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Development and Up-Scaling of Dry Direct Seeded *Boro* Rice System for Areas with Limited Water

Boro rice (winter rice) in Bangladesh is traditionally cultivated in the wetland system, i.e., transplanting seedlings on puddled soil and continuously maintaining 5-10 cm standing water in the field to facilitate crop establishment and weed control.

This traditional wetland system requires a huge amount of irrigation water, a costly and increasingly sparse natural resource in the country.

In recent years, irrigation water has become scarce in many parts of the country threatening the production of boro rice that accounts for about 55% of the annual output of the staple food grain in Bangladesh.

This does not bode well for the food security situation in the country. The cost of pumping out water for irrigation is spiraling due to lowering of ground water table in many parts of the country. More than 80% of the irrigation pumps in Bangladesh are diesel-operated consuming about 10 million liters of diesel per day during the boro season, which is a hazard to the environment.

Moreover, large scale extraction of groundwater is further lowering the water table which is one of the causes of emerging soil and environmental problems in the country.

The alternate wetting and drying (AWD) method of irrigation, instead of the traditional continuous flood-wet system has been advocated and is being used by some farmers as a water saving technology.

However, AWD can hardly save more than 20-30% water, and a more water efficient rice growing system needs to be developed and practiced.

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Dry direct seeding could be a good option for boro rice production with low water inputs. This new system can save 50-60% irrigation water. Also, this system is expected to reduce the emission of methane, a harmful green house gas (GHG). In addition, this system can accommodate a third crop, a short duration non-rice rabi crop in the fallow period between two rice crops, boro and transplanted aman (*T. aman*) to help increase system productivity and farm incomes with limited irrigation. This project studied the possibility of a dry direct seeded boro rice based boro-rabi (mustard)-*t. aman* cropping pattern as a way of sustaining boro rice production and enhancing system productivity in the face of increasing shortage of irrigation water.

Farmer participatory adaptive trials on *T. aman*-mustard-DDS *boro* were conducted in two areas viz., Godagari upazila of Rajshahi district and Sadar upazila of Rangpur district. Six participatory farmers were involved in each upazila to conduct trials on 0.40 ha of land each.

In addition, 24 associated farmers were involved in the trials in each upazila from whom the costs of cultivation of their own crops were recorded for comparing with the new practices. The participatory farmers cultivated BINA dhan7 in the wetland transplanting method on 0.40 ha of land in the *T. aman* season after which they raised mustard (BARI sharisha-14) and then cultivated *boro* rice both in the dry direct seeded (DDS) system and conventional soil puddling-transplanting-continuous flooding system.

In addition to the six participating farmers, 15 and 21 farmers were involved in the up-scaling programs in 201 4-15 and 2015-16 cropping years, respectively, in the Rangpur Sadar upazila only. All project farmers in the Godagari upazila (Rajshahi) cultivated BRRI dhan58 while half of the farmers in Rangpur Sadar upazila cultivated BRRI dhan28 and the remaining farmers cultivated BRRI dhan58.

Field days were organized during the harvesting period of mustard and DDS *boro* rice to popularize the new crop production system. The results were published in the printed and electronic media for dissemination of the technology.

Outputs

- A *T. aman-rabi*-DDS boro rice based cropping pattern was developed which enhanced system productivity over that of the traditional wetland transplanted rice-rice *(T. aman-boro*) system by 30%.
- The new system is agro-economically potentially remunerative in that it can cut down irrigation requirement by 50% and slash production costs by 10%.
- Farmers' knowledge and skills on the production technologies for *T. aman*-mustard-DDS boro cropping system were improved.

Benefits

- Dry direct seeded boro rice production system is a climate resilient environment friendly technology that enables farmers to produce crops with irrigation water savings of about 50%.
- Adoption of the t. aman-mustard-DDS boro rice cropping pattern increases productivity by 30%.
- The use of diesel and electricity for irrigation may be reduced by about 50% contributing to the reduction of GHG emission.

Recommendations

- Community based block demonstrations and mass motivational drives should be undertaken to enhance adoption of this technology.
- A power operated seeder with dibbling facilities needs to be developed for easy and economic rice seed sowing.

Expected Impacts

- The total annual rice output from the new *T. aman*-mustard-DDS boro pattern compares well with that from the traditional *T. aman*-fallow-wetland transplanted boro pattern, but the former outperforms the latter with an additional output of about 1.5 t/ha of mustard, a high value produce while the irrigation water is cut down by 50%.
- Less irrigation means savings on fuel/electricity by about 50% that would substantially reduce of GHG emission.
- The adoption of the new cropping pattern will create a window for crop diversification even in the drought prone areas contributing to the maintenance of food security.
- This cropping pattern will create more employment opportunities for the farming community.

This bulletin has been prepared on the basis of technical information available from a completed CGP project of KGF, the details of which are given below:

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