

SOME LESSONS IN ADAPTING THE IPM FFS APPROACH TO PARTICIPATORY PLANT BREEDING (PPB) IN RICE

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1. Introduction

The Farmer Field School approach in IPM is one of the most successful methodologies that; a) strengthen farmers' role as researchers; and b) strengthens farmers' understanding and use of ecological science and technology to manage pest stresses in their farms. Adapting this approach to plant genetic resources (PGR) research and development is a new and challenging task.

(Note: In fact the more successful FFS in PGR is happening where the FFS in PGR use the IPM platform, and where the communities have completed the FFS in IPM.)

2. Background

2.1 Narrowing of the genetic base of the rice crop.

There are more than 100,000 different rice accessions in the IRRI gene bank. This rich diversity is the creation of local farmers. Today however, this rich diversity has been lost. The Philippines cultivated more than 5,000 varieties of rice every year but this is now reduced to around 20 varieties occupying 90% of the rice lands. Thailand had more than 8,000 varieties but now cultivates only 5 varieties in the irrigated areas of the country. India contributed more than 12,000 varieties to the IRRI collection but cultivates only 20 varieties in 60% of their rice lands. Most of these popular varieties are even sister lines, sharing common pedigrees.

Impact of the loss of genetic diversity. The narrow genetic base of the rice crop means that it also lost its horizontal resistance to biotic and abiotic stresses. This resulted to greater dependence on pesticides, and dependence to inputs like fertilizers and massive supply of water.

Impact to farmers. Farmers, who created and maintained thousands of varieties in the past are now only simple end users of varieties created by research institutions and by commercial breeders. Seeds and the different varieties they used today are no longer created and generated from their farms but are now external inputs. This led to the loss of the local knowledge in PGR management, and in increasing farmers' dependence.

2.2 The Context

Intensification of agriculture. The increase demand for food and the integration of farming communities to the market economy changed farming from a basically subsistence system of production to intensive a market oriented production system. The

cultivation of rice moved from a single cropping season per year to two or even three cropping seasons per year. Productivity per hectare of land also needed to be increased. Rice cultivation not too long ago relied largely on the onset of the rainy season. Today, 70 to 90 percent of rice production depends on irrigation infrastructures. Soil fertility in the past was mainly provided by a fallow period after harvest. Today, intensive rice production areas depend on external inputs of fertilizers. The mixed cropping systems that were more ecologically balanced was replaced by intensive mono-cultures increasing pest and disease pressures. This led to greater dependence on external inputs and chemical pesticides.

Farmers' rice varieties that fitted the subsistence systems of production were replaced by new varieties bred for intensive systems. For example, photo-sensitivity, a characteristic of 99.9 percent of farmers' rice varieties, has fixed flowering dates and cannot be planted anytime.

Intensive agriculture increased rice production and productivity of rice farming. Real food prices have in fact remained stable for several decades, food are available to those who are in other sectors of society. However, sustainability of this intensive system is seriously doubted as the basic resources for agriculture are severely destroyed. Soil degradation, genetic erosion, ecological imbalance, etc are some of the examples.

3. The 3 Levels of Tenancy

Access to land will continue to be a major concern as farmers lack of access to it is a key cause of poverty. Land tenancy also impacts on agricultural productivity. Rice productivity in Vietnam which had a successful distribution of land is around 20% higher than that of India and the Philippines. These two countries are countries that have not succeeded in agrarian reform in Asia.

Market tenancy. Farmers continue to loss income because of their lack of control of the market. In the Philippines, the farm gate price of rice is around 30 to 40 percent of the retail price of rice, for example. Rice farmers have also become a financial market for production loans. One of the reasons for this development is the needed external inputs in intensive agriculture.

Technological tenancy. Farmers' dependence on external technologies increases their production costs. More destructive is their dependence on the knowledge and innovation of others. This dependence is a dis-empowering process.

Participatory plant genetic resources research and development addresses a portion of farmers' tenancy in technology. It is an effort to assist farmers to regain their role in PGR management, reduce their dependency and contribute to their empowerment within the context of intensified and market oriented agriculture. In the end, the rationale behind the need for intensification of agriculture, like unsustainable consumption patterns and the inequity of market forces need to be faced. In fact, the greater and ultimate challenge is in confronting the development paradigm and inequity of the world and its structures that perpetuates poverty and destroys natural resources.

4. Objectives

The main objectives if the FFS in PGR management are: a) to strengthen the farmers' role in PGR management especially plant breeding; and b) to broaden the genetic base of agricultural crops. This requires two additional objectives; c) help establish the scientific bases of participatory PGR management; and d) help develop the FFS educational approaches and tools.

Rice production cannot be sustained unless the genetic base of the rice crop is broadened. There is a need to increase the number of varieties, and there is a need to utilize greater number of parent materials. There is a need to provide varieties that fit thousands of micro specific conditions, and to respond to the different needs, uses and tastes of different peoples. This is a difficult task for centralized research and breeding institutions. These institutions have a strong role in breeding for prime irrigated conditions and for few but widely adapted varieties, only.

Farmers have created rich PGR diversity in the past. The genetic diversity of the rice crop can only be broadened if the farmers system of PGR management is strengthened so that farmers will again breed for their micro-specific conditions (also for the market), and for their different needs and tastes. This will contribute to the over-all agenda of farmers' empowerment.

4.1 Sociological Objectives:

- To empower farmers' PGR management
- To broaden the 'actors' in PGR research and development
- To counter dependency
- To strengthen local knowledge systems
- To ensure that breeding objectives fits local and farmers' needs
- To strengthen the gender roles in PGR management
- To strengthen farmers' alternative socio-economic and political institutions

4.2 Biological Objectives

- Broaden the genetic base; to increase PGR diversity and increase raw materials for farmer breeding
- Breed for micro-specific environments
- Breed for local adaptation
- Breed for distinct local needs
- Breed for low input conditions
- Breed for resistance against stresses
- Breed for the market

5. Brief Review of the Pedagogy

Education for liberation. The FFS methodology will avoid “banking and spoon feeding” way of imparting information. It will be inductive and help build critical thinking. The process will affirm the existing farmers’ knowledge system on PGR management and shall build from it rather than replace it.

Starting from where the people are. Farmers have strengths and weaknesses. Farmers are also shaped by their situation and are victims of what Paulo Friere calls the “culture of silence”, or the culture of poverty. Many have lost confidence in their capacity to provide solutions to farming problems and needs. Many have started to believe that the only effective sources are research institutions and commercial corporations. There is also the internalization of the “oppressor image” where the poor admire the powerful and doubt their own capacities. With this reality, the FFS in PGR management need to consider the objective, and most important, then subjective realities in the farming communities. The objective reality will define the objectives. The subjective reality will largely define the methodologies.

Methodological Principles. “Praxis”, the action reflection process of gaining knowledge, is the main approach. Thus the FFS will be a knowledge-based process that will provide farmers direct experiences as bases of affirming and gaining new knowledge. The process will also ensure collective experiences and systematization of knowledge. This will help ensure the strengthening of farmers’ institutions.

6. The Topics Contained in a FFS for PGR Management

- Understanding the “state of the PGR resources” (of rice)
- Understanding the “state of farmers’ knowledge and skills in PGR management”
- Setting the breeding objectives
- Setting the knowledge and skills to be improved
- The importance of agro-biodiversity
- The need for base broadening
- The breeding cycle
- The morphology of the rice plant and stages of plant growth
- The inheritability of traits
- The reproductive systems of the rice plant
- Emasculation techniques in rice breeding
- Selection of parent materials and pre-breeding tasks
- The nature of segregation
- The different selection techniques
- The breeding cycle
- The maintenance and production of high quality seeds and varietal rehabilitation
- Selection techniques, from traditional mass selection techniques to bulk, pedigree and single-plant selection techniques
- Documentation
- Seeds supply and seeds business systems that exists
- Policies that support or hinder farmers’ PGR management and base broadening

All of these topics require field experiments and exercises with appropriate farmers’ research tools.

7. Examples of approaches and tools of the FFS on PGR management covering the diagnostics and objective setting stages.

These are key stages that will ensure grounding of the season-long FFS. These tools will; a) help ensure farmers' leadership in assessing the state of their PGR of crops selected by the project; b) to help ensure that the research and development objectives are set by farmers; c) to help ensure that the local farmers are able to assess the strengths and limitations of their PGR management and determine the additional knowledge and skills they need to meet the increasing stresses and demands of their agricultural system.

a) Table on Farmers' establishment of the state of the PGR (of selected priority crops).

Variety Name	"Age" – no. of years used in the community	Source of the cultivar	Popularity – percentage of use vis-à-vis other varieties	Positive traits	Negative traits	Personal experience caused by negative traits

This table is aimed at; a) capturing the objective PGR situation in the village; b) capturing the perceptions of local farmers (the subjective reality); c) capturing the human/personal and emotional components of the PGR situation. The process of establishing the state of PGR by the community should be the basis of the community's motivation to work on their problems through the FFS.

b) Table on Research and Development Objectives

Important Traits			
1. Yield	Low (quantify)	Medium (quantify)	High (quantify)
2. Duration	Shortterm(quantify)	Mediumterm(quantify)	Longterm(quantify)
3. Plant Height	Low (quantify)	Medium (quantify)	High (quantify)
4. Tillering	Low (quantify)	Medium (quantify)	High (quantify)
5. PestResistant	Low (describe)	Medium (describe)	High (describe)
6.DiseaseResistant	Low (describe)	Medium (describe)	High (describe)
7.DroughtResstant	Low (describe)	Medium (describe)	High (describe)

Notes:

- This is the next step after the “state of PGR exercise contained in the first table. The bases of selecting the traits as their research and development objectives are in the first table.
- A creative system of community ranking of the traits will ensure that their research and development objectives will incorporate a combination of traits, and more important, the farmers will see that there cannot be one super variety to respond to the needs of their farming conditions; unpredictability of rain, pest and disease resurgence, etc.
- Another approach is for the community to rank their varieties, first. Then after the ranking, use table “b” to study each variety. If a variety rank low yet has been cultivated in the community for a long time, probe for the traits that caused its continuous cultivation. This will highlight the creative use of diversity for diverse needs, conditions, stresses, etc.

c) Table on Farmers’ PGR system, knowledge and skills

Process	Farmers’ objective	Who decides the objectives	Who is directly involved	How – techniques	Strengths	Weaknesses
Seed selection						
Sourcing new cultivars						
Evaluation methods – testing techniques						
Seed multiplication						
PGR exchanges						

Guide questions for analysis

- Do the community need more cultivars and increase rate of introduction? If in need, let the farmers identify reasons why they have failed to do so satisfactorily. This is to identify constraints of their system of access.
- If in need of more cultivars, ask the farmers how they will get access, adapt and develop new cultivars that will meet their development objectives. This will further identify the areas of their system, knowledge and skills that need to be improved.

- Open pollinated varieties like maize, are maintained by farmers as distinct cultivars. Some communities develop new lines or varieties from existing cultivars. Ask farmers how they do this. This is to establish clearly the existing knowledge and skill in PGR management, and to start with these knowledge and skills in the process of improving their system to meet their research and development objectives.
- If some varieties “deteriorated”, e.g. loss of vigor, resistance, “uniformity”, etc, ask farmers what are the causes of deterioration. This will lead to examining their system of selecting seeds for the next season, and to identify areas for improvement.
- Finally, ask farmers what they need in order to meet their development objectives in terms of: a) raw materials to select from (and adapt); b) methods of evaluation and study; c) knowledge and skills.

Guidelines in using these tables.

- These tables are intended for farmers’ use. The facilitator will help farmers use the tables but the data and the actual use of the table should be by farmers. More work needs to be done to ensure participation of non-literate farmers by using visual representation.
- These tables can be used by the field technicians and project advisers, but only as a guide while assisting farmers gather and analyze the data.
- The first step is a one-to-one discussion by the field technicians with individual farmers using the tables (informally and not in a structured interview). This is to start the farmer in thinking about the state of PGR of selected crops, its problems and strengths, possible development objectives, and areas where his system PGR management need improvement.
- The second step is small and formal group discussion (of 4 to 5 farmers). At this stage, the tables shall be used by farmers and field technicians. They will do the following: a) in systematize farmers’ data; b) set up the group’s research and development objectives; c) identify areas of their knowledge and skills that need improvement.
- The final step is a group / community meeting where the reports of the different groups are discussed, analyzed and consolidated.

These guidelines above are important for the following reasons:

- To ensure that the project’s research tools such as tables and graphs do not become tools only of researchers but become tools for and by farmers;
- By conducting one-to-one discussions with individual farmers, the field technician will have access to different sources of data and different perceptions and personal

experiences. Negative experiences of farmers caused by problems related to PGR can help ensure personal and emotional commitment to work on the problems.

- By conducting small group discussions and small group systematization of data and analyses, individual data and informal analysis can be counter-checked reaffirmed, and systematized. This is the first step in which farmers' data and analyses become collective data and analyses.
- Group presentation of their data and analyses will ensure that the voice, perception and opinion of most people are well represented to avoid the domination of a few individuals during a bigger meeting. Communities are not egalitarian equal societies and there is a need to avoid allowing the richer and more powerful sector of the community providing the data and making the analyses.

8. The same pedagogical approach and framework is used in the field experiments and exercises for the other topics listed above. The following key aspects are considered: a) scientific grounding; b) that data is gathered and analyzed by farmers; c) that it is important to consider the subjective perceptions of local farmers; d) that the emotional components are highlighted.

9. Challenges

a) The results of PGR research and development will take several seasons, unlike an IPM FSS where definite conclusions are reached at the end of one season.

b) There is a greater need to understand the impact to PGR diversity, at the spatial and temporal levels, resulting from participatory PGR management. In generally uniform conditions of irrigated lands under intensive agriculture, "star" varieties will tend to be more popular.

c) There is a need for institutional and policy reforms to support on-farm PGR management, to broaden the genetic base and to strengthen farmers' role. Plant breeding institutions need to increase or adjust its role, donor agencies need to realign their resources, policies (e.g. seeds certification systems that fit commercial and institutional plant breeding) need to be reformed.

d) The most important challenge is to contribute to the scientific bases of participatory PGR management, and to help develop the educational processes of the FFS.

(Notes on this paper: The lessons and ideas on this paper, among others, are directly related to activities and projects listed below:

a) This is a result of recent efforts under a Southeast Asian project on PPB involving the Philippines, Cambodia and Indonesia called "Farmers' Agricultural Initiatives in Research (FAIR)", and this framework and some of its tools were introduced to a similar project in Mali last May 2002;

b) FAIR built on the efforts of a project called “Biodiversity Use and Conservation in Asia (BUCAP) that involves Vietnam, Bhutan and Laos, and BUCAP in turn built on the experiences of a project called “Community Biodiversity Development and Conservation (CBDC)” and “Seeds of Survival Project”(all 3 projects coordinated by SEARICE);

c) Community Organizing experiences in the Philippines and Asia.)