

# Using herbicides efficiently in inland-valley rice production

Herbicides are widely used in West Africa, especially in irrigated lowland rice, but farmers often handle them without realizing their potential dangers to health and without great efficiency. This module is designed to improve farmers' knowledge on: general herbicide handling, their potential danger to human health and the environment, and to improve knowledge on optimal timing, dosage and techniques of herbicides application. Such knowledge will help reduce incorrect use of herbicides while increasing their efficacy (Reference 20).



### Learning objectives

At the end of this module, farmers will:

- Know how to choose the most efficient herbicides to control the weeds in their fields.
- Know how to calculate the optimal doses of herbicides.
- Know correct methods of herbicides application, i.e. without endangering their health or that of the crop.
- Know correct timing of herbicide application for optimum efficiency.
- Know the best mode of application for the available commercial products.

- ➊ Summarize farmers' knowledge about weeds, herbicide application and integrated weed management.
- ➋ Discuss farmers' experiences in the use of herbicides.
- ➌ Present key features for herbicide formulations: dosage of products.
- ➍ Demonstrate the use of herbicides in the field.
- ➎ Synthesize observations in plenary session.



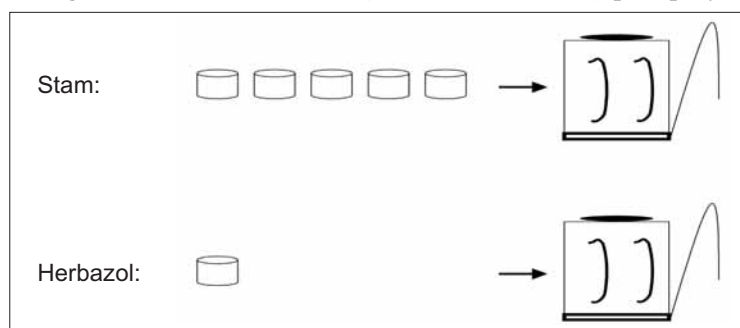
### Procedure

1. Farmers and the PLAR-IRM team meet at the PLAR-IRM Center. The facilitator briefly reviews the previous module and invites farmers' feedback. The facilitator asks if the farmers have put in place any new practice on their IRM fields.
2. One of the PLAR-IRM team members explains the learning objectives and procedures for the current module.
3. The facilitator reminds farmers of the following elements:
  - The role of herbicides in integrated weed management. Firstly, it is important to emphasize that herbicides are poisonous or may be harmful to human health and the environment when not used properly. Secondly, they are only *one element* in a range of techniques in integrated weed management.
  - The three main groups of weeds (grasses, sedges and broad-leaves): the farmers will show some samples from their own herbaria.

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4. The facilitator stimulates a discussion on farmers' experiences with chemical weed control. They will talk about the commercial products available and their respective efficiencies (the facilitator brings samples of the commercial products commonly used in the area and will explain the labels).
5. Using the instruction leaflet (Reference 20), the use of herbicides is discussed, including the idea of using a 'small tomato tin.' The following topics are to be dealt with:
  - The number of herbicide sprayer (knapsack) loads that would cover a plot of 2500 m<sup>2</sup>: with a 15-liter capacity sprayer, well adjusted, walking not too fast or too slow (60 m per minute), five sprayers will be needed to treat one rice field of 2500 m<sup>2</sup>. Different sprayers will have different capacities and output will be affected by pressure and nozzles used. The calculations used here are for illustration only and they may have to be adjusted according to the equipment used.
  - The product to be used to combat sedges (Cyperaceae) and broad-leaf weeds: for instance Herbazol or Herbextra (with 2,4-D as active compound):
    - Dosage: one little tomato tin (50 ml) per sprayer-load.
  - The product to be used against grasses (Gramineae): for instance Stam (with propanil as active ingredient):
    - Dosage: five little tomato tins (5 × 50 ml = 250 ml) per sprayer.



6. The participants then depart to the fields and choose a plot that can be used for the demonstration. It is important to choose a well-drained field with weeds that have approximately reached the 2–3 leaf stage. The following issues will be dealt with:
  - The use of clean water in the preparation of the herbicide solution to avoid blocking the nozzle.
  - The use of the correct nozzle. There are nozzles for insecticides and other nozzles for herbicides. Farmers often use the nozzles designed for insecticides (which produce a cone-shaped spray instead of a fan)—these are not appropriate for herbicides, as the sprayed droplets from the insecticide nozzle are too small.
  - The importance of washing after applying or handling herbicides, changing clothes that become contaminated, and not smoking, eating or drinking while handling herbicides.

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- The importance of the farmer wearing protective clothes: all injuries (cuts, grazes, etc.) must be covered; gloves, glasses and boots must be used, if they are available. Noses should also be covered with protective masks, that are usually easy to find and relatively cheap.
  - Drainage of the field (except for some products, such as Londax).
  - The plant development stage, i.e. for many post-emergence herbicides, weeds must be treated when they are at the 2–3 leaf stage for best effect.
  - Testing the equipment with water. Treatment should start only after the functioning of the equipment has been confirmed with ordinary water.
  - Rinsing the sprayer. The sprayer could still contain some remnant of another product and, for instance, it would be disastrous for the rice if this leftover were, e.g., Round-up.
  - Filling the sprayer up to half its capacity.
  - Pouring the contents of the ‘small tomato tins’ (e.g. one tin of Herbazol and five tins of Stam) into the sprayer and rinsing the tins with clean water. It is important to stress that the product should be added to the water and not the opposite. Therefore, water must not be poured on the product. The products must not be mixed together before dissolving them in water.
  - Closing and shaking the sprayer.
  - Completely fill the sprayer (15 liters) and rock gently to mix properly.
7. The facilitator then encourages a debate on the optimal conditions for chemical treatment:
- No wind.
  - No strong sun.
  - No heavy dew.
  - No threat of rain.
  - Preferably done early in the morning (07:00–10:00) or late in the evening (16:00–18:00).
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8. The facilitator invites a volunteer farmer to demonstrate how to fill the sprayer and how to spray. The other farmers watch how their peer is performing, they give their comments and pay particular attention to the following aspects:
- The means of protection: gloves, mask and boots.
  - The height at which the spraying lance must be held: 0.7 m above ground.
  - The walking speed, which should be about 60 m per minute—that is, neither too fast nor too slow—, and walking in a straight line.
  - Walking, treating and pumping, which should be done simultaneously.
  - The width covered by the spraying nozzle, which should be about 1.5 m.
  - Turning around when arriving at the end of the field, and moving across 1 to 1.5 m.
  - The importance of not waving the spraying lance—it must be held steady and at a constant height.

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9. Back at the PLAR-IRM Center, the facilitator encourages further discussion about the demonstration.
  - For example, if a plot of only 250 m<sup>2</sup> has been treated, how much water should be left in the sprayer. The farmers calculate. The rule is that a 2500-m<sup>2</sup> plot requires 5 sprayer loads, so a 250 m<sup>2</sup> plot—being 1/10 of the field—will require the use of 5/10 (half) of a sprayer load.
  - The facilitator explains that, if there is any left-over herbicide mixture, it should not be applied a second time on the same area of the field, as it may be dangerous for the rice because the dosage would then be too high. Do not dispose of any spare herbicide into waterways or drains, but instead, if surplus herbicide has to be disposed of, it should be sprayed onto a waste area away from habitation and waterways.
10. The farmers should talk about the time to flood the field after treatment: it should usually be done 2 to 3 days after treatment. Long delay should be avoided, otherwise the weeds could start growing from seed.
11. Evaluation: the facilitator asks what the farmers appreciated (or did not appreciate), what they learnt, and what they intend to do with their newly obtained knowledge. The facilitator specifically asks which new ideas this module has generated and how farmers intend to put these into practise on their IRM fields.
12. The facilitator asks volunteer farmers to draw conclusions from the session, and then invites all the farmers to the next session.



#### Time required

- Two–three hours



#### Materials required

- A sprayer with an appropriate nozzle; samples of the herbicides available in the area; a little tomato tin; clean water.

#### Box 17

The session in Lokakpli, where some farmers have been using herbicides for a few years, allowed a good discussion about the other methods to control weeds (manual weeding, good water management, good field-leveling) and also about the modes of application of herbicides. We verified that the farmers have a good knowledge of herbicides. They mentioned the following compounds: Tamariz, Calliherbe, Herbextra, Herbazol, Ronstar, Rical, Round-up and Gramoxone. What seemed less evident to the producers was the right timing and dosages of herbicides treatment.

A woman farmer said she used Herbazol, using one bottle of Herbazol (250 ml) per sprayer (which is far too high a dosage). Another farmer said that he used a mixture of Garil and Herbazol. Another farmer used either one “Herbazol bottle” filled with Herbextra to 15 liters of water or half a Herbazol bottle filled with a mixture of Herbazol and Herbextra to 15 liters; he also said that when mixed together, these two products are very effective and that the dose can be reduced afterwards.

Another farmer explained that he used Tamariz mixed with Herbazol, or Rical mixed with Calliherbe. A woman used Round-up three days after the second tillage.

Many farmers said that herbicides were effective on most weeds, except some weeds like ‘Denis Kouamé’ (*Echinochloa* spp.) and Ngaté or feuille de aranchide (*Marsilia minuta*), which resist any treatment. They were thinking that this was mostly due to the fact that chemical compounds could not kill these weeds.