Journal of AgriSearch 3(1): 47-50
Peer Reviewed Quarterly

ISSN : 2348-8808 (Print), 2348-8867 (Online)
http://dx.doi.org/10.21921/jas.v3i1.4104

Role of Farmers Participatory Vegetable Breeding in Kashmir

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ARTICLE INFO	
Received on :	18.02.2016
Accepted on :	01.03.2016
Published online :	10.03.2016

ABSTRACT

Vegetable crops are conducting under Farmers Participatory Research Trial in Temperate regions of Kashmir Valley. The trials are designed and managed by farmers, the researchers have only advice for selection of the resource conservation technology (treatments). Farmers have full control over the selection of treatments to be used on his/her field. The main objectives of this type of research is to be established and demonstrate the benefits of resource conservation technologies like raised bed, furrow irrigated planting system, zero tillage etc. over the conventional practices. In these type of trial farmers are briefed about new practices. The participating farmers are encouraged to experiment their own and are given the full control over the selection of subset of resource conservation technologies to be tested on their fields with a view to assess farmer innovation and acceptability.

Keywords: Farmers Participatory, Vegetable Breeding, Kashmir

INTRODUCTION

Vegetable crops are conducting under Farmers Participatory Research Trial in Temperate regions of Kashmir Valley. The trials are designed and managed by farmers; the researchers have only advice for selection of the resource conservation technology (treatments). Farmers have full control over the selection of treatments to be used on his/her field. The main objectives of this type of research is to be established and demonstrate the benefits of resource conservation technologies like raised bed, furrow irrigated planting system, zero tillage etc. over the conventional practices. In these type of trial farmers are briefed about new practices. The participating farmers are encouraged to experiment their own and are given the full control over the selection of subset of resource conservation technologies to be tested on their fields with a view to assess farmer innovation and acceptability.

Why Participatory Crop Improvement (PCI)

Poverty in Asia is most severe in rainfed areas. Classical breeding approaches have been successful in developing improved varieties of vegetables for favourable environments. However, these approaches have been less successful for all the target environments because they fail to account for the high levels of social and agro-ecological diversity in these areas. Witcombe *et al.* (1998) report weaknesses in the formal testing system in India that havereduced the chances that rice varieties released for marginal areas would meet farmers' needs. The failure of the system is evidenced by for example; the rejection of many rice varieties by farmers, and the rapid and high adoption by farmers of such non-released varieties such as Mashuri rice that had been rejected in the formal testing. Green revolution and plant breeding techniques mostly benefit the farmers in high potential environments and those who can afford (and choose to use) inputs such as fertilizers and pesticides. But several million poor farmers in developing countries most of whom operate small farms under unstable and difficult growing conditions, in a precarious situation cannot afford to use inputs to alter their fields to provide the growing conditions that many new varieties need or suit their requirements. The adoption of new plant varieties by this group has been hampered by the constraints of poverty and the international policies promoting an industrialized model of agriculture. As a consequence low yields, crop failures, malnutrition, poverty and famines are still widespread. On a global level despite the green revolution hunger and poverty are still widespread; about 2 billion people still lack reliable access to safe, nutritious food and 800 million of them are chronically malnourished (Reynolds and Borlaug, 2006). Plant breeding has not been as successful in marginal environments as in favourable ones because farmer's do not have their fields highly productive, demand uncommon traits as well as unusual combinations of traits where trade-off seems tricky for a breeder and varietal development and official release consumes about 15 years by which a variety almost loses its relevance, hence, many varieties released officially are never grown but many unreleased varieties are widely grown by farmers. The success of PPB should therefore be measured more by the number of new varieties produced and used in those niche environments (and the improvements they contribute to farmers' livelihoods) than by the total number of hectares sown globally to a particular variety. In Syria, where a PPB programme on barley started in 2000, 25 varieties have so far been selected, named and multiplied; each of them occupies between 5 and 25 000 hectares. Similarly, six barley varieties have been namedand multiplied

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for their adaptation to the north-west coast of Egypt, and three varieties of barley and one of lentil are being multiplied by farmers in Eritrea. Other successful examples can be found in countries as diverse as China (maize), Nepal (rice and maize), Mali (millet), Cuba (maize, beans, rice, cassava and tomatoes) andHonduras (maize and beans). PPB provides a forum for building participants' knowledge and skill in genetic resources conservation and empowers rural institutions and farmers in community-based crop improvement and biodiversity enhancement. PPB can also be less costly to conduct than traditional breeding, due to potential savings on field testing sites, lower overhead costs and the shortening of the research period required for producing useful materials.

To this, the response has been the creation of a novel and promising set of research methods collectively known as Participatory Crop Improvement. Participatory means that farmers, besides others, such as consumers, vendors, industry and rural cooperatives participants are more involved in the breeding process and breeding goals as defined by farmers instead of international seed companies with their large-scale breeding programs.

Participatory Crop Improvement (PCI)

Participatory Crop Improvement (PCI) involves many stake holders in crop improvement which brings on their empowerment besides the usable end product development. Farmers' involvement in participatory crop improvement (PCI) can take many forms (Fig.1): defining breeding goals and priorities; selecting or providing sources of germplasm; hosting trials on their land; selecting lines for further crossing; discussing results with the scientists; planning for the following year's activities; suggesting methodological changes; and multiplying and commercializing the seed of the selected lines.

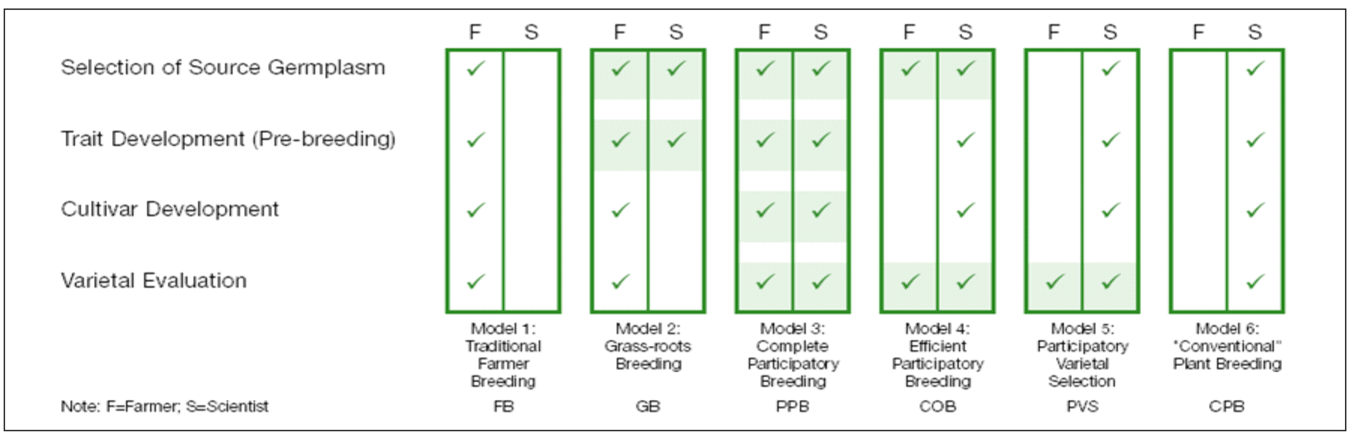

Fig. 1: Various approaches to participatory plant breeding based upon stages of participation in breeding process.

Participatory Crop Improvement approaches can be usefully categorized into Participatory Varietal Selection (PVS) and Participatory Plant Breeding (PPB). (Witcombe *et al.*, 1996).

1. Participatory Variety Selection (PVS)

PVS is the selection of fixed lines (released, advanced lines or landraces) by farmers in their target environments using their own selection criteria. In PVS farmers are given a wide range of novel cultivars to test for themselves in their own fields. A successful PVS programme has four stages:

1. Participatory rural appraisal (PRA) to identify farmers' needs in a cultivar
2. A search for suitable material to test with farmers
3. Experimentation on the acceptability of this material in farmers' fields
4. Wider dissemination of the cultivars farmers prefer.

It is important to note that this process is not simply a relabeling of old techniques such as front-line demonstrations or minikits. Traditional approaches do not start with a PRA; they offer little choice in new cultivars but only the few that have been selected after years of formal trials; they tend to involve only a few farmers; and management is improved by a 'recommended package of practices' that is beyond the resources and risk-taking capacity of most resource-poor farmers. In the PSP Mother and Baby trials system all the varieties are grown in Mother trials in a one-field, onereplicate design. Typically, there are about 5–6 Mother trials. Baby trials are more numerous, with each farmer growing a single entry and comparing it to his or her local variety. In the Mother trials quantitative estimates of yield are obtained, but in the Baby trials PSP simply collects farmers' perceptions on yield. One of the great strengths of PVS is that it is both an extension and a research method. For example, PVS trials in upland rice in Ghana resulted in a dramatic spread of new varieties to new villages over a single season (Craufurd *et al.*, 2002).

2. Participatory Plant Breeding (PPB)

PPB is a breeding process in which farmers and plant breeders jointly select cultivars from segregating materials under target environment. A successful PPB has the following features:

- understanding reasons for growing diverse varieties;
- identification of expert farmers with skills in managing diversity and seed selection;
- setting up breeding goals (and roles of participants) jointly to meet farmers' needs;
- use of landraces as parent materials;
- decentralized selection of segregating lines by farmers;
- use of farmers' observation and opinions;

- ❖ farmer participation at all stages of selection and evaluation;
- ❖ transfer of skills and knowledge between breeder and farmer;
- ❖ evaluation and monitoring of varietal spread by scientists;
- ❖ use of informal seed supply systems for wider dissemination.

The breeding strategy that has been followed in PSP PPB programmes involves:

1. Making a careful choice of parents (often using PVS to help identify them)
2. Making only a few crosses
3. Using a large population size in each cross
4. Selecting in the target environment with the participation of farmers
5. Employing PVS to test the products derived from the PPB programme.

The capacity of any breeding programme is limited and as more crosses are made the populations derived from sizes (Witcombe and Virk, 2001). Hence, one possible breeding strategy is to select a few crosses that are considered most likely to give desirable segregants and produce large populations from them. The use of few crosses with large population sizes is not a common strategy. Many breeding programmes use many more crosses and hence restrict the size of the F_2 populations that are evaluated. Depending on the circumstances, such a strategy may be correct. The optimum number of crosses will differ depending on how competitive the breeding is, how targeted it is to a specific environment, the type of parental material used, and whether the breeding can be considered strategic oradaptive.We now have empirical evidence that making few crosses in rice in PPB programmes is effective. The experiments, however, were not designed to make a comparison to such alternative approaches as a many-cross strategy. Nonetheless, the breeders involved in the programmes who have had experience of both few- and many-cross strategies appreciated the reduced complexity of a programme that uses fewer crosses. We assume that the most likely explanation is that F_2 and F_3 population sizes have been too small to recover and select desirable segregants.

What we have found is that PVS and PPB are used in combination. We start with PVS and that helps to identify parents, then we carry out PPB. As soon as there are products from this PPB, we test them in PVS trials. This is a continuous process because new varieties whether introduced from classical breeding programmes or from PPB, are always becoming available and can be tested by PVS.

This strategy is well suited to the constraints and advantages of PPB in that:

- ❖ PVS aids the selection of parents. It is effective in identifying locally adapted parental material and in identifying breeding goals – for example, early maturity – that assists the selection of complementary parents
- ❖ Participatory breeding programmes conducted by NGOs will not have many resources to devote to such technical processes as making many crosses
- ❖ Large population sizes are easy to deal with when grown by farmers. For example, in collaborative breeding a farmer can cost-effectively grow and select from a very large population of rice. The farmer was, in any event, going to grow rice, and if the PPB material yields adequately, costs (or benefits) are only the difference between the yield of the population and the yield that the farmer would normally have obtained from his or her own variety.

  There are two further important benefits from farmer participation:

- ❖ Selection is carried out in the target environment (minimizing the untoward effects of genotype x environment interaction) and the selection is for traits that farmers consider important. When breeding for drought-prone environments in particular, conventional multilocational trials are difficult to analyze. Trials in the most drought-stressed environments produce many missing values and are often excluded for this reason, despite such trials being the most relevant them have to be smaller. However, theoretical considerations provide strong arguments for using large population Participatory trials do not suffer from this disadvantage. Indeed, when a variety fails in a farmer's field this gives valuable information on
- ❖ PPB generally involves a higher and more complex degree of involvement of farmers, as they are engaged in decision-making in earlier and more fundamental stages of the variety development chain; PPB therefore has a higher empowerment effect than PVS. Before proceeding, it is important to note that farmers' interests in the outcomes of PPB or PVS rarely end with the evaluation of improved materials. Farmers' ability to certify or multiply and distribute seed is directly affected in many countries by legal regulations and standard-setting bodies. PPB and PVS therefore can and should raise farmers' awareness of those regulatory frameworks and, where possible, involve farmers in efforts to influence the modification of those frameworks if they limit farmers' ability to maximize the benefits of exploiting the materials they participated in improving.

Research conducted on "Performance of Radish (*Raphanus sativus* L.) genotypes for yield and qualitative traits at experimental and farmer's field"

Radish (*Raphanus sativus* L.) is one of the most popular vegetables. It is an important winter vegetable grown all over the India. The edible portion of the crop is its fleshy root which is used as salad and vegetables while the tender leaves are used as vegetables. Besides roots and green leaves, its immature pod usually called mongra is eaten raw and also cooked as vegetable. It forms an important dietary component in day to day human food. Roots, leaves, flowers and pods of radish are effective against gram positive bacteria. However radish is low in calories, but roots and leaves are rich source of vitamin A, vitamin C, mineral and carbohydrates. The high nutritive value of radish is considered quite useful for patients suffering from piles, liver troubles, enlarged spleen and jaundice (Brar and Nandpuri, 1972). Radish roots are good appetizer. The juice of fresh leaves is useful as diuretic and laxative. In homeopathy, radish is use forneuralgic headaches, sleeplessness, and chronic diarrhoea. Besides health promoting substances, it also fits well in multiple cropping and brings lucrative returns to the farmers. Under the agro-climatic conditions of Kashmir, the main season for radish is August to September with a good quality roots being available from October to January. Under the valley conditions radish is also grown during March and April. However, during summer radish of good quality is not available particularly during May to August.

CONCLUSION

On the basis of findings obtained from this investigation, it can be concluded that the traits like leaf number, leaf weight, leaf width and root diameter which exhibited positive direct effects along with positive correlation with root weight as important components of root weight and selection based on these characters will result in the development of high root weight superior genotypes of radish. CO-1, Kalayani White, HK-111, White Round, Japanese White Long and IIVR-1 were recorded to be Superior and best genotypes on farmer's field in terms of root yield and quality attributes and Anantnag Red Round and Chinese Pink were reported as better genotypes for quality attributes which may be used in future breeding programme. This strongly supports the current objectives of the farmers in this region also. The PVS programme has given the breeders a systematic way to approach the farmers. The interaction with farmers and social scientists involved in the study helped breeders and farmers develop a better understanding of the complexity of the problem.

REFERENCES

Brar, J.S. and Nandpuri, K.S. 1972. Cultivation of root crops. Punjab Agriculture University Bulletin, pp. 10-15.

Craufurd PQ. 2002. Seed systems and PVS – scaling up for impact. Pages 76–77 *in* Breeding rainfed rice for drought-prone environments integrating conventional and participatory plant breeding in south and southeast Asia: proceedings of a DFID Plant Sciences Research Programme/IRRI Conference, 12–15 March 2002, IRRI, Los Baños, Laguna, Philippines (Witcombe JR, Parr LB, Atlin GN, eds.). London and Manila, Department for International Development (DFID) Plant Sciences Research Programme, Centre for Arid Zone Studies (CAZS) and International Rice Research Institute (IRRI)

Gyawali S, Joshi KD, Witcombe JR. 2002. Participatory plant breeding (PPB) in rice in low altitude production systems in Nepal. Pages 8–10 *in* Breeding rainfed rice for drought-prone environments integrating conventional and participatory plant breeding in south and southeast Asia: proceedings of a DFID Plant Sciences Research Programme/IRRI Conference, 12–15 March 2002, IRRI, Los Baños, Laguna, Philippines (Witcombe JR, Parr LB, Atlin GN, eds.). London and Manila, Department for International Development (DFID) Plant Sciences Research Programme, Centre for Arid Zone Studies (CAZS) and International Rice Research Institute (IRRI)

Reynolds, M.P and Borlaug, N. E. 2006. Applying innovations and new technologies for international collaborative wheat improvement. *Journal of Agricultural Science*. **144**: 95-110

Witcombe JR, Joshi A, Sthapit BR. 1996. Farmer participatory crop improvement. I. Varietal selection and breeding methods and their impact on biodiversity. Expl Ag 32: 4, 445–460

Witcombe JR, Virk DS. 2001. Number of crosses and population size for participatory and classical plant breeding. Euphytica 122:451–462

Witcombe JR, Virk DS, and Farrington J (eds.). 1998. Seeds of Choice. Making the Most of New Varieties for Small Farmers. Oxford and IBH, New Delhi, and Intermediate Technology Publications, London

Citation:

Singh P K, Baksh H, Singh S and Singh L.2016.Role of Farmers Participatory Vegetable Breeding in Kashmir. *Journal of AgriSearch* **3** (1):47-50