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Participatory Plant Breeding-Role of Farmers in Plant Breeding

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Introduction

Despite the tremendous effects of the Green Revolution, millions of people still go to bed hungry every day and little has changed in the life of subsistence farmers in many developing countries. Most of these farmers live in the drier parts of the world where water is scarce, so they must depend on rainfall. Because most "improved" crop varieties have been developed for near-optimal conditions of water supply and other inputs, they often do not perform well under the subsistence farming conditions. The outcome of conventional crop breeding is a few varieties, often closely related, which are cultivated over large areas resulting in genetic uniformity which is dangerous in areas prone to disease and pest attack, and with unpredictable climate.

It is widely recognized that conventional plant breeding has been more beneficial to farmers in high potential environments or those who could profitably modify their environment to suit new cultivars, than to the poorest farmers who could not afford to modify their environment through the application of additional inputs and could not risk the replacement of their traditional, well-known and reliable varieties. As a consequence, low yields, crop failures, malnutrition, famine and eventually poverty are still affecting a large proportion of humanity.

Participatory plant breeding is seen by several scientists as a way to overcome the limitations of conventional breeding by offering farmers the possibility of deciding which varieties better suit their needs and conditions without exposing the household to any risk. Participatory plant breeding exploits the potential gains of breeding for specific adaptation through decentralized selection, defined as selection in the target environment, and is the ultimate conceptual consequence of a positive interpretation of genotype environment interactions.

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Problems in conventional plant breeding –Examples

- **Arkaharit** – rejected by consumers because of shape even though the nutritive quality is good compare to previous verities. Here breeders not considered consumer preference in developing variety.

Fig. 1: Shape of Bitter Guard

- **KMR-34** white seed ragi developed at UAS (Bangalore)- rejected by consumers as well farmers because of colour, they prefer brown colour – even though same nutrient content. So now this white seed ragi used for backing purpose.

Fig.2: Colour of Ragi seeds

- **Arkaneelkanth**- brinjal variety- resistant to bacterial wilt- its an hybrid and high yielding-but because of shape and colour rejected by consumer as well farmers.

Fig. 3: Shape and colour of Brinjal

Broadly, participatory plant breeding (PPB) is the development of a plant breeding program in collaboration between breeders and farmers, marketers, processors, consumers,

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and policy makers (food security, health and nutrition, employment). It is also known as Collaborative Plant Breeding (CPB), Farmer Participatory Breeding (FPB), Decentralized Participatory Plant Breeding, and Participatory Crop Improvement (PCI).

The Term Participatory-

It is termed "participatory" because users can have a research role in all major stages of the breeding and selection process. Such 'users' become co-researchers as they can: help set overall goals, determine specific breeding priorities, make crosses, screen germplasm entries in the pre-adaptive phases of research, take charge of adaptive testing and lead the subsequent seed multiplication and diffusion process.

Who Participate in Participatory plant breeding?

In PPB, professional plant breeders and researchers from various disciplines collaborate with farmers and other stakeholders in the food chain to produce locally-adapted varieties that meet farmers' needs, priorities, and market opportunities.

Goals of Participatory plant breeding

1. Increase production and profitability of crop production through the development and enhanced adoption of suitable, usually improved, varieties.
2. Provide benefits to a specific type of user, or to deliberately address the needs of a broader range of users.
3. Build farmer skills to enhance farmer selection and seed production efforts

Roles of farmers in PPB

There are mainly three roles of farmers in PPB

1. **Management role**- farmers provide technical and social leadership in PPB. Farmers decide what types of varieties are to be developed to suit specific environment and farmers need.
2. **Input supply role**- making arrangement of various inputs for conducting plant breeding trails at their fields.
3. **Skill building role**- also play role in skill building. The breeders provide training to group of farmers in the adopted village.

Possible Outcomes/Benefits of PPB

1. **Production gains:** yield increases; increases in stability of yield; faster uptake; wider diffusion; and higher market value of products.

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2. **Biodiversity enhancement:** communities have wider access to germplasm; wider access to related knowledge; and increased inter- and intra-varietal diversity.
3. **Cost-efficiencies and effectiveness:** fewer research dead-ends; more opportunities for cost sharing in research; and less expensive means of diffusing varieties. *Effective meeting* of *user needs*: higher degree of farmer satisfaction; broader range of users reached, including marginal farmers; and promotion of group learning through farm walks.

PPB produces varieties that are

1. **Targeted:** because they are focused on the right farmers;
2. **Relevant:** because they respond to the real needs, concerns and preferences of farmers; and
3. **Appropriate:** because they can be adopted and used under the conditions in which farmers live and farm.

Stages of PPB

1. **Set the breeding objectives-** decided for solving problems of coomn interest of farmers.
2. **Generating genetic variability-** new variability is created by crossing between selected parental lines.
3. **Selecting within variable populations to develop experimental varieties-** the selection is made in segregating populations to deelop new varieties for specific situation.
4. **Variety testing and characterization-** variety is tested for yield performance and other economic characters in different trials and the best entry is identified for release.
5. **Popularization and seed production-** new variety is popularized by conducting demonstrations. Seed multiplication is carried out to make available seed of new variety to farmers of the region foe which variety has been released.

Conclusion

The scientist/breeders while developing a new variety have to consider the important traits liked by the consumers as well as farmers. Inclusion of farmers in the decision-making and breeding process also strengthens the empowerment of both farmers and farm women, thus contributing to sustainable food security and strengthened resilience to a variety of risks

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and challenges. PPB organized with the advantages of producing environment-friendly varieties and of maintaining or even enhancing biodiversity. Government should encourage and facilitate the adoption of participatory approaches by public and private sector institutions involved in breeding. Institutions should adjust their regulatory frameworks, particularly concerning variety registration and maintenance, seed production and marketing, to ensure that farmers are able to gain maximum benefit from PPB programmes.