CASE STUDY 1: Participatory plant breeding in Syria

The International Centre for Agricultural Research in the Dry Areas (ICARDA) has developed participatory breeding (PPB) programmes in Algeria, Egypt, Eritrea, Iran, Jordan and Syria on crops widely produced in the Middle East and North Africa (MENA) such as barley, wheat, lentil, chickpea and faba bean. ICARDA decided to convert its breeding programmes from a classical model to a participatory approach in the late 1990's after successfully breeding several new varieties of barley with Syrian farmers.[1]

Breeding barley together in North Africa and Middle East. Credit, IRDC

Barley is grown on more than 5 million hectares across the MENA region and remains popular for its ability to adapt to harsh conditions and its use as livestock feed. To address the shortfall in both adapted and high yielding barely varieties, ICARDA brought together farmers, breeders, and social scientists as partners to solve this challenge. Between 1997 and 2004, the ICARDA barley breeding program featured farmer selection and breeding line evaluation on 8,000 plots planted in farmers' fields. Host farmers in 9 communities were linked to 2 research stations from which they obtained experimental lines to combine with their own local varieties. As part of these trials several new varieties were identified that satisfied farmers' needs for high yields and palatability for grain and straw for their animals.[2]

The Syrian example demonstrated that farmers could handle large populations of plant varieties, develop their own measurement and scoring systems, and that they could be as efficient if not more so than trained breeders in selecting the highest-yielding varieties in both their own fields and in lower rainfall research stations. Based on the successes of the programme, the ICARDA team extended the PPB model to 6 other commodities.[3] Complementary to the PPB efforts, ICARDA has begun participatory research in natural resource management, in particular on sustainable land management in dry areas.

CASE STUDY 2: Participatory plant breeding and farmers rights in the Pokhara Valley, Nepal

Jethobudho is an aromatic rice variety found in the Pokhara valley of central Nepal. The variety is valued for its superior cooking qualities such as softness, taste, aroma and volume expansion ability. But due to significant problems with quality variation from susceptibility to lodging (stalk bending) and disease, *Jethobudho* was not competitive with other high quality rice varieties despite consumers being willing to pay a high price.[4]

Pokhara valley, Nepal. Credit, Bioversity

Together, the Fewa farmers' group, the Local Initiatives for Biodiversity Research and Development (LI-BIRD), the Nepal Agricultural Research Council (NARC), the District

Agriculture Development Office Kaski and Bioversity International initiated a participatory selection process to identify improved *Jethobudho* varieties. An extensive field diversity collection survey was carried out to identify plants with valuable characteristics, as determined through consultation with farmers, traders and hoteliers who identified a list of traits, including aroma, taste, softness, yield, susceptibility to lodging and diseases, for the "ideal" *Jethobudho* variety. Surveys of crops were carried out across several locations in the valley, with a total of 338 lines from farmers' fields evaluated for their performance against these desired traits. Based on the survey, 46 lines were selected and 6 distinctive lines chosen to create '*Pokhareli Jethobudho.'* In the years that followed, *Pokhareli Jethobudho* was found to outperform the original breeds in uniformity, post-harvest quality (such as taste and aroma), yield, straw quality and tolerance to stress. Yields increased from 2.4 t/ha to 3.35 t/ha. For the first time ever in Nepal, the variety was formally registered and released by the Nepalese regulatory authorities with recognition of farmer co-ownership even though under the Nepalese Seed Act, varieties can only be registered to those with an MSc degree or higher. [5]

CASE STUDY 3: Participatory plant breeding in Guangxi province, south-west China

From 1994 to 1999, the International Maize and Wheat Improvement Centre (CIMMYT) assessed the impact of the existing range of maize germplasm on poor farmers in the Guangxi province of south-west China. The study showed that there was a systematic separation between the formal and farmers' seeds systems. This led to inadequate variety development, poor adoption of modern varieties, a decreasing genetic base and biodiversity in farmers' fields.[6] Although there are more than 16,000 varieties of maize germplasm collected in China, 53% of total maize growing areas are covered by just 5 dominant species. In Guangxi, the local germplasm collection has around 2,700 entries, but only 3 main hybrids are generally used, all of which show poor adaptability for the diverse and fragile agro-ecological conditions in the province, as well as disease susceptibility.[7]

Farmer in China. Credit, Lenierers

A team of local farmers and the Centre for Chinese Agricultural Policy and Guangxi Maize Research institute carried out trials in 6 villages and on-station using both participatory plant breeding (PPB) and participatory varietal selection (PVS) methods. Tests compared the impacts of the locality, approach, objectives and varieties selected. The maize varieties compared included open-pollinated varieties, waxy varieties and those introduced by CIMMYT, some of which were already improved with local crossings. The new varieties developed from these crossings showed better adaptation to the local environment with desired traits for yield, taste and palatability. Whilst germplasm diversity improved so did the local level organizational and decision-making capacity of farmers.

In addition to 31 varieties of maize, there are now 17 types of bean, 16 vegetables, 14 cereals, 8 root crops, and an assortment of traditional herbs, spices and medicinal plants, almost all of which are farmer-developed. Now in its second phase, the project is attempting to link community-based action research with the policy-making process by increasing efforts to engage directly with key decision-makers in the policy arena at both the provincial and national levels. A better understanding of farmers' roles has enabled their participation. In part, this is due to the project team providing training and network

building support, facilitating effective interaction and collaboration between all of the stakeholders: 5 women's groups, 6 villages, 6 township extension stations and 2 formal breeding institutes.[8]

---

[1] Walker, TS 2006, 'Participatory Varietal Selection, Participatory Plant Breeding, and Varietal Change' *Background Paper for the World Bank Development Reoprt, 2008*, Available from: < http://siteresources.worldbank.org/INTWDR2008/Resources/2795087-1191427986785/WalkerT_ParticipatoryVarietalSelectionPPB_complete.pdf> [6 July 2015].

[2] Vernooy, R & Stanley, B 2003, 'Breeding Better Barley – Together: A new way to work with farmers in dry areas' *Seeds That Give: Participatory Plant Breeding Case Study Series*, International Development Research Centre (IDRC), Ottowa.

[3] Walker, TS 2006, 'Participatory Varietal Selection, Participatory Plant Breeding, and Varietal Change' *Background Paper for the World Bank Development Reoprt, 2008*, Available from: < http://siteresources.worldbank.org/INTWDR2008/Resources/2795087-1191427986785/WalkerT_ParticipatoryVarietalSelectionPPB_complete.pdf> [6 July 2015].

[4]Gyawali, S, Sthapit, BR, Bhandari, B, Bajracharya, J, Shestha, PK, Upadhyay, MP & Jarvis, DI 2010, 'Participatory crop improvement and formal release of *Jethobudho* rice landrace in Nepal' *Euphytica* vol. 176, pp. 59-78.

[5]Halewood, M, Deupmann, P, Sthapit, BR, Vernooy, R & Ceccarelli, S 2007, *Participatory plant breeding to promote Farmers' Rights*, Bioversity International, Rome.

[6] Halewood, M, Deupmann, P, Sthapit, BR, Vernooy, R & Ceccarelli, S 2007, *Participatory plant breeding to promote Farmers' Rights*, Bioversity International, Rome.

[7] Vernooy, R & Song, Y 2004, 'New approaches to supporting the agricultural biodiversity impotant for sustainable rural livelihoods' *International Journal of Agricultural Sustainability*, vol. 2, no. 1, pp. 55-66.

[8] Vernooy, R & Stanley, B 2003, 'Breeding Better Barley – Together: A new way to work with farmers in dry areas' *Seeds That Give: Participatory Plant Breeding Case Study Series*, International Development Research Centre (IDRC), Ottowa.