

Good Practices 14: March 2016



New Cropping Pattern Gives Four Crops Annually



Adoption of alternate cropping pattern can increase productivity, profitability and employment during the agricultural lean season in Bangladesh. Md Mamunur Rashid and Md. Moynul Haque share their experience with promoting alternate cropping pattern in Northern Bangladesh here.

CONTEXT

Food insecurity among the poorer segment of rural population during September-October and in April-May is common in northern Bangladesh. This is primarily due to unemployment during this period and many poor families face almost near famine situation during these periods (RDRS, 2006). It happens as long duration rice varieties (Swarna, BR 11 and local) dominate during aman season. These varieties require nearly 150 days to harvest and farmers have to wait until mid-November for agricultural job as well as their food (Hossain, 2004; Haque, 2010). (Rice is cultivated in Bangladesh throughout the year as Aus, Aman or Boro. Aman (broadcast and transplanted) is generally cultivated in December-January, Boro in March-May and Aus in July-August cropping seasons).

Very recently, aman rice-potato-boro rice cropping pattern is rapidly becoming popular in northern Bangladesh due to good market of potato as well as good harvest of rice (RDRS, 2010). This cropping pattern however, might not be economical and environmentally safe as it requires withdrawal of huge quantity of ground water to cultivate boro after the harvest of potato in sandy loam soils. Rice production requires about 4000 litres of water for producing a kilogram of rice; but this precious natural resource is not unlimited. About 15-20 million ha of rice cultivation in Asia might be impacted by water scarcity because of climate change and increased consumption of water for agricultural use (IRRI, 2010).



ALTERNATE CROPPING PATTERNS

Food insecurity and unemployment of farm workers in September-October can be mitigated by up-scaling the production of short duration aman rice (Var. BUdhan 1, BRRI Dhan 56, BINA Dhan 7) as it can be harvested by October. It is evident and popularized in some areas of northern Bangladesh through the preliminary research and development works done with the financial assistance of KGF (*Krishi Gobeshona Foundation*) from May 2009 - April 2011. Similar changes in other parts of northern region will not only ensure food security but also enhance system productivity as it facilitates timely planting of winter potato or wheat after the rice harvest (Haque, 2010). However, this technology requires further testing and validation under specific micro-environments.

Timely planting of potato or wheat in winter season further creates opportunity to establish short duration mungbean (BUmug 4, BARImung 6) and short duration aus rice (var. Pariza) in sequence, as it requires nearly 60 and 70 days field duration, respectively (RDRS, 2010). As short duration aman rice and aus rice utilizes mostly rain water, it offsets the detrimental effect of excessive withdrawal of ground water as being



practiced in boro cultivation in traditional cropping systems. Therefore, the alternate cropping pattern (aman rice - potato or mustard - mungbean - aus rice) was designed against farmers' cropping pattern (aman rice - potato - boro rice) to intensify cropping and enhancing system productivity in northern Bangladesh.

RDRS Bangladesh in collaboration with Bangabandhu Sheikh Mujibur Rahman Agricultural University (BSMRAU) took up the alternate cropping pattern initiative with financial assistance of KGF. The initiative was launched under the project "Crop intensification in northern region of Bangladesh through up-scaling the production of short duration rice and mungbean" in July 2011.

GOOD PRACTICES

Farmer Field School Approach

RDRS follows an effective extension model called 'Farmer Field School (FFS)' to spread appropriate improved farming practices among farmers who are quick to adopt profitable and sustainable technology. FFS provides small and marginal farmers with access to Government

services and support within their own groups. The FFS are linked into Farmers Forum of Federation (FFF), an apex body that manages FFS formation and development. FFS tested an intensive four-crop sequence (aman rice - mustard or potato – mungbean - aus rice) and compared it with traditional cropping pattern (aman rice - potato - boro rice).

Farmers' selection

The activities were implemented in eight northwest districts namely Rangpur, Gaibandha, Kurigram, Lalmonirhat, Nilphamari, Dinajpur, Thakurgaon and Panchagarh of Rangpur division. As the initiative targeted 400 farmers, 50 farmers from each district were selected from FFS in group discussion with the help of Farmers Forum of Federation (FFF).

Training

Although the selected farmers have experience in cultivation of rice, mustard, and potato, they lacked knowledge on new cropping systems and also modern agricultural technologies and effective and efficient use of inputs. So, the project staff provided practical training to farmers on different aspects of crop cultivation and utilization of available resources for crop intensification and diversification.



These one day trainings were field based and these were facilitated by Deputy Director (DD) and Upazila Agriculture Officers of the Department of Agricultural Extension (DAE), and the project staff of RDRS. The topics that were covered during the training were as follows:

- Selection of good quality seeds and crop varieties
- Fertilizer application and management
- Irrigation water application and water saving techniques
- Pest control
- System of production with four crops.

Demonstrations

The project provided critical input like seed, micronutrient fertilizer, pesticide and insecticide to establish demonstration on selected crops. Only 400 farmers of FFS were involved in 2011-12 for field level experiment of the cropping pattern.



Total four field based staff (Research Assistants) were appointed to work with 400 farmers and they were responsible for guiding farmers and monitoring field activities. Most of the fields were established as a block wise and 5-10 farmers were involved in each block.

The project gave emphasis to those who can act as Farmer Promoter/Lead Farmers in each block and they were provided training on basic facilitation skills and data collection. The lead farmers helped the project staff and they worked to mobilize more farmers to follow this proposed cropping pattern. As a result, in 2012-13, the project directly worked with 800 farmers and each farmer established one demonstration in one bigha land (33 decimals).

Field Days

After successful completion of demonstration of crops under alternate cropping pattern, farmers (both husband and wife) government administrators, policy makers, GO-NGO extension providers, local leaders, social workers and journalists met during the two Field Days organised every year in each district. a year in each district. In this way, total 48 Field Days were organized during the 3-year project period (July 2011 - June 2014) in eight districts where around 10000 male and female farmers participated.

BENEFITS AND IMPACT

Economic analysis showed that the alternate cropping patterns are more economical than the crops grown in the existing cropping pattern. Among the four crops grown in sequence, potato



contributed the highest economic return although it required highest investment in crop cultivation. Gross return in potato of alternate cropping pattern (Tk. 300188 ha⁻¹) was found almost double than potato in farmers cropping pattern (Tk. 145661 ha⁻¹) mostly because of higher market price of early potato than late harvested potato of farmers cropping pattern.

Similarly, greater benefit in aman rice of the alternate cropping pattern was associated with higher early market price than late harvested rice in the traditional cropping pattern. To some extent, better grain quality of early rice of alternate cropping system also enhanced the market price. From whole system research, gross return Tk. 499027 ha⁻¹ was obtained in alternate cropping pattern against Tk. 25550 ha⁻¹ which is 75.92% higher than that of farmers cropping pattern. Further, the alternate cropping pattern with four crops produced 73.43% higher system yield and 11.96% food energy over yield and food energy produced by three crops of farmers cropping pattern.



Considering cost-benefit ratio, potato (3.96) of alternate cropping pattern is more economical than potato (2.21) of farmers cropping pattern. Based on the whole cropping pattern, cost-benefit ratio was 2.93 in the alternate cropping pattern and 1.72 in the traditional cropping pattern. Comparison of the cost-benefit ratio of

potato (2.21) in the traditional cropping pattern to that of the mustard (2.54) in the alternate cropping pattern suggests the possibility of extending mustard in four crops in sequence. Therefore, a lot of scope exists for adopting mustard in place of potato to minimize the risk of overproduction of potato in northern districts. Moreover, further yield improvement in mustard may create additional impact to farmers as unit price of mustard is much higher than that of potato.

SUSTAINABILITY AND SCALING UP

The project with four crops in sequence [aman (early) - potato or mustard - mungbean - aus (early)] was initiated with 400 farmers of eight northern districts of Bangladesh during aman season of 2011. The project created tremendous impact which is evident from the adoption of new cropping pattern in subsequent years. While designing the project, we expected that about 2000 farmers to adopt the alternate cropping pattern. However, nearly 4000 farmers adopted the alternate cropping pattern at the end of the project in June 2014 (Table 1).

Table 1: Adoption of new cropping pattern in northern region of Bangladesh

Year	Number of farmers			Remarks
	Project activity	RDRS core program	Spill over effect	
2011-2012	400	0	0	Neighbour farmers adopted at least 3 out of 4 crops in sequence (exception is mungbean).
2012-2013	800	288	2000	
2013-2014	800	1500	4000	

This was possible because of active participation and continuous promotional activities of RDRS and involvement of other organizations working with agricultural extension. RDRS Bangladesh itself already has taken it into their core program to popularize the cropping pattern with four crops in sequence.

LESSONS LEARNED

Monthly learning session in FFS: The tested cropping pattern is highly knowledge intensive and so good crop planning is very important to promote and adopt new cropping patterns. The monthly learning session in FFS helped in careful crop planning and solving field problems.

Use of lead farmers and DAE staff: The participation of lead farmers and also local extension personnel of the Department of Agricultural Extension (DAE) also contributed to the success. While the lead farmers helped in mobilizing more farmers to try the alternate cropping systems, the DAE staffs' participation ensured availability of more resource persons to support farmer trainings.

Use of media: The project also involved the print and electronic media to share the details of the activities and its success and these helped in convincing other extensionists and the country administration in the value of promoting the alternate cropping pattern.

Need a study on soil nutrient balance: Four crops system being a highly intensive cropping system, nutrient demand of individual crops should be met judiciously in order to arrest soil degradation. It is well known that declines in crop yield are related to soil quality degradation, particularly nutrient depletion (Roy et al., 2003). Nutrient depletion can be attributed to insufficient fertilizer use and unbalanced fertilization (Tan et al., 2005). The common fertilizers applied for crop production are nitrogen, Phosphate, Potassium, Zinc and Sulphur. The rate and type of these fertilizers depend on a farmer's financial status, and the farmer's choice is often made without considering soil nutrient conditions and balance. Therefore, a separate study on soil nutrient balance is essential to ascertaining the future sustainability of soil fertility which was not considered in the previous project.

Acknowledgement

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