Participatory varietal selection: short duration legume crops for rainfed rabi in India and Nepal

Summary
Poor farmers in marginal areas continue to grow old crop varieties that are often susceptible to pests and disease, and which are less suited to current constraints and opportunities experienced by farmers. These farmers have had little exposure to new varieties, whilst those that have been released are often not suitable for conditions on marginal lands. One means of addressing this problem is to place the seed of novel cultivars directly in the hands of the farmers. By facilitating collaboration between plant breeders and farmers, the poorest farmers gain the opportunity to benefit from new varieties. Methods used to achieve this are known as Participatory Varietal Selection (PVS) and client-oriented breeding. This record focuses on Participatory Varietal Selection in the Terai region of Nepal.

Description
1. Rice fallow and the rabi season
Rice-fallows are lands used to grow rice in the kharif season but left uncropped during the following rabi season. A scoping study funded by the UK Department for International Development (DFID) identified the presence and location of large areas of rice fallsows in India, Pakistan, Bangladesh and Nepal. Given the large area of rice fallsows, and thus the great potential for impact of rainfed rabi cropping (RRC) in India and Nepal a pilot, diagnostic project was implemented between October 2001 and June 2002. Surveys showed that farmers were generally not aware of, or did not pursue opportunities for RRC. Those studies identified many reasons for this, including physical, environmental and social factors, and the relative importance of these varies in different places.

The findings of the surveys were complemented by hands-on experience of farmers who implemented preliminary trials of the RRC technology developed in the Barind area of Bangladesh. An impact study from that project identified access to seed of appropriate varieties, training and hands-on experience as key factors influencing Bangladeshi farmers to adopt RRC. Additional factors identified by farmers in the India and Nepal study sites were the importance of early sowing (and thus the timely sowing and harvest of the preceding rice crop); the value of early maturing varieties (to avoid drought and to target markets for green pods sold as a snack); and of protecting small, scattered plots of crop during the rabi season from free-grazing animals. Poor soil fertility, linked to lack of resources in general in these villages,
was also highlighted by farmers and was confirmed by analysing soil samples taken from trial fields. Almost all soils were very acidic in nature (and thus prone to various micro-nutrient deficiencies) and were also low in phosphorus. There was widespread enthusiasm for RRC from farmers who participated in the preliminary studies, coupled with self-analysis of the pros and cons of the elements of the preliminary “package”.

2. Participatory varietal selection

Participatory varietal selection (PVS) assumes that, varieties exist that are better than those currently grown, but which farmers have not had the opportunity to test, or adopt. In PVS, farmers are given varieties to test in their own fields. Researchers have used seed of cultivars that have already been released, not only from the target region but also from other regions or countries, yet have the potential to be useful in elsewhere.

A further project using Participatory Varietal Selection addressed the constraints identified and scaled up the preliminary research outputs of the previous study in villages in Orissa, West Bengal, Jharkhand, Chattisgarh and Madhya Pradesh states in India and Dhanusha, Jhapa, Kapilvastu, Morang, Saptari and Siraha districts in Nepal. The project followed a holistic approach to overcome the technical and social problems associated with rice - fallow systems through participatory action research and development activities.

3. Outcomes in India

In India, farmers preferred short-duration “kabuli” chickpea varieties such as ICCV 2, KAK 2 and JGK 1 over “desi” chickpea varieties (ICCC 37 and local) because of their bold seed and higher market value. The optimum duration of seed priming “kabuli” chickpea varieties was worked out to be about four hours compared to eight hours or overnight soaking of “desi” chickpea varieties.

The preferred tillage method for sowing the rabi crop (e.g. chickpea), following rainfed rice involves two ploughings of the land followed by sowing the seed by dropping behind plough and then planking. Planting in large blocks, sometimes involving land sharing, allowed cost-effective protection from free-grazing animals.

Most of the rice-fallow soils examined were low in nitrogen, phosphorus, boron, molybdenum, zinc and native rhizobia. Molybdenum application through seed priming (at 0.5 g sodium molybdate per kg seed per litre water) increased chickpea nodulation by about 90 percent and grain yield up to about 30 percent and was as good as, but cheaper than, soil application in increasing yield. Relative to controls, molybdenum content in chickpea grain increased up to 2.4-fold using Mo-primed seed. The main advantages of Mo application through seed priming are ease of application, uniform application and cost saving by about 30-fold.

Similarly, Rhizobium inoculation was found to be compatible with on-farm seed priming and these two components have been added to the RRC package. This improved RRC package for growing chickpea on residual soil moisture after rainfed rice was tested and adopted by about 10 580 farmers in representative rice fallow areas of eastern India. Chickpea yields were invariably low in the first year that the farmers tested the package, however, it was a valuable learning experience and the farmers were enthusiastic about growing chickpea in subsequent years.
Collar rot caused by Sclerotium rolfsii is an important biotic constraint of chickpea grown in rice fallows. Efforts have been underway to protect the crop from collar rot by exploring simple methods of combining fungicide (e.g. captan) application with seed priming. Recent trials at several locations in eastern India indicated that use of short-duration rice varieties (Ashoka 200F and Ashoka 228 developed under another DFID/PSP project) resulted in higher yields of succeeding chickpea crops (122 percent in Orissa; 94 percent in Chattisgarh; 36 percent in Uttar Pradesh; up to 46 percent in M.P.), compared to chickpea grown after a traditional long-duration variety (e.g. swarna or local).

The farmers preferred these two short-duration rice varieties because they enabled them to sow post-rice crops earlier and thus maximize the potential of the whole rice-chickpea system. As the rice-fallow soils are generally low in phosphorus, the effect of loading chickpea seeds with extra phosphorus during the seed priming process was tested during rabi 2005 - 2006. A significant response of chickpea grain yield (11 to 65 percent) to phosphorus application to soil was recorded in six villages, while the response to seed priming with phosphorus was recorded in three villages of Chattisgarh and M.P. and the response ranged between 24 and 50 percent.

Chickpea cultivation following rainfed rice has been reported (by farmers in Chattisgarh and Orissa) to be beneficial for the following rice crop and thus should be contributing to the overall sustainability of the rice-based system. Overall rainfed rabi cropping technology developed for rice fallows of eastern India offers great scope to improve the livelihoods of resource-poor farmers.

4. Outcomes in Nepal
In Nepal, the project employed a system-based participatory research and development approach where the activities were reshaped based on the feedback from the experiential learning cycles. The interventions included participatory variety selection (PVS) and strengthening community-based seed systems for producing seeds of a wide range of crops. Farmers have adopted a range of crop varieties of rice, chickpea, mungbean, pigeon, and other resource management options. Scaling up of farmer-preferred crop varieties through Informal Research and Development (IRD), together with validation and promotion of resource management options, such as Integrated Pest Management (IPM), Integrated Plant Nutrient Management System (IPNMS), Integrated Crop Management (ICM) is ongoing in the project areas, and in nearby Village Development Committees (VDCs).

Within the livelihood systems perspective, the project included other supportive activities, such as development of Local Resource Persons (LRPs), establishment and strengthening of agroforestry nurseries, and sensitization about regenerative energy for the sustainability of the system. Various technological and resource management options were developed and promoted in the project districts and beyond.

A total of 1,100 households of the project area were organized in 57 groups who participated in various activities of the project. These activities included participatory trials, demonstrations, seed productions and scaling up. Farmers groups were sensitized about group management, cooperative education, and marketing and processing of agricultural products through
trainings, visits and interactions. About 100 Local Resource Persons (LRPs) have been developed and mobilized. A number of institutions, from grassroots level through to policy makers were made aware of the technologies and information related to rice-fallows. This was done through their direct participation in workshops, meetings; information broadcasting through news media, such as FM radio, television, newspapers; and by proceedings, which were presented in national and international workshops.

This project has materialized the partnership in agricultural research for the first time in Nepal as exemplified by release of two-mungbean varieties, namely Kalyan (NM 94) and Prateeksha (VC 6372), jointly by the National Grain Legumes Research Program, FORWARD and CAZS-NR, and more varieties of other crops are in the process of release.

An outcome assessment at the project sites indicated that about 60 percent of farmers have adopted the RRC technologies, with a perception that they have increased the yield of crops by about 25 percent. These concerted efforts have enabled 70 percent of project area rice fallows to be covered with various winter crops. A number of institutions including ten District Agricultural Development Offices have already adopted some of the RRC technologies into their own programs.

Overall, the project has created enormous impact on the livelihoods of poor farm communities by increasing the accessibility of technological and resource management options. After the adoption of RRC technologies, the income of farmers has increased by 200 to 300 percent. They are perceived to have improved their livelihoods, and become more empowered in technical capabilities and managerial skills. The technologies are being scaled up through various promotional pathways developed by the project.

5. Health and safety
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6. DFID disclaimer
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8. Further reading

- Saha, A.K. 2002. Impact assessment of the DFID PSP project “Promotion of chickpea following rainfed rice in the Barind area of Bangladesh”. Centre for Arid Zone Studies, University of Wales, Bangor, UK.

8.1 e-Resources


9. Agro-ecological zones

- Tropics, warm
- Temperate, cool

10. Objectives fulfilled by the project

10.1 Resource use efficiency

Participatory varietal selection allows for more efficient use of crops, increases crop resistance to pest and diseases; and uses
different varieties pertaining to different land types and conditions.

10.2 Pro-poor technology
The practice facilitates collaboration between plant breeders and farmers, allowing poor farmers to benefit from new crop varieties, thereby increase their food and income sources.