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Participatory Plant Breeding in Diverse Production Environments and Institutional Settings: Experience of a Nepalese NGO

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Abstract

This paper provides an overview of participatory plant-breeding (PPB) programs implemented by LI-BIRD in different environments and institutional settings in an attempt to address various breeding goals, such as productivity increase, research efficiency, biodiversity enhancement and on-farm conservation, users' needs, capacity building, and policy changes. It draws lessons from these experiences and raises some concerns about strengthening PPB in the future.

Background

In the 1960s and '70s, some developing countries saw a profound impact on crop production from plant breeding. Modern varieties developed from the breeding programs were seen as one of the main ways to achieve food security. Based on these experiences and research strategies, formal research systems in developing countries were gradually strengthened according to the Green-Revolution model and supported infrastructure, human-resource development, and finance. Several technologies (based on external inputs) were generated, aimed mainly at wider adaptability and uniformity and for high-production environments. However, it gradually became evident that adoption of these technologies by the farming communities has been low. For the vast majority of small-scale farmers, living particularly in marginal and heterogeneous production environments, the benefits from these technologies have not been realized. At the same time, their needs and problems have not been appropriately addressed. On the other hand, a large number of farmers have been dependant on their own skills and knowledge as well as resources to improve their crops to suit their own environments and resource base. This process of local crop development is still an important institution of crop breeding in most marginal environments (Hardon and Boef 1993). This again has to be fully recognized if efficiency in crop breeding is to be improved.

In realization of these concerns, therefore, some researchers moved into participatory plant breeding (PPB) and used their own approaches and methodological processes as they worked without any institutional support (Hardon 1996). However, the usefulness of PPB is yet to be realized. It is being considered parallel to and competing for resources with the conventional breeding system. This view may be because of the lack of realization that it is complementary, the lack of enough empirical evidence to demonstrate the advantages of PPB, and the lack of opportunities for interested researchers to work in participatory approaches to strengthen farming communities in local crop development. However, this is now changing since the number of researchers and institutions involved in participatory plant breeding is growing—70 cases have already been recorded (Sperling 2000). In this context, Local Initiatives for Biodiversity, Research and Development (LI-BIRD), a Nepalese nongovernmental organization (NGO), is one of the few institutions that has been involved in participatory research in the region since late 1995.[1]

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1. LI-BIRD professionals have been involved in PPB since the early 1990s at Lumle Agricultural Research Centre (LARC), a British-funded project in the western hills of Nepal.

In Nepal, consultative PPB[2] was used in breeding high-altitude rice. The decentralized testing of cold-tolerant rice was initiated in 1985 by Lumle Agricultural Research Centre (LARC) in the village of Chhomrong (2200 m). This later evolved into a consultative PPB activity, leading to collaborative PPB while developing a white peri-carped rice variety (Sthapit, Joshi, and Witcombe 1996; Sthapit and Subedi 2000; Witcombe et al. 1996). In this process, farmers were consulted for developing farmer-preferred, cold-tolerant rice varieties resistant to sheath brown-rot disease (ShBR).[3] Starting with the monitoring of the spread of PPB products, LI-BIRD has undertaken several programs using approaches based on participatory varietal selection (PVS) and PPB in different production and institutional environments.

This paper provides an overview of PPB programs implemented by LI-BIRD in different production environments and institutional settings. It then draws upon some lessons from these experiences. The PPB cases discussed here attempt to address various breeding goals, such as increasing productivity and research efficiency, enhancing biodiversity and on-farm conservation, and recognizing users' needs, capacity building, and policy changes.

PPB and production environments

PPB, by definition, assumes decentralized testing and evaluation in various production environments. Successful PPB case studies have often been reported from marginal environments (PRGA 1999; Ceccarelli, Grando, and Booth 1996; Sperling and Scheidegger 1996; Sthapit, Joshi, and Witcombe 1996). Consequently, it is widely perceived that PPB is useful only in marginal environments rather than in favorable environments. However, Hardon (1996) argues that farmers in better-endowed environments may also benefit from participatory plant breeding, for some of the same reasons as in marginal environments. In recent years, therefore, a large number of PPB programs are being initiated in intermediate areas where agroclimatic stresses are less severe (Weltzien/Smith, Meitzner, and Sperling 1999). In this context, LI-BIRD is one of the pioneering institutions to undertake PPB programs in diverse environments, including high-potential production systems (HPPS). Figure 1 shows the distribution of LI-BIRD's PPB projects (including PVS) across market and biophysical environments.

It is often assumed that high-potential production systems are uniform, more market-oriented, and well served by formal research for technological options and that, therefore, there is no need for participatory crop improvement. The preliminary findings from four PPB projects implemented in areas representing commercial and high-production systems indicate that there are diverse niche conditions within HPPS that need different locally adapted varieties, with different users' preferences (Joshi et al. 1998; Joshi et al. 1999a; Rana et al. 1999). Participatory methods such as PVS and informal research and development (IRD) have also been found effective (DTZ Peida 1999; Joshi et al. 1997).

2. There seem to be different definitions of PPB. In its broadest sense, PPB ranges from decentralized breeding controlled by plant breeders to various degrees of farmer involvement in the breeding process (Hardon 1996). PPB includes both PVS and PPB. PVS is the selection of fixed lines in the target environment by farmers using their own selection criteria (Joshi and Witcombe 1996). PPB is the selection of segregating materials by farmers in the target environment (Witcombe et al. 1996; Sthapit, Joshi, and Witcombe 1996). According to PRGA (1999), PPB includes not just the actual mixing of plant genes to produce new traits but all the joint efforts of farmers and trained researchers to improve and move germplasm into the field.
3. Sheath brown-rot disease is caused by *Pseudomonas fuscovaginae*.

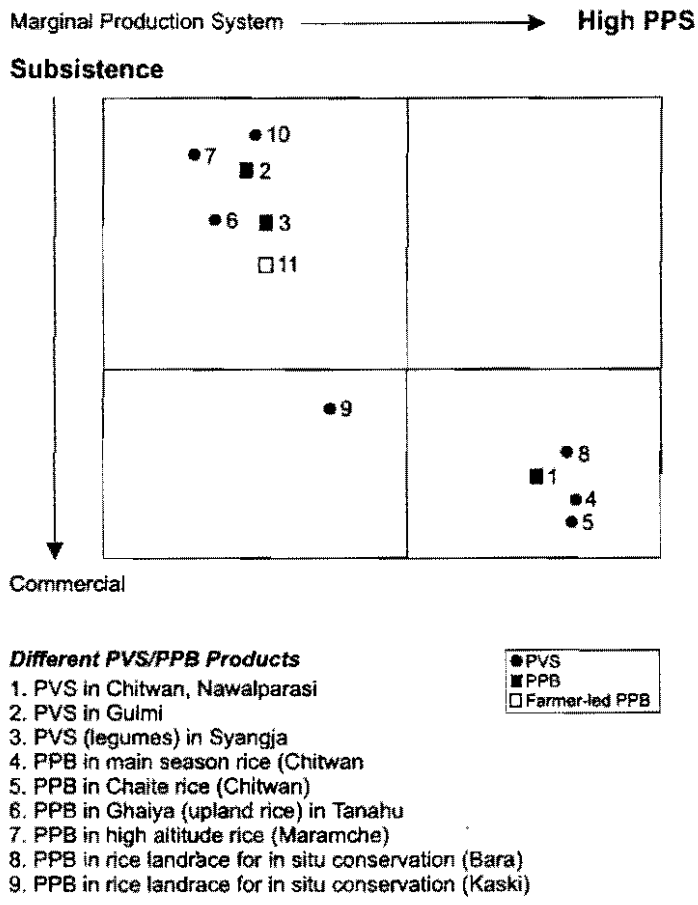

Figure 1. Distribution of LI-BIRD's PVS/PPB by production environment

PPB and breeding goals/objectives

Increasing productivity is obviously an important breeding goal. Beyond this, PPB is aimed at achieving other goals, such as improving research efficiency, addressing diverse users' needs, enhancing agrobiodiversity, building local capacity in local crop development and on-farm conservation, and influencing policy changes for farmer involvement in formal breeding processes. LI-BIRD's PPB projects have also been aimed at achieving most of these goals through specific breeding objectives (table 1).

PPB and participation

PPB assumes that the participation of primary stakeholders (i.e., farmers) is beneficial for farmers, themselves. Different PPB programs include varying degrees of participation of researchers and farmers (PRGA 1999; Ceccarelli, Grando, and Booth 1996; Sperling, Loevinsohn, and Ntabomvra 1993; Sperling 2000; Sthapit, Joshi, and Witcombe 1996; Subedi, Rana, and Joshi 1997; Subedi and Joshi 1998; Witcombe et al. 1996). But mode of participation, as defined by Biggs (1989), may vary according to the stages of the PPB process: setting breeding objectives; creating or providing variability, selection and evaluation within and between populations; and dissemination (Sthapit