

## Reference 17 Farmers' experimentation

### Summary

This reference presents six important steps to promote farmer experimentation: (i) meeting for consensus-building and planning, (ii) lay-out of the experiment, (iii) monitoring of the experiment, (iv) field visits, (v) managing and analyzing the data, and (vi) evaluation.

The experimentation phase can be split into six steps, in the context of participatory learning and action research (PLAR) (Table 17.1). It should be noted that farmer experimentation is designed only for a group of test-farmers within the group of farmers following the PLAR for integrated rice management (IRM) curriculum.

### STEP 1: Consensus-building and planning meeting

This section describes how to design and monitor experiments with test-farmers in an action-research context. The facilitator guides the discussion to help farmers define clearly the objectives of the experiment or test and what they hope to learn from it. Farmers are encouraged to outline the objectives as hypotheses, which will help them design the experiment and specify the information to be collected. They also discuss how they want to try out the new methods, which will involve describing the new practices, and how they will fit into existing management strategies. The discussions cover the following issues:

- How to implement the new practice.
- Which current practice the new method should be compared with.
- The number of treatments (different new practices).
- How and where to lay out the experiment, etc.

The PLAR-IRM team then outlines how to design an experiment. It is necessary to follow certain guidelines and use a systematic approach so that the results of the experiments can be analyzed and used. A checklist is given below.

- The choice of treatments to be compared: the range of choices is determined by the hypotheses of the experiment and is guided by the number of factors to be compared and the levels for each factor.
- It is necessary to include the farmers' practices as 'control' treatment.
- Specify the niche (and adequate conditions needed) to apply the new practices in the farmers' current management strategy: this will raise questions about the location of the test-site and the site itself—the sites should be representative.

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**Table 17.1 Six steps to promote farmers' experimentation**

Description	Objectives	Expected outputs
<p>Step 1</p> <p><b>Planning meeting</b></p>	<ul style="list-style-type: none"> <li>• Assist farmers in defining objectives and designing, monitoring and evaluating experiments</li> <li>• To agree on procedures for experimental designs and for monitoring the experiments</li> </ul>	<ul style="list-style-type: none"> <li>• Objectives and hypotheses of experiments are clearly defined</li> <li>• Experiments designed</li> <li>• An agreed procedure for the lay out and monitoring of the experiments, including the roles and responsibilities of the PLAR-IRM team and test-farmers</li> </ul>
<p>Step 2</p> <p><b>Lay-out of the experiment</b></p>	<ul style="list-style-type: none"> <li>• To train the farmers how to lay out experiments</li> <li>• To allow farmers to implement the experiment on their own</li> <li>• To agree on procedures for experimental designs and for monitoring the experiments</li> </ul>	<ul style="list-style-type: none"> <li>• Test-farmers trained to lay out experiments themselves</li> <li>• Facilitators and farmers agree on procedure for monitoring experiments</li> </ul>
<p>Step 3</p> <p><b>Monitoring of the experiment</b></p>	<ul style="list-style-type: none"> <li>• To see how the experiment performs</li> <li>• To assess the farmers' opinions about the experiments</li> <li>• To collect the information needed to interpret and judge the experiment's performance</li> </ul>	<ul style="list-style-type: none"> <li>• General data about the experiment's performance</li> <li>• Farmers' opinions and preferences and their reasons for them</li> <li>• Data to enable analysis of the experiment's performance</li> </ul>
<p>Step 4</p> <p><b>Field visits</b></p>	<ul style="list-style-type: none"> <li>• To encourage participating farmers to exchanging their experiences</li> <li>• To share information among test- and non-test-farmers (within and between villages)</li> </ul>	<ul style="list-style-type: none"> <li>• All test-farmers to be well-informed about new techniques</li> <li>• Non-test farmers informed about the experiments conducted</li> <li>• Information exchanged between farmers and PLAR-IRM team</li> </ul>
<p>Step 5</p> <p><b>Managing and analyzing data</b></p>	<ul style="list-style-type: none"> <li>• To enter and process data</li> <li>• To analyze data</li> <li>• To organize results in tables, figures, etc.</li> <li>• To summarize results, so that farmers can easily understand them</li> </ul>	<ul style="list-style-type: none"> <li>• Data processed on computer spreadsheets</li> <li>• Data analyzed</li> <li>• Results accessible for farmers</li> </ul>
<p>Step 6</p> <p><b>Evaluation: discussing results with farmers</b></p>	<ul style="list-style-type: none"> <li>• To present the results of data analysis</li> <li>• To gather what farmers think about the results</li> <li>• To identify suggestions for follow-up</li> </ul>	<ul style="list-style-type: none"> <li>• All farmers informed about the results of data analysis</li> <li>• Farmers' comments on results</li> <li>• List of suggested follow-up activities</li> </ul>

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- The arrangement of the treatments, how they will be laid out in the field: the arrangement has to be as simple as possible and the different treatments will be preferably lined up and separated by narrow walkways.
- The plot size: the plot has to be large enough to include all treatments including the borders and walkways.
- The replications between farms: avoid replications in the same plot or on the same farm.
- Non-experimental variables should be kept in mind.

*Depending on how the farmers view experimentation, some aspects will receive more attention than others. The experimentation will allow farmers and the PLAR-IRM team to:*

- Compare the results obtained by different test-farmers, thereby increasing the farmers' learning capacity and knowledge.
- Draw conclusions about the effectiveness of the techniques and practices tested (involving statistical analysis).
- Convince other farmers to start similar experiments.
- Convince partners (other researchers, extension workers and policy-makers) of the validity of farmers' experimentation.

The farmers should then discuss the monitoring and evaluation of the experiment, and the indicators (criteria) used to assess its results. These may include agronomic criteria, such as crop development, yield, height of plants; socio-economic criteria, such as labor demand, input costs and cash income; or both.

The farmers should also consider the following issues: what external inputs are needed? What are the requirements for labor or other farm resources? What kind of knowledge does the new practice require? What are the benefits of the new technology in terms of increased yield, economic or other advantages? What is the risk involved?

The farmers must then discuss how to collect information; what they will observe and measure; the usefulness of a notebook or recording sheets to keep records of what happens in the field and what management practices they apply.

The PLAR-IRM team should make complementary suggestions as to what to monitor, how to monitor, and how to evaluate the findings. It is important to establish a clear link between the objectives of the experiment and the data required to assess whether it has achieved the desired results. Monitoring their experiments will show the farmers how various factors influence the results. Monitoring will also help explain the different results obtained by different farmers, and should also improve how future activities will be planned.

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The PLAR-IRM team might have additional objectives, particularly when farmers' experiments are part of their own research activities. In this case, other monitoring–evaluation sheets have to be developed in order to collect the additional information:

- Information related to the new practice or technology being tested. This information will be based on the farmers' criteria for success, such as plant growth, leaf color, crop development or yield.
- Data related to factors that are likely to influence the technology's performance, which include (1) environmental variables such as soil types, climate and pest infestation, and (2) management practices such as land preparation and fertilizer application.
- Socio-economic data that might influence whether farmers adopt the new practices: input costs, produce prices, farmers' access to resources (farm size, labor, etc.) and to markets.
- It is very important to know, and to assess, what farmers think of the new practice or technique being tested and to understand the reasons for its adoption or rejection.

The PLAR-IRM team needs to be careful not to overload the farmers with a lot of data collection, particularly when these data are not of great importance to the farmers. The exchange of views between farmers and the PLAR-IRM team should lead to a consensus on how to lay out and monitor the experiment, and to an agreement about the roles and responsibilities of the test-farmers and the PLAR-IRM team.

### **STEP 2: Lay-out of the experiment**

The demonstration of the lay-out of the experiment is a kind of training session given on a farm. Participants are shown in a practical way how to lay out an experiment. Although the overall design of the experiment has been agreed upon during the design and planning meeting (see Step 1), it may have to be adapted to the prevailing conditions, which implies that the training session should review site selection, experimental plot size, border effects, marking out plots, etc.

The training session often starts with a short explanation of the underlying principles of the lay-out followed, by the lay-out itself being implemented by the participants and a member of the PLAR-IRM team. In principle, the demonstration only covers the specific treatments, although the practical fieldwork often actually includes activities that do not directly relate to the treatments. As a rule, farmers generally follow their own practices for these activities.

### **STEP 3: Monitoring the experiment**

Monitoring is an integral part of the experimentation phase since it provides information that is needed in order to learn from the experiment. To a large extent, the type of information and data to be collected are determined by the objectives (see Step 1).

We can generally group the type of information that needs to be collected into four categories:

- Data related to the performance of the new practice or technology (also called farmers' indicators of success): observations.
- Data related to factors that may affect how the experiment performs: environmental factors and management practices.
- Socio-economic data that might influence the adoption or non-adoption of the new techniques.
- Information on what farmers think about the new technology (their perception).

If illiteracy is widespread among the participants, they should use forms and symbols to assess the technologies. In our experience, farmers are keen to record the information linked to the lay-out and management of the experiments. They are also able to evaluate crop performance in terms of plant growth and color, pest damage and crop yields. However, the information collected by farmers tends to be qualitative and is often only recorded on an irregular basis, depending on the farmer's curiosity and available time. Although most of the monitoring is done by farmers, there is still plenty for the PLAR-IRM team to do. They should visit the experimental sites regularly and encourage farmers to monitor their experiments by observing and recording what they see.

If the farmers' experiments are part of a wider research program, the PLAR-IRM team will also have to record data and should visit each site regularly, noting their observations on a pre-established monitoring form. This form should be designed on the basis of discussions about monitoring held at the experiment-design meeting (see Step 1). The type of data recorded will not only depend on the experiment's objectives, but also on the PLAR-IRM team's interests and agenda. They may focus on estimating quantitative data related to factors that influence how the new techniques perform, such as farmers' access to credit and control over resources (water, land) or their use of inputs. The team may also want to record quantitative information on yields using yield sampling.

The PLAR-IRM team should note what farmers think of the new test practices and, for experiments that consist of several different treatments, they can compare and rank treatments. This kind of exercise is usually done twice for crop-related experiments, once during the vegetative stage and once after harvest. Comparing pairs of treatments is a very useful way of determining farmers' preferences. Experiments are monitored not only on the individual test-farmer plots, but also at farmers' meetings during which participants discuss the advantages and disadvantages of the newly tested practices.

#### **STEP 4: Field visits**

The information gained from the experiments should not be restricted to the test-farmers. During the observation modules, the experiments will be visited by all the PLAR-IRM participants.

#### **STEP 5: Managing and analyzing data**

Once collected, the data must be entered, analyzed and presented in a user-friendly way for farmers and be easy to manipulate. It should be managed in a way that will facilitate communication between farmers and the PLAR-IRM team. All participants should agree on how the data should be handled and managed. The PLAR-IRM team should refer to group field observations and to farmer meetings to better understand results obtained by test-farmers and discuss with them the practices that have been tested.

All the information collected in the course of the experiment is summarized on a monitoring sheet designed for each specific experiment. Additional information may also be needed on labor inputs, fertilizer prices, etc. The information collected can be entered into a computer and processed into data spreadsheets. There are various software packages available for organizing and analyzing data, but we recommend that the analysis be kept fairly simple, so that it remains meaningful for farmers.

However, the PLAR-IRM team may have their own research objectives that require a more refined analysis. The initial analysis consists of calculating mean values for all the criteria identified by farmers as representing 'successful' performance, e.g. yield. Different tools can then be used to generate a more specific set of analyses, such as adaptability analyses and cost-benefit analyses.

We mainly use more qualitative analytical tools to analyze the results of farmers' experiments, giving priority to the evaluation criteria proposed by the farmers. The information obtained from ranking and paired comparisons is particularly useful for this. The next step is to compare the results of the analysis with observations made by the PLAR-IRM team and the farmers' comments on the different tests.

Before the results are discussed with farmers they are drawn up into a series of visual aids (*see* Step 6). Analytical results are most commonly presented in tables, charts and graphs, with quantitative and qualitative information shown as scores, pictures or symbols.

#### **STEP 6: Discussing results with farmers**

Once the data have been analyzed, all interested farmers are invited to discuss the results in a community meeting. The presentation starts with a review of the farmers' indicators of success, followed by a presentation of the means calculated for each indicator. The farmers are then asked to comment on the results and to discuss what they think has caused the differences between results obtained by different farmers: environmental factors, differences in management practices or any other factors. If management seems to be the major cause, it is important to identify why some farmers have managed the experiments more successfully than others. This discussion should help to highlight how differences in access to and control over resources influence the practices being tested.

The farmers' views of the tests are discussed next, starting with a presentation of how farmers ranked the different treatments, and the percentage of farmers strongly for or against the new practice. Farmers

should be encouraged to discuss why some are in favor of the practices being tested and others are dissatisfied with them.

The meeting concludes with the farmers' suggestions on how to follow up on the experiment. They might decide to reject the new practice or to try it out for a second season, possibly with an adapted design, or they might propose widespread trials.

### **Bibliography**

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