Integrated pest management: Rice stem borer

This module is similar to Module 21 and is also closely linked to Module 20. In this module, the integrated management of the rice stem borer is considered. Several species of rice stem borers are found in West Africa (e.g. *Maliarpha*, *Diopsis*, *Sesamia* and *Chilo* species), but in this module, only one of the species (*Diopsis*) is discussed as an example of integrated pest management (Reference 23).

❶ Make observations in the field; sample infected plants.
❷ Reconstruct the life-cycle of a species of rice stem borer most common from the samples.
❸ Discuss the methods of integrated management of stem borer.

Learning objectives

At the end of this module, farmers will:

- Be able to recall the main attacks of harmful insects, the different control methods and the principles of integrated pest management.
- Be aware that it is the combination of methods that builds integrated and effective management of harmful insects.
- Be able to evaluate the nature, severity and importance of damage with a view to taking rational decisions for integrated control.
- Be able to take rational decisions to control the insect, based on the (i) nature, severity and importance of the attack, and (ii) development stage of the rice plant and of the insect.

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.

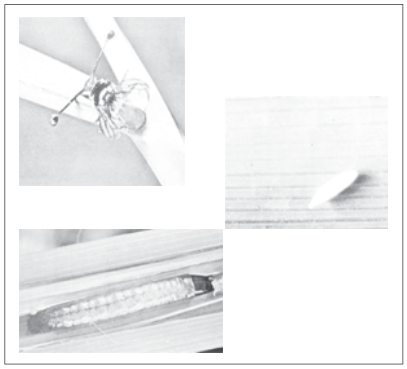
3. In a brief review, the farmers recall the types of attacks by insects (Module 20), the control methods and the principles of integrated pest management (Module 21). If necessary, the facilitator helps the farmers.

4. The facilitator presents the working *procedure* for the field observations:
   - Division into four sub-groups of four or five farmers.
   - Designation of a farmer-facilitator and of a farmer-rapporteur for each sub-group.

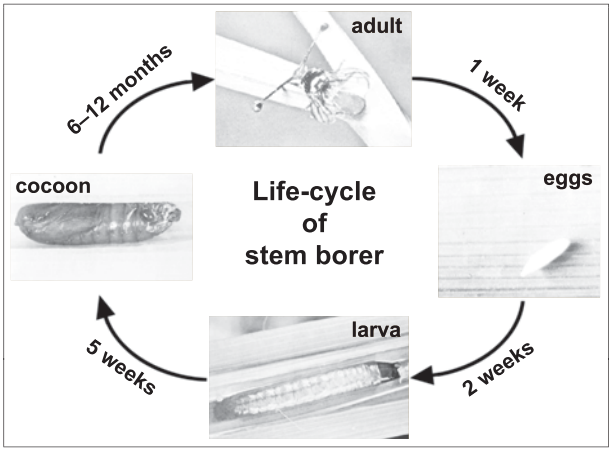
- Each sub-group will visit four sites:[1] the farmers will have to find examples of the damage caused by stem borers.

5. The facilitator and the farmers depart to the field for observation and sampling.
   - Visit to the different fields at different stages of rice development.
   - Observation of the different symptoms and discussion of their severity and importance.
   - Sampling of damaged rice plants, which are placed in small plastic bags.
   - Sampling of insects present in the field, which are caught using sweep nets and then kept in glass jars.
6. Back at the PLAR-IRM Center: presentation of the sub-groups' observations.
   - Each sub-group places its samples of damaged rice and its glass jars on the ground.
7. Reconstruction of the life-cycle of stem borer.
   - Brief review of the various symptoms and types of attack (Module 20).
   - The farmers distinguish between the two main symptoms—'dead heart' and 'white panicle', and also the differences in attack related to plant development stages.
   - They compare the rice developmental stages at which the attack of stem borers is most noticeable with that of African rice gall midge, and farmers discuss the differences:
     – The facilitator assists the farmers in finding the answer for themselves: African rice gall midge appears soon after transplanting, whereas 'dead heart' symptoms are generally observed later in the vegetative stage, and 'white panicles' only after flowering.
   - The farmers discuss the causes for such differences:
     – The facilitator assists the farmers in finding the answer: there is a difference in the life-cycles.
   - The farmers discuss the implications of these differences between African rice gall midge and stem borer, with respect to the risks of proliferation and the implications for rice yield:
     – The facilitator encourages the farmers to think of the relationship between (a) plant vigor, health and age, and (b) its vulnerability to insect attack, and then to evaluate the potential impact of attack before and after tillering.
   - The facilitator briefly reminds the farmers of the interest in understanding insects' life-cycles in order to choose the right time and the right plant development stage to intervene (control).
   - The farmers are divided into their sub-groups and encouraged to find the insects by opening the stems of the plants they sampled in the field.

1. The observation sites should be prepared in advance by the team of facilitators. They should preferably comprise sites showing rice at different growth stages, e.g. at vegetative stage and presenting the symptoms of 'dead heart,' at reproductive stage or maturity stage presenting the symptoms of white panicles.



- After isolating the larva, the facilitator shows the picture of a larva that can be found in infested stems, and places this picture at the bottom of the board.[2]
- Thereafter, the farmers should deduce the origin of the larva and how it entered the stem.
- Next, the farmers have to find where the eggs were laid and what happened to them. The facilitator shows pictures of eggs and of the insect and pins these pictures on the board, respectively to the right and above the picture of the larva.
- Next the facilitator assists the farmers in describing what happens to the larva after it has eaten enough. In order to rest, the larva builds a home where it hides and 'hibernates' until it transforms into an adult insect that can fly. The facilitator shows a picture of a cocoon and pins the image on the board, to the left of the larva picture.



- The facilitator then shows—by drawing arrows between the different pictures—that this represents the four-stage cycle of the insect.
- After reconstructing the life-cycle of a stem borer, the facilitator assists the farmers in determining the duration of each life stage and aligning each with the corresponding rice development stage:
  - The facilitator must demonstrate that the life-cycle of the stem borer (*Diopsis*) is much longer than that of African rice gall midge. Its larval stage can last up to five weeks, as compared to two weeks for African rice gall midge. Furthermore, the adult stage is also longer. The *Diopsis* cocoon, for example, can remain for up to 12 months if the conditions for cocoon hatching are not favorable.
- If necessary, the facilitator provides more information about the insect's biology.

2. We have chosen here the example of *Diopsis*, because it is one of the most frequent stem borers found in the area around Lokakpli and Bamaro where the PLAR-IRM work was initiated.

Control methods

- The facilitator encourages the farmers to reflect on methods for controlling stem borers (in this case, *Diopsis*), using the knowledge obtained from the life-cycle. He/she will stimulate the debate by dealing with the following topics:
  - How can the life-cycle of the stem borer be interrupted?
  - Which of the insect's developmental stages will be easier to attack or eliminate—eggs, larva, cocoon (pupa) or adult?
  - What method control would be more feasible: curative or preventive?
- Next, the facilitator stimulates farmers' curiosity to find out where the cocoon is hidden during unfavorable periods (i.e. when it hibernates) and asks farmers to suggest or identify ways to destroy the cocoons.
  - If necessary, the facilitator may suggest burning crop residues or flooding the field completely for at least three days before plowing.
- The facilitator encourages the farmers to think about other possible techniques for controlling stem borer, for instance, localized insecticide treatment or the use of a trap crop (Reference 23).

8. 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.

9. The facilitator asks a volunteer farmer to draw conclusions from the session, and then invites farmers to the next session.

Time required

- Three hours

Materials required

- Strong packing paper and marker pens.
- Observation sites with severe damage by stem borers, both at vegetative stage (with 'dead heart') and at reproductive stage (with 'white panicles').
- Pictures showing the four stages in the life-cycle of stem borers.
- Small plastic bags and glass jars.