterfeit products.

**2. Work Groups – Shop Organisation**

**Divide** participants into 3 groups for this activity.

**Give** each group a flipchart ‘shop’ with empty shelves.

**Explain** that the pesticides they have ordered from their supplier are about to be delivered.

**Distribute** to each group:
- 8 x KillPest 35% EC (to represent a liquid pesticide), 6 cards with this year’s expiry date, 2 cards with next year’s expiry date.
- 8 x PestGone 50% WP (to represent a powder pesticide), 6 cards with this year’s expiry date, 2 cards with next year’s expiry date.
- 8 x NoWeed 40% EC (to represent a herbicide), 6 cards with this year’s expiry date, 2 cards with next year’s expiry date.
- 8 x Vegetable Seed (to represent packages of seed)
- Blue tack or double sided tape to stick the containers onto the shelves.

**Work Group Task:**
- Each group should stock their ‘shop’ with pesticides and the other products by sticking the cards onto the ‘shelves’.

After 15 minutes, **ask** all groups to put up their ‘shop’ at the front of the classroom.

**Allow** participants 4-5 minutes to look at the organisation of the other ‘shops’.

**Ask:**
- Has anyone any comments to make on how the shops / shelves have been stocked?
- What is good about the ‘shop’ organisation? What could be improved?
- What to do with the stock that does not fit on the shelves?
- How should the different expiry dates be stocked?

**After** participants have made their comments, **explain:**
- Pesticides should be separated from all other products.
- Powders should be above liquids
- Herbicides should be on the lowest shelves
- The reasons for the organization of pesticides and formulations in this way.
- Excess stock should be kept in a separate store if possible.
- Products with the shortest time to expiry should be at the front of shelves, longest time to expiry in the separate storage area - The First In - First Out principle so that the oldest stock is sold first, before the expiry date.

Take one ‘shop’ and rearrange the products on the shelves as necessary to meet the above criteria, and using *Stock Management and Shop Organisation* from the Fact Sheet as checklists.
### Interactive Discussion – Keeping Records

**Say** that some of the points from the first activity were that
- We need to know what pesticide farmers will need and how much,
- We do not want to order too much or too little, and that
- We needed to take current stocks into account when ordering.

**Ask:**
- Apart from knowing our customers, in what other way can we get this information?

**Guide** participants to the response *Keeping Records*.

**Ask:**
- What information can records give us?
- What records should be kept?

**Write** appropriate responses on the flipchart, using *Keeping Records* from the Fact Sheet as a checklist.

**Say** also that keeping records of pesticide purchases and sales is a legal requirement in some countries.

### Finish

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
</table>
| **Summary:**  | **Include** as major messages:  
- How to estimate the amount of stock to purchase.  
- Taking existing stock into consideration when ordering new stocks.  
- Shop organization, particularly the separation of pesticides from other inputs, and the separation of different pesticide types.  
- That keeping records can provide helpful information on sales and the amounts of pesticides to order.  |
| **Questions:**| **Ask** if everyone understands or if there are any additional questions.  
Answer these provided they are relevant.  
Ask if the session objectives were met |
| **Evaluation:**| **Hand out** the Assessment Sheet and ask participants to complete two of the questions.  
**Collect** the Assessment Sheet for later marking and entering the marks on the Attendance Record. |
Next step: Say this is the last training session. During all sessions participants have learnt about:
- Crop and pest management
- The different types and formulations of pesticides, and how pesticides work
- The product label
- The environment
- Safety
- Hand sprayers, pesticide mixing, and spray application
- Pesticide transport, disposal, and spill clean-up
- Laws and regulations
- Shop and warehouse location and construction
- Counterfeit pesticides
- And this last session, Purchasing, Stock Control, Shop Organisation

This knowledge will enable participants to give better service to their customers in terms of both of the quality of the products stocked and of the quality of the advice given to customers.

As a result, customers will trust the retailer, use him as their supplier of preference for pesticides and other inputs, and tell their friends to use him as well.

**Good Service = Good Business.**

Hand out the Fact Sheet to participants.

Thank all participants for their participation in the activities of the course and for passing on their own knowledge and experience to others.
Example Flipchart Layout of Shop Shelves
Example Container Shapes and Labels

<table>
<thead>
<tr>
<th>Liquid Insecticide</th>
<th>Powder Pesticide</th>
<th>Herbicide</th>
<th>Seed</th>
</tr>
</thead>
<tbody>
<tr>
<td>KillPest 35% EC</td>
<td>PestGone 50% WP</td>
<td>NoWeed 40% EC</td>
<td>Vegetable Seed</td>
</tr>
<tr>
<td>Expiry xx/xx</td>
<td>Expiry xx/xx</td>
<td>Expiry xx/xx</td>
<td></td>
</tr>
</tbody>
</table>
Assessment Questions

Name: ........................................ Date: ........................ Mark: □

Answer TWO (2) only of the following questions.
You may write your answers on this question sheet or tell your trainer the answers.
All questions are the same value (5 marks).

Question 1: Give two ways of estimating the quantity of pesticides to purchase.
...........................................................................................................................................................................................
...........................................................................................................................................................................................
...........................................................................................................................................................................................

Question 2: How many years supply of pesticide should be purchased at one time, and why?
...........................................................................................................................................................................................
...........................................................................................................................................................................................
...........................................................................................................................................................................................

Question 3: What does ‘First In – First Out’ mean?
...........................................................................................................................................................................................
...........................................................................................................................................................................................
...........................................................................................................................................................................................

Question 4: Which pesticides should be kept on the top shelves, the middle shelves, and the bottom shelves.
...........................................................................................................................................................................................
...........................................................................................................................................................................................
...........................................................................................................................................................................................
FACT SHEET

PESTICIDE PURCHASING
Ordering accurate quantities of pesticides is essential for a profitable business. Pesticides purchased in too large amounts or at the wrong time of the year are money tied up in the stock, money which could be used for something else.

Know Your Customers:
- Know what crops they grow, what pesticides they use, and how much of each pesticide they need.
- This will obviously vary from year to year, but good contact with customers provides valuable information on their varying requirements.

Time of Purchasing
- Different pesticides are needed at different times of the year, as crops are planted at different times, and pests attack at different times of the year.
- There is a delay between placing an order and arrival at the shop. This lead time needs to be taken into consideration when purchasing.
- Lead times may vary during the year in some countries. For example, delivery may take longer during the rainy season when roads may be in poor condition.
- An input ordering calendar is useful when different inputs need to be ordered at different times.

Amount to Purchase
- Base purchase orders on estimated amounts for each product for the season, less the amount of the product currently in stock from the previous year.
- Only buy one year’s requirements.
- Do not purchase more than one year’s requirements because of offers of discounts for bulk purchase. These may appear to save money, but can be costly due to unsold stock at the end of the season, and the risk of holding stock past the expiry date.
- Check the expiry date when stock is delivered. Products with less than one year to the expiry date should not be accepted.

Quality Products
- Purchase products only from reputable manufacturers, importers, and distributors.
- Be aware of counterfeit products and how to recognise them.
- Do not purchase counterfeit products – they are often not effective, can be hazardous, and will affect the reputation of the retailer with customers.

STOCK CONTROL
Accurate stock control is essential to avoid both shortfalls and excesses in stock levels, both of which cost money, and to avoid the possibility of stock being held past the expiry date.

Keeping Records:
- Records are vital to purchasing accurate amounts of stock.
- Records should be kept separately for each product by pack size:
  - Name of product
  - Date of purchase
  - Amount purchased
  - Pack size
  - Name of supplier
  - Expiry date
  - Dates and amounts of each sale
  - Details of purchaser
  - Balance of product remaining in stock.
• Records show how much of each type of stock sold during a year, and so provide a basis for the estimate of future requirements.
• Records show how much stock is left unsold from the last season. This should be deducted from the purchase estimate for the next season.

Stock Management
Expired stock is a problem in many parts of the world. Good purchasing and stock management procedures can avoid this problem.
• Stock should be sold on a First In – First Out basis. In other words, stock received first is sold first, before newer stock is sold.
• Newer stock should be kept in the pesticide storage area of the shop or in a separate facility, if this is available, with older stock ready for sale on the display shelves.
• If no pesticide storage area is available, new stock should be at the back of shelves, with older stock at the front of shelves.

SHOP ORGANISATION
• Good shop organisation promotes safety, minimises the risks associated with pesticide storage, avoids one product type being contaminated by another, helps to make stock management easier, and improves the attractiveness of the shop to customers.
• The main risks involved with pesticide storage are fire and environmental contamination.
• Pesticides must be stored separately. They must never be kept in the same area as food, drink or medicines for human or animal consumption. They must also not be kept in the same area as any material that may become contaminated (seed, fertiliser, clothing etc).
• Pesticides must be stored out of direct sunlight, temperature extremes, water and moisture.
• If stored on shelves, dry pesticides should be placed above liquid pesticides (in case of leakage of liquid and contamination of the lower containers).
• Herbicides should be on the lowest shelves (in case of leakage of herbicide and contamination of the lower containers).
• Containers should be inspected regularly to ensure that there are no leakages.
• Shelves should not be over-stocked.
• Materials for cleaning up spills must be available (sawdust, sand, bucket, broom, shovel, gloves, face mask, drum / strong plastic bag for sweepings).
• Fire fighting equipment must be available (fire extinguishers (foam or dry powder), buckets of sand etc).
• Washing facilities must be provided (basin, water, soap, towel).
• There should be no smoking, eating or drinking in the pesticide area.
• There should be no unauthorised access to the sales or storage area.
• Warning notices (No Smoking; and Danger – Pesticides) should be displayed.
• An area of wall should be devoted to informational posters, brochures, and other literature – government advice, pest and disease recognition, safety, etc.
# Example Input Ordering Calendar

<table>
<thead>
<tr>
<th>Input</th>
<th>Crop</th>
<th>Month Required</th>
<th>On Crop</th>
<th>In Shop</th>
<th>Order</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sprayers</td>
<td>All crops</td>
<td>Start of season</td>
<td>January</td>
<td>September</td>
<td></td>
</tr>
<tr>
<td>Sprayer spares</td>
<td>All crops</td>
<td>Start of season</td>
<td>January</td>
<td>September</td>
<td></td>
</tr>
<tr>
<td>PPE</td>
<td>All crops</td>
<td>Start of season</td>
<td>January</td>
<td>September</td>
<td></td>
</tr>
<tr>
<td>Winter oil</td>
<td>Almonds</td>
<td>February</td>
<td>January</td>
<td>September</td>
<td></td>
</tr>
<tr>
<td>Insecticide A</td>
<td>Melon</td>
<td>March</td>
<td>February</td>
<td>October</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Wheat</td>
<td>March</td>
<td>February</td>
<td>October</td>
<td></td>
</tr>
<tr>
<td>Insecticide B</td>
<td>Grapes</td>
<td>March</td>
<td>February</td>
<td>October</td>
<td></td>
</tr>
<tr>
<td>Insecticide C</td>
<td>Apple</td>
<td>March</td>
<td>February</td>
<td>October</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Vegetables</td>
<td>March</td>
<td>February</td>
<td>October</td>
<td></td>
</tr>
<tr>
<td>Herbicide A</td>
<td>Wheat</td>
<td>March</td>
<td>February</td>
<td>October</td>
<td></td>
</tr>
<tr>
<td>Vegetable seed</td>
<td></td>
<td>March</td>
<td>February</td>
<td>November</td>
<td></td>
</tr>
<tr>
<td>Harvest basket</td>
<td>Vegetables</td>
<td>May</td>
<td>April</td>
<td>January</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Grapes</td>
<td>July</td>
<td>June</td>
<td>January</td>
<td></td>
</tr>
<tr>
<td>Insecticide D</td>
<td>Orchards</td>
<td>October</td>
<td>September</td>
<td>May</td>
<td></td>
</tr>
<tr>
<td>Fungicide A</td>
<td>Winter Wheat</td>
<td>October</td>
<td>September</td>
<td>May</td>
<td></td>
</tr>
</tbody>
</table>

**Note:**
A three month lead in is assumed in the above calendar, which will vary by country. It may also vary during the year, for example being longer in the rainy season because of poor road conditions.

**See also:**
CropLife International Guidelines for the Safe and Effective Use of Crop Protection Products
http://croplife.org/?s=guidelines
21. COURSE EVALUATION
Introduction to the Session
Welcome participants to the final Session of the course.
Present the session objectives, and give a brief overview of the procedures.

Course Summary

OBJECTIVES OF THE PROCEDURE:
• To summarise the main course messages for participants.

Review the Overall Goals of the training course from Session 1 and provide a course summary with lessons learned from each of the sessions.

Ask the participants:
• Have these Overall Goals of the training course been met?

Participant Course Evaluation and Networking
Distribute the compiled list of participant contact details. Ask participants to check that their details are correct.

Distribute the Participant Course Evaluation.

Say that participants can now have a short break while you mark the papers. Ask them to complete the Participant course evaluation during this break. Ask one of the participants to collect the completed questionnaires while you are marking the post-course papers.

Encourage them to establish longer term relationships and contacts during this period (if they have not already done so) as these could be valuable in the future, particularly if participants are from both the public and private sectors.

Course Closure
Officially close the course.

Again thank participants for their contributions, and the public or private sector representative if they are present.
# Participant Course Evaluation

<table>
<thead>
<tr>
<th></th>
<th>Excellent</th>
<th>Good</th>
<th>Average</th>
<th>Poor</th>
<th>Very Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Training method</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course contents</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course structure</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Training venue</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trainer skills</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trainer knowledge</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Food</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accommodation</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Did the course meet your expectations?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Has the course been of benefit to you?</td>
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</tr>
<tr>
<td>What did you like best about the course?</td>
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<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>What did you like least about the course?</td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>How could the course be improved?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Any other comments</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
CropLife International is the voice of the global plant science industry. It champions the role of agricultural innovations in crop protection and plant biotechnology in supporting and advancing sustainable agriculture; helping farmers feed a growing population while looking after the planet; and progressing rural communities. The world needs farmers, and farmers need plant science. CropLife International is proud to be at the heart of helping farmers grow.