RESEARCH HIGHLIGHT: Client-oriented breeding sparks a low-input green revolution in Bangladesh

In Bangladesh, farmers enthusiastically adopted newly introduced rice varieties because they yielded much more grain, but without any of the disadvantages that are often encountered with modern varieties. They had high quality grain, they did not require more fertilizer, and in the main rice growing season they were earlier to mature than any available alternative. The superiority over locally available and recommended varieties was not an incremental gain but a considerable advance with increased grain yields of over 35% in farmers' fields *without increases in inputs*. Yield gains were over 1 t ha^{-1}, even higher than those in Nepal the country where they were originally bred using novel, highly client-oriented methods (see Box 1).

Box 1. Participation improves client-orientation

The pioneering participatory plant breeding (PPB) approaches used to produce these varieties were all designed to increase the client-orientation of the breeding programme. Hence, highly client-oriented breeding (COB) accurately describes why the approach is effective. Participatory methods are used to identify client needs, products are tailored to meet those client needs and then tested without delay with the client farmers. This testing is termed participatory varietal selection (PVS).

These methods of plant breeding are highly transferable. They can be used in most, if not all, crops and in any country. Their success is greatest in countries where the varietal release system is most rigid. This is why the superiority of this approach was even more impressive in Bangladesh than in Nepal.

A marked departure from the conventional approach is the use of only a few crosses that are chosen based on the extent to which the parents of the cross can contribute to the desired specifications in the new variety.

New variety Judi 582, a product of COB in Nepal, matured over 3 weeks earlier than Swarna the most popular variety grown by farmers. Early maturity is a character greatly liked by farmers because it provides more time to carry out agricultural operations between crops. Earlier harvest of the new varieties increases the likelihood that follow-on crops can be sown earlier and this gives higher yields, thus maximising the productivity of the whole cropping system.

Farmers are rapidly adopting the introduced varieties not only for their high yields but also for their improved cooking and eating qualities. With continued funding the introduced varieties can be promoted throughout Bangladesh and more varieties introduced from Nepal which are adapted to an even wider range of rice ecosystems. Such an impact would result in significant increases in rice yields at both a district and national level and would provide overwhelming evidence that this new approach to plant breeding is superior and should be formally adopted.

Farmers' preferences

Farmers, along with their neighbours, ranked the varieties in the trials after harvest. There was an overwhelming preference for Judi 582 compared to the two check varieties and Pant Dhan 10 (an Indian variety identified by PVS in Nepal) was also preferred to the checks. In both years, both checks were among the least, or were the least preferred varieties.

Farmers' adoption

Although Judi 582 was only introduced in the main season (transplanted *amman* or *T. amman*) farmers also grew it in the winter season (*Boro*) and the spring season (*Aus*). Eleven farmers were interviewed on the performance of Judi 582 in the *Boro* season who pointed out that it had many advantages (see Box 2). In the *Aus* season, Judi 582 yielded twice that of the local variety Vadhai. Farmers distributed the seed of Judi 582 to other farmers and greatly increased the area under cultivation on their own farms. Given the overall preference for this variety, its adaptability across seasons, and the evidence for its early adoption it is likely to become popular even without official release or unofficial support from NGOs. Given its higher grain yield and acceptability this variety alone could have an impact on rice production at the household and national level.

We have described the results for Judi 582 but it is just one of several examples. So far, nine varieties from the client-oriented breeding programme in Nepal have been tested in Bangladesh and all nine have performed better than the best locally available or recommended varieties.

Box 2. A *Boro* rice farmer talks about Judi 582

Md Rajob Ali *who owns 17 bigha (2.3 ha).*

- He grew Judi 582 in 5 *kattha* (0.03 ha) of land. He got 1 kg seed from PROVA during last *T. aman* season and harvested 75 kg and the same seed was used for planting during the *Boro* season.
- He was so satisfied with the performance of the variety that he called it "*Sundar Dhan*" meaning beautiful rice. He made the following observations for this variety:
  - There was no seedling mortality in the nursery under the foggy conditions as the variety was cold tolerant in the seedling stage. Under similar conditions, the seedling mortality for the officially recommended variety BRRIdhan 28 was quite high.
  - He called it *"Khara Shahisnu Dhan"* which means drought tolerant.
  - High yield: seeding was late, in spite of that the yield was quite high. Had other varieties been planted so late no reasonable harvest could be expected.
  - It has more attractive grains and less chaffs compared to other *Boro* varieties.
- It is early maturing and did not lodge even under adverse conditions (survived stormy winds) while BRRIdhan 28 did lodge

Rajob Ali with his rice thresher

- He planted Judi 582 in less fertile land compared to BRRIdhan 28 and applied the same amount of fertilizer but it did well even under these moderate fertility conditions (unlike BRRIdhan 28).
- It requires less cooking time compared to BRRIdhan 28
- It has a better quality of *bhat* (cooked rice) than BRRIdhan 28.
- Even *basi bhat* (stale rice, i.e. eaten a considerable time after cooking!) is reasonably good while *basi bhat* of Minikit does not taste as good.
- He plans to reduce the area under BRRI varieties and increase the area under Judi 582 and another project variety Pant Dhan 10.