

Insects in rice cultivation

When human beings don't eat well enough, they will not be healthy and will easily fall ill. Taking medicine in such a state is quite meaningless, as the cause of the illness is known: it is due to an inappropriate diet. This is also true for plants. Indeed, healthy plants are naturally protected against attacks from diseases and pests. For a plant to be in good health, there should be enough sunlight, space, water and nutrients. Module 10 dealt with a healthy soil and the role of nutrients in growing healthy, vigorous plants. In spite of all the precautions that may have been taken to grow healthy plants, they cannot be totally protected from harmful insects. Parts of the plant may suddenly begin to fade or to change shape, or color. The first thing to do is to make good observations of the problem. Next, a sound analysis is made of the problem, resulting in appropriate decision-making of what to do. As previously seen in Modules 11, 14 and 18, it is important to make an accurate analysis, as this will lead to taking appropriate decisions. In this module, we will discuss insects that endanger rice cultivation and insects that are beneficial to rice growth (Reference 21).

- ❶ Summarize farmers' knowledge on harmful insects: identification and damage to rice.
- ❷ Make observations in the field.
- ❸ Synthesize the observations in plenary session.
- ❹ Discuss differences between useful and harmful insects in rice cultivation.



Learning objectives

At the end of this module, the farmers will be able to:

- Recognize the most common harmful insects (*enemies of rice*) and the useful insects (*friends of rice*) in rice production.
- Recognize the types and the importance of damage and of the diseases caused by insects.
- Classify insect damage in relation to the development stages of the rice plant.
- Recognize the different stages in the development of the major harmful insects.



Procedure

1. Farmers and the PLAR-IRM team meet at the PLAR-IRM Center. The facilitator briefly reviews the Module 18 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. Summarize farmers' knowledge of insect damage and management in rice. The facilitator starts the debate by asking the following questions:
 - What is a healthy plant? (Recalling the discussion in Module 10.)
 - How do you know a plant is not in good health?

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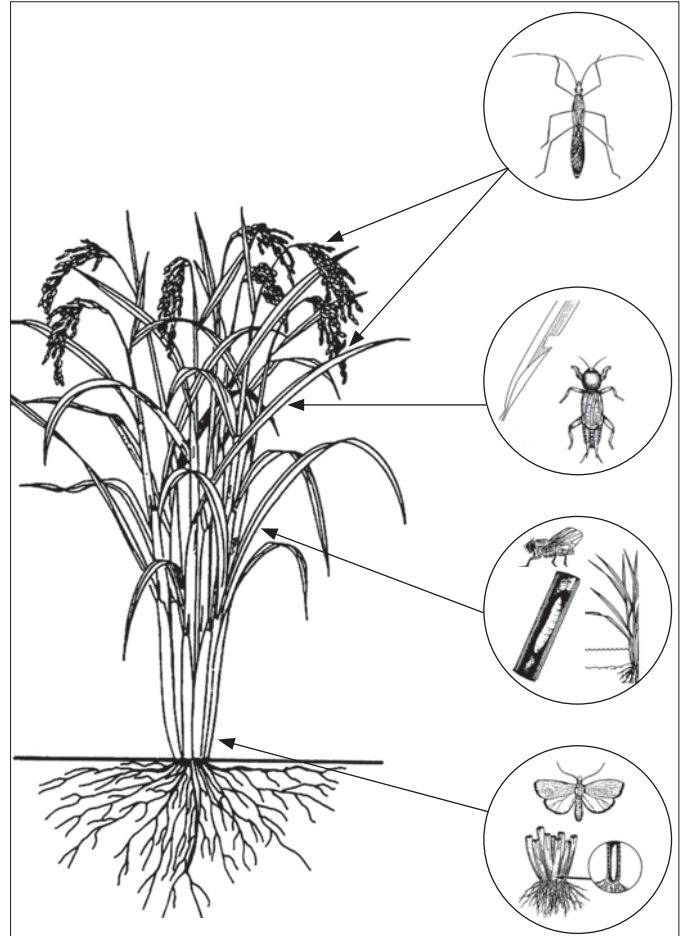
- Could you list some symptoms of disease or some damage caused by insects?
 - Which ones? The facilitator will need to be cautious—the farmers themselves should have made the observations of symptoms or damage!
 - At which stage of growth of rice do these symptoms or damage occur on the field?
 - Which insect or agent causes these symptoms or damage? The facilitator stresses the importance of the farmers differentiating between symptom or damage and the causative agent or insect; this is linked to the distinction between observation (symptoms or damage signs) and analysis (causative agent or the insect responsible for the damage).
 - Are there other insects that can often be found in the paddy fields?
 - Do these insects also cause any damage?
 - If not, what do they do?
4. The facilitator presents the *procedure* for field visit and observation.
- Division into four sub-groups of four or five farmers.
 - Designation of a farmer-facilitator and of a farmer-rapporteur for each sub-group.
 - Each sub-group will visit four sites.¹
5. The farmers and the facilitator depart to visit the four sites.
- Visit of the fields with rice plants in different rice development stages.
 - Observation of the symptoms of disease (or damage) due to insects on rice plants.
 - Discussion of the importance and causes for each of the damage symptoms observed.
 - Sampling of damaged rice plants, which are placed in small plastic bags.
 - Sampling of the insects found in the field, which are caught using an insect trap and then kept in glass jars.
6. Back at the PLAR-IRM Center, the farmers report and comment on their results: each sub-group presents its samples of damaged rice plants and its jars containing insects.
- The facilitator prepares a large sheet of strong packing paper: he/she draws a six-column table with the following headings:



Symptom description	Type of damage	Plant development stage	Cause/agent	Importance of damage	Harmful effect on rice yield
...
...

1. The team of facilitators should prepare the observation sites in advance.

- The first sub-group’s rapporteur begins by describing the symptoms in the first plant sample.
- The facilitator briefly notes the description in the first column.
- The facilitator invites the farmers in this sub-group to specify the type of damage; he/she helps the farmers by telling them that it can be:
 - Cut leaves;
 - Deformed leaves;
 - Perforated leaves;
 - Discolored or spotted leaves;
 - Drilled/bored stems;
 - Discolored panicles;
 - Cut panicles, etc.
- The farmers specify the stage of plant development that the symptom appears.
- Then the facilitator encourages debate on the causes of the damage and tries to obtain the widest range of information from the farmers:
 - When the farmers mention an insect as the cause, he invites them to identify (“to find”) the insect on the leaves or the roots, inside the stem (as a larva) or in one of the jars;
 - The facilitator notes the causes mentioned by the farmers, even when the farmers mention causes other than insects—local names will be used preferably;
 - Using the data from Reference 21, the facilitator can also add elements about:
 - the different stages in the development of insects (the life-cycle) and the most sensitive development stages for rice,



- the kind of damage: the distinction between four types of infestation by insects and larvae must be clearly made:²
 - √ those that stay outside the leaf, and cut or nibble/gnaw them,
 - √ those that enter the plant through the leaf and migrate downwards,
 - √ those that enter the plant from the bottom of the stem or the roots and migrate upwards,
 - √ those that suck the sap from the leaves and grains and thus transmit diseases from one plant to another (compare with HIV/AIDS),
 - the factors due to weather, environment and management practices which may influence the degree of infestation,
 - natural enemies.
- After surveying all the damage found by the first group, the facilitator asks the other farmer-rapporteurs if their sub-groups found some other damage different from these already mentioned. In such a case, these will be added to the table.
 - Then, using column 5, the farmers classify all the damage described by degree of severity, by scoring: for instance, score 1 for the most severe damage, 2 to the second most severe, and so on. The same process is repeated for column 6.
 - The facilitator encourages discussion about the damage (and causes) that the farmers considered as most important. The facilitator explains that, in the following weeks, the ways to tackle these problems will be discussed.
7. The facilitator initiates debate on possible beneficial insects (and similar creatures) to rice cultivation.
- The farmers identify the insects (and similar creatures) that cause no harm to rice but that are nevertheless often present in the field. The farmers describe what these insects (and similar creatures) do and how they feed.
 - If necessary, the facilitator gives some details about the behavior, life-cycle and activity of these beneficial insects (and similar creatures) (Reference 21):
 - Dragonflies;
 - Spiders;
 - Grasshoppers/locusts with long antennae.
8. The facilitator initiates a discussion on how to preserve useful insects:
- He explains that certain weeds can shelter useful insects; e.g. *Paspalum scrobulatum* shelter natural enemies of rice gall midge. He tries to find the plant in the field and identifies the local name together with the farmers ;

2. Apart from these four types attacking the plants, there are also bugs that attack and suck grains (sucking bugs).

- Various means to preserve useful insects are discussed (e.g. to avoid burying the rice stubble and to leave *Paspalum scrobulatum* on the field bunds) and the risks of using insecticides and herbicides are listed.
9. 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.
 10. The facilitator asks volunteer farmers to draw conclusions from the session, and then invites farmers to the next session.

**Time required**

- Three hours

**Materials required**

- Strong packing paper and markers.
- Small plastic bags.
- Insect traps.
- Samples of the growth stages of the most widespread harmful insects; preferably as models, photos or drawings.
- The team of facilitators will have identified four observation sites representative of four rice development stages: just after transplanting, vegetative stage, reproductive stage, and maturity stage. They will have to make sure that these sites show insect damage.

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Box 20

We explained the objectives of the module to farmers in Lokakpli and Bamoro by giving the following example. If someone is ill, she or he can show symptoms such as tiredness, aching joints and headache. These are symptoms that point to malaria. Malaria is the sickness and the headache is a typical symptom of malaria.

The farmers then talked about what they know about damage caused by insects. They mentioned: rice ‘dead heart’; black spots on rice grains; yellowing of leaves after transplanting; caterpillars at the panicle stage; rice can also dry up in some areas. The farmers also talked about the causes of damage and mentioned: green caterpillars, which seem to induce seedling yellowing in the nursery; locusts eating the leaves at panicle-initiation stage; red worms gnawing the roots after transplanting; dragonflies sucking plant sap while fluttering from seedling to seedling; white butterflies, which lay eggs that become larvae that bore into the stems; ladybirds on rice; the fly with antennae, which cuts the leaves; there are also caterpillars inside the rice leaves.

Afterwards, we made three sub-groups of farmers and departed for two different fields, where we collected plants and insects. After coming back, we collected the data, beginning with the first sub-group. The observations are summarized in the following table:

Symptom description	Type of damage	Plant development stage	Field occurrence	Effect on yield	Cause
1. White leaf – onion leaf	Discolored and deformed leaves	Vegetative stage: 0–15 days: +++; 15–50 days: ++; >50 days: 0	++	+++	Insect (gall midge larva)
2. Cut and nibbled leaves	Cut leaves	Vegetative stage > 50 days	+++	+	Locusts Butterfly larvae
3. The heart of the flag leaf is yellow to brown and is dead	Discoloration and deformation of stem and leaf	Beginning of panicle initiation	+++	++	Various butterfly species
4. Yellow and brown round spots on leaves	Discolored and spotted leaves	Fleshy vegetative stage or aged nursery	++	+++	Grasshoppers transmitting rice yellow mottle virus
5. Perforated leaves with translucent areas filled with gnawing insects	Perforated leaves	Fleshy vegetative stage after tillering	+++	+	Small white insect (Caseworm or <i>Nymphula</i>)
6. White empty seeds	Discolored and cut panicle	Flowering stage	+	+	Drought Insect if the panicle can be withdrawn easily: <i>Sesamia</i>

1. Some farmers noticed neither the insect nor the larvae: this suggests they don't know them. We asked farmers to open the ‘onion leaf’ so that they could find the larva. After that demonstration, they understood that the larva had entered the leaf and that, before becoming a larva, there had been an egg laid by an insect, they named ‘mosquito.’ We showed them a photo of the insect. Farmers had difficulty making the link between the larva and the adult; then they were shown a picture of an immobilized cocoon; they then understood that the larva had transformed into a cocoon and that the cocoon would undergo other transformations before becoming an adult midge.
2. No specific comments.
3. The farmers found a hole at the bottom of the stem, which they opened and where they found a larva. We explained that the soil had a role in the cycle: the insect lays eggs on the grass, the larvae survive in the soil waiting for the rice to grow, and then they enter the stem from the bottom.
4. This is an example of transmission of the rice yellow mottle virus; there are several insects that can transmit this virus as the locusts do.
5. These larvae hibernate inside the leaves and stay there.
6. No specific comments.

Afterwards we talked about the insects (and similar creatures) that are not harmful, which are beneficial because they eat the pests, for instance, ladybirds and spiders. The insect reproduction cycle was also presented: Adult–egg–larva–cocoon (pupa)–adult.