FINAL TECHNICAL REPORT:

R6748: Participatory crop improvement in high potential production systems in India and Nepal

Dr J.R. Witcombe,
Centre for Arid Zone Studies,
University of Wales, Bangor,
Gwynedd LL57 2UW

Executive Summary

High Potential Production Systems (HPPSs) have diverse biophysical and socio-economic environments, but there is a lack of crop varieties and agronomic techniques to match this diversity. Previous PSP research has begun to demonstrate the effectiveness of participatory approaches in high potential production systems. *The second phase of PCI had been started with objectives to carry out further validation & promotion of identified varieties as well as continuation of searching, validation and promotion of better new crop varieties*. By the third season of second phase of the project, new varieties introduced by participatory methods occupy about 10-25 % of the cropped area in study villages (a spread limited by seed supply). The new varieties have spread to 80 km from the project villages. However, the rapid and wider dissemination of project varieties was constrained by a drought for the three consecutive and by the ineffective government seed supply system for the farmer-preferred varieties. It was found that varieties that were identified in the first phase of the project have been replaced by a newer and better set of varieties. Apart from higher yield, resistance against insect and diseases, market was one of the major influencing factors for farmer's to choose project-varieties.

The preliminary project assessment study indicates that farmers got 20-40% yield increments from the project-introduced varieties of various crops. It was also found that the impact of project-introduced varieties was more visible with the poor and marginal farmers. The project-introduced varieties were of short duration that saved farmers 1–2 irrigation, and allowed sufficient intervening time for growing the following crop. Farmers also saved on the additional expenditure on pesticides due to the resistance of new varieties against diseases and insect.

The adoption rate of agronomic intervention of seed priming was slow by the project farmers. However, the adoption rate was faster when the most influential farmer in the village adopted it, and the other farmers in the village followed him quickly. For example, in Dalvaisavli village, the whole village is practicing seed priming because of the lead taken by the most entrepreneur farmer in the village.

1418 farmers in 9 project villages and 393 farmers in 66 non-project villages were directly benefited by the project-given varieties within a geographical spread of around 90 km.

To make the PVS approach sustainable, and to ensure a mechanism local of seed supply of farmer-preferred varieties the project initiated a "seed producers' cooperative". This organisation has made a modest beginning, and sold seed of farmer preferred varieties. However, before it becomes a viable institution to practice its own PVS to identify new varieties and produce their seed there are financial implications that seem difficult to resolve due to the financial incapacities of member-farmers of the cooperative.

The project impact on livelihood and potential of its further replication was studied by two independent agencies whose reports are being compiled.

Background

Farmers' choice of varieties to grow in High Potential Production Systems (HPPSs) is limited because of inefficient plant breeding and popularisation methods that have a low level of farmers' participation. Conventional research aims to select a few widely adapted varieties with little consideration either of the needs of farmers or the large differences in physical and socio-economic environments within and between HPPSs. This greatly reduces potential crop yields in HPPSs (Witcombe, 1999).

The number of new varieties grown by farmers is small and the most popular varieties occupy most of the areas (sometimes nearly 100 %). Moreover the age of most popular cultivars is over 25 years. Widely grown old varieties of crops are vulnerable to pests and disease, farmers resort to pesticides, and baseline studies revealed several examples of acute illness due to their mishandling (Witcombe, 1999; Witcombe et al., 1999 and the R6748 project baseline data in India)

The first phase of the project from 1996 to 1999) studied the application of participatory varietal selection (PVS) to promote new varieties. The second phase (February 2000-January 2003) was undertaken to further validation and promotion of identified varieties as well as continuation of searching, validation and promotion of better and new crop varieties. The project in the second phase continued in the same set of villages identified in the first phase with minor modifications. The collaborating NGO in the second phase was Action for Social Advancement (ASA).

Project Purpose:

Strategies for the introduction of new varieties and improved agronomic practices in HPPSs validated, further developed and scaled up

Research Activities: Targets and their achievements are given in Table 1. The number of varieties and the number of trials conducted are presented in Table 2 and 3.

Table 1. Targets and achievement of targets

Target		**Achievement against target**	
Activities	**MOV**		
Validation 1. Monitor the uptake of varieties identified in R6748 in PVS, IRD and non-project villages.	1. Seed flow, adoption and agronomic surveys conducted in 6 PVS, 3 IRD, 3 non-project and 3 control villages. Two h/h surveys conducted by EOP and compared with phase I baseline survey.	1.1 Seed flow, adoption survey and house hold level survey has been conducted in end of each seasons. 1.2 Three surveys have been conducted in 6 PVS, 3 IRD, 3 Non-Project and 3 control villages in each successive year. A project review study had been conducted by ETC (India) in June 2002 that has covered the impact of project varieties. Comparison of impacts with phase I has been covered under final impact study, which is carried out by independent consultant in the EOP.
Participatory technology development 2.1 Participatory varietal selection and agronomic interventions.	2.1.1 At least 4 wheat, 4 rice, 2 summer mung varieties tested in about 800 on-farm trials. 2.1.2 At least 200[§] trials conducted on agronomic interventions.	2.1.1 10 rice, 17 wheat, 4 summer mung and 3 chickpea varieties were tested in 821 successful FAMPAR trials. 2.1.2 67 trials of seed priming were conducted with three crops; wheat, mung and gram. In addition, 18 trials of green manuring were conducted in rice fields (a total of 85).
2.2 Monitor changes in farmers' methods of cultivation after adoption of new cultivars.	2.2 Changes in farmers' practices monitored.	2.2 This part has been covered under impact assessment study which is currently undergoing

[§] The original target of 400 was revised to 200 in the Annual Report 2001.

Table 2. Number of successful FAMPAR trials conducted from 2000 to 2003 on newly-introduced varieties in the second phase (2000-2003) and those identified in the first phase (1996-1999)

Crop	Variety		No. of trials[§]		
	Phase II	**Phase I**	**2000**	**2001**	**2002**
Rice	IR64		34	53	7
	PR113		3	0	0
	PR114		3	0	0
	PR116		0	23	37
	Mahamaya		0	17	50
	Bamleshwari		0	16	0
		Pusa 44	1	0	0
		Pusa 834	19	29	13
		Pusa Basmati 1	8	0	0
		BPT5204	0	8	0
		Gurjari	check	check	check
	Total		**68**	**146**	**107**
Wheat	GW273		20	27	6
	GW233		0	2	0
	HD2687		19	0	0
	HI8498		15	8	0
	HD2329		11	0	0
	DL-788-2		0	7	0
	Raj3777		0	24	0
	UP2382		0	8	0
	Kanak		0	9	0
		PBW226	21	0	0
		PDW233	12	0	0
		WH542	12	0	0
		PBW396	3	0	5
		PBW343	3	0	0
		K9107	0	10	26
		Raj3077	0	27	4
		Raj3765	0	22	15
	Total		**116**	**144**	**56**
Summer Mung bean		SML32	24	34	26
		SML134	22	0	0
		JM721	16	18	19
		PS16	0	0	9
	Total		**62**	**52**	**54**
Chickpea	Guj-1		0	3	3
	Guj-2		0	2	4
		RSG44	0	4	0
	Total		**0**	**9**	**7**

[§] There were fewer trials for some varieties either because of non-availability of sufficient seed or the prevalent drought and non-availability of canal water did not allow transplantation of the nurseries.

Table 3. Number trials conducted using agronomic interventions

Name of practice	Trials 2001			Trials 2002		
	Crop	**No. of varieties**	**Total trials**	**Crop**	**No. of varieties**	**Total number of trials**
Seed Priming	Mung	2	11	Mung	4	21
	Wheat	6	11	Wheat	2	15
	Chickpea	2	3	Chickpea	2	7
Green manuring						9 trials in summer season before rice transplantation
Uses of BGA (bio fertiliser) in rice fields						-ditto-
	Total		**24**			**61**

Outputs:

Out puts expected		Achievement against target
Narrative summary	**OVI**	
Validation		
1 Monitoring and evaluation of farmer identified varieties over a further three seasons validates the PVS/IRD approach.	1 Varieties already identified by 1999 occupy at least 15 % of area in PVS and IRD villages with significant spread outside.	1. Varieties identified in the first phase occupied area of more than 20% at the end of first phase according to the survey of 1999. However, due to consecutive years of drought, farmers lost their seed for the project-identified varieties and they were unable to get further seed supply from government agencies since many varieties were not recommended. Therefore, they were forced to buy the available seed from private companies. This led to the decline of project-identified varieties. However, some varieties identified by the project such as Gurjari in rice and GW496 in wheat were sustained because their seed was available in GO departments and private seed shops. On the other hand superior varieties such Raj3077, Raj3765 and K-9107 in wheat were did not spread rapidly because of non-availability of seed in the market.
Participatory technology development		
2.1 New farmer-preferred varieties identified and popularised.	2.1 At least 4 new varieties in major crops adopted and occupying 10% of study area by EOP.	2.1 Six new varieties of rice, 9 of wheat and 2 of chickpea were tested in the second phase. Five varieties of wheat (Raj3765, Raj3077, K9107, GW273 and DL-788-2), two varieties of rice (Mahamaya and Pusa834) and two varieties of chickpea (GG2 and RSG44) were highly preferred by farmers (Tables 2 and 3). Preliminary study showed that these varieties occupy (as farmers intended to grow) 10-15% of the study area. Varieties Mahamaya of rice and Raj3077 of wheat are spreading rapidly due to their superior grain quality, market acceptability and drought tolerance. In rice, variety Gurjari identified in the first phase became most popular and almost entirely replaced GR17 local cultivar. In the second phase variety Mahamaya has offered an alternative to Gurjari since it has similar grain quality.
2.2 Improved agronomic practices identified and promoted.	2.2 At least one agronomic practice tested and adopted by 200 households.	2.2 About 50 farmers of village Dalvaisavli, 20 of village Panchmahudiya have adopted seed priming in wheat. At present, they are sowing the entire crops by priming the seed. In village Thanasavli, Dokelev and Kothamba, green manuring was highly preferred by farmers but due to drought it has not disseminated adequately.

Contribution of Outputs to project goal

1. In the view of DFID's development goals, the participatory crop improvement (PCI) programme has attained the outputs to some extent that were proposed. The 'PVS' methodology, which was introduced in the project in 1996, was successfully validated and identified as one of the most potential, cost-effective, convincing and simple methodology of varietal testing and promotion in contrast to existing system and methodology being followed by conventional research systems of the Government. New varieties, which have been identified, meet the need of poor and marginal farmers also.

2. The direct beneficiaries-the farmers have benefited by seeds of new varieties as well as by simple technology e.g. seed priming and green manuring and the intermediaries-non-governmental organisations have adopted and introduced this methodology in their areas. Specific mention can be made that ASA has adopted the PCI methodology in its regular programme of community based natural resources management in the dry land areas of Madhya Pradesh in nearly 50 villages. Some partner organisations of India Canada Environment Facility has shown keen interests to follow this methodology in their programme area and have taken training from ASA. Few Rural Agriculture Extension Officers of the Gujarat Agriculture Department, who are from the project areas and are aware of the project introduced varieties, have purchased seeds from the project initiated 'seed cooperative' and also reported to have directly purchased seeds from the farmers and distributed among the farmers of villages under their jurisdiction.

3. However, despite the project success at local government level it has not been able to influence the state or central governments to adopt the participatory methodology. It is realized that for changing/ influencing government rules and policy, a higher level of policy advocacy is required at various levels. This means that separate initiatives for policy research and advocacy are required for at least a further 4-5 years for attaining a significant platform towards farmer led agricultural research and extension.

4. There is a need to support farmers' organisations (e.g. seed cooperative, seed groups) for sustainable development in PVS. There is a need of a policy framework which recognises the local agro-climatic variations and therefore is responsive in promoting individual or local institutional initiatives for the PCI approach.

5. The project has carried out three independent assessments of the activities and has disseminated them strategically within the development circles. The project approach has been presented in various fora by ASA and this will be continued in the future. The programme findings have been also disseminated through CAZS and ASA's annual reports and publications. Details about PCI's intervention, has been also published in Enriching Experience Volume I brief-11, a periodical publication of Aga Khan Foundation (India). PCI programme was well presented by ASA team in the Second Rural Development Conference held at Goa in August 2002.