

Pesticide Training Tool: A Simplified Guide for Agricultural Extension Officers and Farmers

Abstract

Due to increasing popularity and use of agro-chemicals to control pests and diseases on fields, applicators of these pesticides, consumers of agricultural products and other living organisms are exposed to the dangers of these chemicals if not used properly. To mitigate these dangers and general environmental pollutions, farmers need to be trained on the dos and don'ts that ensure safer usage and increased efficacy. Key protection measures like use of right spraying equipment and wearing personal protective equipment such as waterproof apron, rubber gloves, gumboots, and breathing masks should be adhered to. Farmers should be reminded to read and follow properly the product labels provided before handling any chemical. In the case of using pesticide tank mixes, care must be taken to ensure that individual chemicals are miscible and never react to each other. The information on using tank mixes could be found from the product labels, approved and certified agro-dealers and agricultural extension officers. Remaining and or unused pesticide products must be stored safely under cool temperature and locked out of reach of children. Proper disposal of expired chemicals and their containers must be guaranteed.

Keywords: Agricultural extension, farmer training, pest and disease control, pesticide efficacy, pesticide products, safety tool, personal protective equipment

Introduction

Crop yield losses due to pests and diseases vary from one country to another depending on several factors including prevailing climate, the crop grown and type of pest [as reviewed by [1]. Climate change, for instance, has increased incidences of pests in Africa. As a result, farmers have opted in using pesticides for immediate control- a practice currently gaining popularity in the region. However, appropriate and safe use of these chemicals is never guaranteed since most farmers are illiterate and have poor access to agricultural extension officers for better instructions. Farmers do not put on personal protective gears/equipment (PPE) when handling these chemicals which are (some) very toxic to human. The worrying extension agent to farmer ratio is one of the reasons for the poor adoption of chemical best practices. For instance, in Africa, the ratio of an extension agent to farmers is quite wide: 1: 3,333 in Nigeria, 1: 2,500 in Tanzania, 1:1,800 in Uganda, 1:1,500 in Kenya, 1:476 in Ethiopia, [2-4]. Due to this concern, I decided to put together this document that pinpoints key issues that need to be taken care of and stressed when dealing with any farm chemicals. Better and safer use of farm chemicals begin with the proper selection of the products- that must be less toxic to humans, and other non-targeted living organisms, effective and affordable [5-12].

Key topics and practices to be covered

The following section outlines key topical issues which should be covered when training farmers on the use of any pesticides.

Please note that;

- This is just a guide and anybody planning to train farmers should always refer to the product label to determine product-specific guidance.
- Also, reach out to specialists (e.g. extension officers, and agro-dealers) approved by the government in the area if you are unable to find detailed product labels.
- Where product label recommendations differ from the general guidelines given below, the product label recommendations should be given preference.
- The guide below is not exhaustive, for some products additional training messages may be necessary (e.g. maximum number of applications for fungicides, specific re-entry period).

1. Safety

- Farmers should only use pesticide if they have access to:
 - ❖ Appropriate application equipment (e.g. Knapsack sprayer or Hand sprayer)
 - ❖ Personal protective equipment (PPE) - waterproof apron, rubber gloves, gumboots and breathing masks.
- Any organization or response agency distributing pesticides to farmers should also offer product-specific guidance on what to do in case of exposure (in eyes, on skin or clothes, or through swallowing or inhalation).
- Chemical handling (preparation and cleaning) should be done in a spacious and well-ventilated place away from areas where children play, or animals graze.

2. Timing application

- To maximize product efficacy, and limit unintended damage to the crop or other organisms, application of pesticides should be done when:
 - ❖ There is little or no wind.
 - ❖ Temperatures are cool- around midmorning or late in the evening.
 - ❖ Plants are not too wet from dew or recent rainfall to avoid spillage and washing away of pesticides into water streams.
 - ❖ Rainfall is not expected for at least 2 hours after completion of the application.
- Specific instructions like the stage of the crop and economic thresholds may vary between products - refer to the label. For instance, in Fall Army Worm (FAW) control, pesticide should only be applied when maize infestation levels are as follows [13]:
 - ❖ Early whorl stage (emergence to V6): 10-30% of plants have symptoms of FAW damage
 - ❖ Late whorl stage (V7 to tasseling): 30-50% of plants have symptoms of FAW damage
 - ❖ No spraying should be done once the crop reaches the tasseling and silking stage.

3. Preparing spraying equipment

- Sprayers should only be handled after PPE have been put on.
- If sprayer equipment are being distributed, farmers should be shown how to correctly assemble and use them, and which nozzle attachments or settings to use for the product concerned.
- Rinse the pumps before use - pour in clean water, shake, and then pump out.

4. Preparing the pesticide solution

- Applicator's safety must be guaranteed by ensuring that PPE has been put on.
- When preparing dilution rates:
 - ❖ Pesticide quantities can be measured using calibrated pesticide bottle caps or calibrated sprayer caps. If farmers are unlikely to have either of these, it is important to identify a safe way for them to measure pesticide quantities with a reasonable degree of accuracy.
 - ❖ Only use dilutions that are within the ranges recommended on the label. Variation within these ranges can be done as suggested by local expert agro-dealers or extension officers.
- Mixing the chemical and water:
 - ❖ Do not mix different pesticide products unless you are certain they are chemically compatible, otherwise, you may waste money by making both products ineffective.
 - ❖ To make a spray solution, add half the volume of water required for dilution then add the recommended quantity of pesticide, then top up to the right volume with water. Stir using a rod, or pump the tank until well mixed.

5. Spraying pesticide solution

- Illustrate to the applicators how to correctly wear and use sprayers.
- While spraying, maintain a steady walking pace to ensure uniform application.

6. After the application of pesticide

- Cleaning of equipment:
 - ❖ Fill the sprayer with clean water, stir, and spray the rinsate out away from any water sources. Do this 3 times.
 - ❖ Thoroughly wash your PPE with soap and plenty of water (before washing yourself).
 - ❖ Dry the sprayer and PPE in the sun for about 6 hours before storage.
 - ❖ Thoroughly wash yourself with soap and plenty of water.
- Re-entry:
 - ❖ Do not re-enter any sprayed fields for the period stated on the product label (usually several hours to several days). Please confirm with the label for product specific re-entry period.

7. Storing pesticide

- Keep pesticides in their original containers with all the labels and instructions intact.
- The store should meet the following conditions;
 - ❖ Designated room away from food or drinking water and out of reach of children, livestock and pets.
 - ❖ Cool and well ventilated.
- Small bottles should be packed into larger containers that could contain liquids in the event of leakage.

8. Disposal of containers and excess product

- Empty pesticide containers must be destroyed and not be used for any other product or purpose at home.
- Leftover pesticide should not be poured down the sink, into the toilet, or down a sewer or drain. It is better to give any leftover product to a neighbor who can use it.
- If official disposal options are not available (e.g. via returning to agro-dealers or local government collection), empty containers should be disposed of in the following way:
 - ❖ Rinsed three times, with rinsate sprayed over a wide area, away from water sources.
 - ❖ Punctured several times and/or crushed.
 - ❖ Buried deep in the soil - farmers may want to do this in groups, especially where land is limited:
 - The location should be at least 100 m away from houses and water sources (e.g. spring, wells, rivers etc.); located in areas they are unlikely to be disturbed (especially by children or livestock) and no food crop will be grown in the future.
 - Dig a hole of at least 1m depth and 2m above ground water level.
 - Place the container at the bottom of the hole, and then place a large rock on top before covering with soil.
 - Erect a sign to warn others and remind themselves that they have buried a dangerous item there.

Conclusion

Campaign on safe use of pesticide products must be taken seriously to reduce negative impacts on the environment. Before distributing or buying any pesticides, farmers must ensure that they have right equipment e.g. Knapsack sprayer or hand sprayer, depending on the scale of production and personal protective equipment (e.g. waterproof apron, rubber gloves, gumboots, and breathing masks). At all times, both farmers and extension officers should thoroughly read and follow instructions provided on the product label when using the product.

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