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Genetic Resources Conservation
Participation of Farmers and Germplasm Collectors
Towards Sustainable Crop Improvement

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None of the vast genetic resources collections of cultivated species now conserved in national and international genebanks would have been possible without the active participation and generosity of the farmers in various countries, especially those that fall within the centers of diversity of our major crops. These precious germplasm resources contributed genes that constituted varieties that launched the "green revolution".

Germplasm collectors traveled far and wide, often at some risk to themselves, to assemble these collections that plant breeders used to develop new varieties. Accolades have been showered on wheat, rice, and maize plant breeders for saving the masses in poorer countries through the introduction of the highly bred dwarf and semi-dwarf varieties that more than tripled the crop yields, but hardly any appreciation has been forthcoming for the countless germplasm collectors and even less for the donor-farmers. When approached by germplasm collectors during exploration missions, farmers enthusiastically give a seed sample. Hence, it is now natural that we, the users of germplasm, pay back by way of participating in the task of improving their landraces.

The international agricultural research centers (IARCs) have done commendable work on improvement of their mandate crops in collaboration with the national programs and other institutions. However, by and large, the work has been confined to their own farms and experimental plots and laboratories. During the past decade, Participatory Crop Improvement (PCI) has emerged as an alternative approach for less industrialized countries as opposed to conventional breeding methods employed by formal institutions and the IARCs (Ceccarelli *et al*., 2009). In the past, there has hardly been any input intellectually or physically from farmers save for an occasional visit to the centers to view demonstration plots It was therefore erroneous to assume that some of the breeding materials developed for the high-input favorable environments would be suitable for the low-input marginal areas ploughed mainly subsistence by farmers (Damania and Srivastava, 1990)

With the advent of global warming and climate change it is imperative that plant breeders test and select their breeding lines when actually grown on farmers' fields and in full consultation with the farmers themselves. Farmers with small holdings on fertile and flat land still tend towards planting low-risk improved varieties when they are assured of good water-supply through irrigation and farm credit on reasonable terms for inputs. On the other hand, farmers in marginal areas, especially on mountain slopes, maintain diversity as a strategy to cope with drought, possibly low-inputs, and other uncertainties (Altieri and Montecinos, 1993).

Crops that are purely of local interest and are not included in the major breeding programs of the IARCs. Crops that are grown in the marginal environments by basically subsistence farmers, e.g., barley growers in the semi-desert parts of Syria as described by Ceccarelli *et al*. (2001). Crops that are grown in changing environments within short distances where GxE interaction makes the use of a single variety inadvisable. Crops where the end-users desire unusual or very-specific trait or combination of traits, e.g., the requirement of small farmers in Nepal for cold resistance in local varieties (Almekinders and Elings, 2001).

Breeders who include farmers' opinions in every stage of crop improvement are often surprised by the rankings that farmers give to each of the breeding lines. The rankings are very often very different from what the breeders think are their best lines. This is because the typical small subsistence agriculture farmer looks at seed-color, culinary attributes like taste and cooking quality/time, etc. Yield increases of 30-50% have been reported when a PCI approach has been adopted (Ashby, 2009). Farmers tend to adopt more varieties that have been developed using PCI than otherwise.

The role of women in participatory plant breeding cannot be under-estimated. The acceptance of germplasm is ultimately decided when the harvested product is being prepared for food or for other uses like fodder. The case in point here is the introduction of the 2-row barley cultivar 'Betzes' to sheep herders in Northern Syria. 'Betzes' was rejected because the sheep's gums began to bleed due to rough awns (Ceccarelli, pers. comm.). This author, while on a germplasm collection trip to Somalia in 1979 noted that the white loose headed sorghum variety introduced from U.S. to the local subsistence farmers was rejected as the Somalis prefer their own red to dark brown and round-headed variety that also stores well for year-long consumption (Damania and Rao, 1979).

To conclude, it can be said that the needs of the small farmers, especially in marginal or hilly environments, have not been met by and large by the IARCs and other formal national plant breeding efforts. To address this lacuna in the agricultural systems of the developing countries a participatory approach has been tried with great success and should continue. The participatory approach has other benefits also, such as, it helps the small farmer maintain landrace diversity *in situ* and thereby keeping his germplasm more adaptable to climate change. And lastly, a firm bond of confidence is established between the farmer on one hand and the researcher/plant breeder on the other thereby eliminating any misgivings the farmer may have to try out new germplasm

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