

# TECHNICAL BULLETIN

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## Validation and Up-Scaling of Resource Conservation Technologies (RCT) for Improving Productivity in the Drought Prone Areas

Drought prone areas in northern Bangladesh regularly experience hot dry spells during April-May when temperatures may become as high as 40° C or even higher. Potential evapo-transpiration (PET) is higher than precipitation in the five winter and pre-monsoon months (January-May) resulting in water stress or drought for the growing crops.



Farmers in this drought prone region of the country normally grow only one crop of transplanted aman (*T. aman*) rice in the year under monsoon rainfed conditions. Moreover, recent reports

indicate that the groundwater level in the Chapai Nawabganj district of the Barind Tract is rapidly falling due to over exploitation of water through deep tube wells the command areas of which are shrinking. Irrigation costs in the region are also on the rise.



There have been reports of 40-57% crop yield reduction due to drought. The present cropping intensity in the drought prone areas is about 130%. It is possible to increase the cropping intensity from 130 to 300% with appropriate resource conservation technologies (RCT) consisting of minimum tillage, crop growing on raised beds, taking advantage of residual soil moisture and quick seeding in moist soil with the power tiller operated

seeder (PTOS) machine that facilitates plowing, seeding and laddering (leveling) in a single operation.

Soils in drought prone areas of the Barind Tract in northern Bangladesh are heavy clays, acidic (pH 5.5 or lower) in nature. There are no rains from September to March but heavy rains occur



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in June to August. In the Barind areas, about 75,000 ha of land remains fallow after *T. aman* harvest due to scarcity of irrigation water. Farmers in these areas usually keep *T. aman* rice straw in the fields to dry and do not grow any rabi crop, but there is an opportunity of growing rabi crops on 40,000 ha using water from some 60,000 ponds. Also, after the harvest of *T. aman* rice, enough residual soil moisture remains there for seed germination and wheat, chickpea, and other rabi crops can be quite easily grown taking advantage of the residual soil moisture and through quick seeding by PTOS.

On-farm adaptive and up-scaling trials resource conservation technologies (RCT) were conducted in drought prone areas. The project activities were carried out in a participatory approach in farmers' fields at three locations of three drought prone upazilas of the Rajshahi division viz., Paba and Godagari of the Rajshahi district and Nachole of the Chapai Nawabganj district. One hundred farmers were selected at each location as participating farmers.

Forty-two validation and 158 up-scaling trials were conducted on different crops using RCT. HYVs of rice, wheat, lentil, chickpea, maize, sesame and mungbean were tested in comparison with farmers' varieties. Technology dissemination efforts included field days, training, workshops and print and electronic media coverage involving farmers, local leaders, service providers, DAE Officials, NGO and newspaper and TV journalists.

## Results

Tillage method markedly affected crop growth and yield (Fig. 1 and 2). The highest grain yield of *t. aman* rice (4.45 t/ha) was obtained from transplanting in unpuddled soil with strip till system followed by transplanting in unpuddled soil with the raised bed (RB) system (4.2 t/ha) and the lowest grain yield (3.75 t/ha) was with direct seeding which was similar as conventional

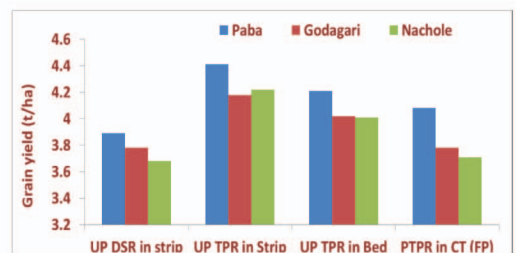


Fig. 1. Grain yield of *t. aman* rice under different tillage



Fig. 2. Effect of tillage on rice growth

practices (CT) at all three locations. The crop grown in strip and raised bed system received more light, air and was also benefited by border effect which resulted in better growth and yield. In the strip till system, plants grow in line and it is easy to perform intercultural operations. As the soil is

not disturbed in this system, good soil aeration occurs which facilitates good crop growth. Results of the validation and up-scaling trials supported suitability of RCT in improving

productivity and reducing irrigation water needs in drought prone areas. The heat and drought tolerant *T. aman* rice HYV, BRRI dhan56 and wheat varieties, BARI Gom-26, BARI Gom-28, were found to be suitable for the Barind areas. Soil organic matter was increased by about 0.15% through crop residue retention in rice-based cropping system in drought prone areas. Cropping intensity was increased by about 100-200% through incorporation of pulse and oilseed crops in the system.



## Recommendations

RCT is a promising technology for improving productivity and reducing irrigation water needs in drought prone areas of northern Bangladesh.

Efforts should be strengthened to disseminate and extend the alternative cropping patterns, rice-wheat-mungbean and rice-wheat-sesame to other drought prone areas of northern Bangladesh and replace the traditional farmers' cropping pattern, rice-fallow-fallow.

## Expected Impacts

With suitable crop varieties and RCT, cropping intensity in the drought prone areas of northern districts can be increased by about 100-200%, irrigation water needs and production costs can be reduced by 30-35% and 45-50%, respectively.

Higher crop yields and lower production costs will increase farmers' net incomes. Soil fertility may be improved through cultivation of legume crops and soil incorporation of crop residues.

As a consequence, this traditionally low-productivity region of the country can come up with higher annual agricultural outputs contributing significantly to food security and economic development at the national level.

A greater consumption of pulses is expected to improve farmers' health and nutrition status.

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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:

Project code and title: TF 08 NR: Validation and up-scaling of resource conservation technologies (RCT) for improving productivity in the drought prone areas; Principal Investigator: Dr. Md. Ilias Hossain, BARI; Project duration: May 2013 to May 2016

