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# PERFORMANCE OF AUS RICE VARIETIES IN NORTHWEST BANGLADESH AMID CLIMATE CHANGE

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**ABSTRACT**

Rashid MM, Ghosh AK, Roni MN, Islam MR, Alam MM, Ahamed S (2017) Performance of aus rice varieties in northwest Bangladesh amid climate change. *Int. J. Sustain. Crop Prod.* 12(2), 7-10.

An experiment was conducted at RDRS Bangladesh farm, Monthana, Rangpur, Bangladesh during April to August 2016 to evaluate the yield performance of six *aus* rice varieties of Bangladesh *viz.* BRRI dhan43, BRRI dhan48, BRRI dhan55, BRRI dhan62, BRRI dhan28 (BRRI dhan55 and BRRI dhan28 is a *boro* recommended and BRRI dhan62 in *amon* recommended but all are photo-insensitive so those can be cultivated year round and BRRI dhan28 is a late *boro* which known as *Boroaus* in northwest area) and Pariza. The experiment was laid out in a randomized complete block design with three replications under rainfed condition by using rain water instead of ground water. Total 1532.2 mm rainfall occurred during the cultivation period (April to July 2016). The entire yield contributing attributes varied significantly among the varieties. The highest plant height (108.11 cm) was observed in BRRI dhan28 and the lowest (93.67 cm) in Pariza. In the variety BRRI dhan55 number of filled grains panicle$^{-1}$ was found highest (105.44) and the lowest (85.0) was recorded in the variety BRRI dhan48. BRRI dhan48 produced the highest 1000-grain weight (25.3 g) and the lowest (23.73 g) was recorded from the variety Pariza. The highest grain yield (3.42 t ha$^{-1}$) was obtained from BRRI dhan43 and the lowest grain yield (2.33 t ha$^{-1}$) was obtained from BRRI dhan28. Among the six *aus* rice varieties under Northwest condition BRRI dhan43 and BRRI dhan48 are suitable in respect of yield and there are many scope of *aus* rice cultivation under rainfed condition to reduce ground water use as well as to ensure food security.

***Key words:*** *yield, yield contributing characters, rainfed, aus, variety*

## INTRODUCTION

Rice (*Oryza sativa* L.) is the most important cereal crop all over the world. Bangladesh ranks fourth in both rice area and production among leading rice growing countries (WRP 2016 and BRRI 2007). About 75.01% of total cropped area of Bangladesh is used for rice production, with annual production of 34.71 million tons from 11.28 million hectares of land (BBS 2015). Farmers of Bangladesh cultivate rice three seasons in a year namely *aman*, *aus and boro*; land area covered nearly 48%, 9% and 43% respective of rice production area (BBS 2015). *Boro* rice is irrigated rice, *aman* and *aus* rainfed rice. Rainfed rice farming play an important role for achieving food security, poverty alleviation and economic growth for millions' of farm household specially those who operate in unfavorable environments (Barrow *et al.* 2010). Aus rice is one of these major rice crops in Bangladesh and contributes 7% of total rice production in 2014–2015 (BBS 2015). The Aus rice is sown in March–April and harvested in July–August. Aus rice is both directly seeded and transplanted under rainfed or limited irrigated conditions (Rahman *et al.* 2009). The season during the growing period is very hot summer with yearly mean maximum and minimum temperatures usually highest during this time. The *aus* is a pre-monsoon rice growing season where farmers grow short durated drought tolerant rice varieties by direct seeding or transplanting under rainfed condition. The area under *aus* rice has declined from over 3.0 million ha in the 1960s, to less than 1.0 million ha by mid 2000s (Hossain *et al.* 2013). The traditional *aus* rice varieties are very low yielding with a maximum yield of 1.5 to 2.0 t/ha. Over time with the expansion of irrigation facilities the *aus* varieties have given way to *boro* varieties, because the later gives two to three times higher yield than previous *aus* yield. Its cultivation depends on ground water for irrigation which has severe limitations. Farmers are already suffering from water scarcity in the northwest part, a heavily rice producing region of Bangladesh (IRRI 2012). Day to day *aus* cultivation area has been reduced because lower yield by replacing High yielding and Hybrid *Boro* rice (BBS 2016). But one kilogram *Boro* rice production requires 3000-4000 liter of water. It is estimated that in Asia, rice in 15-20 million ha rice will suffer from water scarcity brought by climate change and increased competition for water for agricultural use (IRRI 2010).

Previous studies of RDRS Bangladesh and others indicated that people living in the northwest of Bangladesh have experienced changes in rainfall patterns. The most important changes are excessive rains during rainy season. Also, an increase in the distribution and frequency pattern of rainfall, in terms of "too much" and "too little" rain and its timing, as rain is either absent or comes at unexpected times (CARE 2005). The average rainfall in the northern region is 350 mm in May, 500 mm in June and 550 mm in July, which wasted in present cultivation technique because after harvesting of *Boro* in late April, no crop is available in the field during May, June and the first half of July (RDRS 2011). The variation of groundwater levels was detected decline (> 1 m/yr) areas around capital Dhaka as well as in north-central, north-western and south-western parts of the country (0.1-0.5 m/yr) due to intensive extraction of groundwater during dry season rice cultivation (Shamsudduha *et al*. 2015). As short duration *aman* rice and *aus* rice will utilize mostly rain water, it will offset the detrimental effect of over withdrawal of ground water as being practiced in *boro* cultivation in traditional

cropping systems. Changes in average rainfall and temperature, boro rice production are negatively impacted in a great extent compared to *aus* rice (Assaduzzaman *et al.* 2010).

RDRS Bangladesh has been working to popularize *aus* rice since 2009 in the northwest part of Bangladesh by utilizing rain water. The Government of Bangladesh has given top priority for increasing the area and production of Aus rice to reduce the pressure on electricity for irrigation needed for *boro* rice production during dry season. "Aus Rehabilitation" has been governments initiated a major project which reduces boro cultivation in Bangladesh and ensure food security for last few years. Since Aus rice group has short duration and huge scope to expand for ensuring food security but there is limited study of varietal performance. This study aims to evaluate yield performance of six rice varieties during *aus* season and explore high yielding rice varieties to farmers for increasing *aus* rice cultivation by using of rain water.

## MATERIALS AND METHODS

The experiment was conducted at the RDRS Bangladesh farm, Monthona, Rangpur during *aus* season (April-August) of 2016 to find out the yield performance of aus rice in response to variety and minimize ground water use in rice cultivation. The experimental site was a medium high land with loamy soil. The experiment was conducted with six rice varieties namely BRRI dhan43, BRRI dhan48, BRRI dhan55, BRRI dhan62, BRRI dhan28 and Pariza. The experiment was laid out in a Randomized Complete Block Design (RCBD) with three replications. The plot size was 8.0m x 5.0m (1 Decimal). Twenty days old seedlings were transplanted at 25cm x 20cm spacing using 3 seedlings per hill. During land preparation for seedling transplanting TSP, MoP, Gypsum and Zinc sulfate were applied at the rate of 60, 75, 38 and 6 kg $ha^{-1}$ as basal dose. Urea was applied in two equal installments at 15 and 35 days after transplanting. Intercultural operations like weeding, gap filling, drainage and pest management were done as and when necessary. From three hills (excluding border hills) randomly selected in each plot to record yield contributing attributes. Then all plots were harvested to obtain grain and straw yield. Data were collected on different growth parameters such as plant height, tiller number and yield contributing characters *viz.* number of effective tillers per hill, length of panicle, number of grains $panicle^{-1}$, 1000–grain weight (TGW), grain yield, straw yield, biological yield and harvest index. Rainfall data is collected from Bangladesh Meteo- rological Department (BMD). The collected data were analyzed statistically using the "analysis of variance (ANOVA)" and treatment means were compared using Duncan's Multiple Range Test (DMRT).

## RESULTS AND DISCUSSION

Crop characters, yield contributing characters and yield of aus rice varieties varied significantly (Table 1). Plant heights at maturity of the tested varieties showed significant variation in response to varieties. The highest plant height (108.11cm) was observed in BRRI dhan28 and the lowest (93.67cm) in Pariza. These may be due to genetic characteristics of the varieties (Tyeb *et al.* 2013; Sarkar *et al.* 2014; Islam *et al.* 2014; Jisan *et al*. 2014; Bony *et al*. 2015). The highest number of effective tiller $hill^{-1}$ (13.33) was obtained from BRRI dhan48 and the lowest number of effective tiller $hill^{-1}$ (9.11) was obtained from BRRI dhan28. This result was supported by Chowdhury *et al.* (1993) who stated that effective tillers $hill^{-1}$ varied with the variety. The highest (25.11 cm) panicle length was obtained from BRRI dhan48 and lowest (22.0 cm) was obtained from BRRI dhan43. Idris and Matin (1990) reported that panicle length influenced by variety. The maximum number of filled grain $panicle^{-1}$ (105.44) was observed in BRRI dhan55 and the minimum (85.0) was obtained from BRRI dhan62. Anonymous (1994) reported that the number of filled grains $panicle^{-1}$ influenced significantly due to variety. The results were also supported by Singh and Gangwer (1989). The maximum number of number of spikelet $panicle^{-1}$ (129.11) was observed in BRRI dhan55 and the minimum number of grains $panicle^{-1}$ (100.89) was observed from BRRI dhan48. The higher number of spikelets $panicle^{-1}$ in transplanting method probably due to severe competition of plants for resource shearing (Javaid *et al.* 2012). The maximum 1000 grains weight (25.3 g) was found in BRRI dhan48 and the minimum (23.73 g) in Pariza. Akhgari *et al.* (2013) reported that 1000 grain weight an important yield component that differed significantly among the cultivars due to genetic make-up which supported the present experimental result. Among, the six *aus* rice varieties the highest grain yield (4.19 t $ha^{-1}$) was obtained from BRRI dhan48 which gave the highest yield due to good crop condition, efficient use of natural resources which results in higher number of tillers, panicle and spikelet $panicle^{-1}$ as well as due to higher number effective tillers. The lowest grain yield (3.21 t $ha^{-1}$) was obtained from BRRI dhan28. The highest straw yield (5.25 t $ha^{-1}$) was obtained from BRRI dhan28 due to longer plant height. The highest harvest index (48.93%) was calculated from the variety BRRI dhan55 and the lowest (39.54%) was calculated from the variety BRRI dhan28 that means the variety BRRI dhan28 is less efficient for translocation of assimilate towards the grain. Shah *et al.* (1991) reported that variety had a great influence on harvest index.

Table 1. Effect of variety on yield and yield contributing character of rice varieties

| Treatment (Variety) | Yield and yield contributing attributes | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Plant height (cm)** | **Number of total tiller/hill** | **Number of effective tiller/hill** | **Panicle length (cm)** | **Number of filled grains/ panicle** | **Number of unfilled grains/ panicle** | **Total grains/ panicle** | **1000-grain weight (g)** | **Grain yield ($tha^{-1}$)** | **Straw yield ($tha^{-1}$)** | **Harvest index (%)** |
| BRRI dhan43 | 106.22bc | 14.67 | 11.22ab | 22.0a | 100.44 | 24.22 | 124.67b | 24.77bc | 4.14d | 4.87e | 42.97c |
| BRRI dhan48 | 105.56bc | 14.67 | 13.33b | 25.11c | 105.33 | 15.89 | 100.89a | 25.3c | 4.19f | 4.59d | 47.74e |
| BRRI dhan55 | 107.89c | 13.89 | 9.78a | 22.89ab | 105.44 | 23.67 | 129.11b | 24.6abc | 3.96e | 4.13b | 48.93f |
| BRRI dhan62 | 102.56b | 14.44 | 11.0ab | 23.0ab | 91.78 | 22.56 | 114.33ab | 25.03bc | 3.21a | 3.89a | 45.14d |
| BRRI dhan28 | 108.11c | 12.56 | 9.11a | 24.44bc | 104.11 | 19.78 | 123.89b | 24.23ab | 3.43c | 5.25f | 39.54a |
| Pariza | 93.67a | 15.56 | 13.22b | 22.67ab | 97.56 | 19.33 | 116.89ab | 23.73a | 3.32b | 4.49c | 42.53b |
| Level of significance | 0.05 | NS | 0.01 | 0.05 | NS | NS | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| CV (%) | 6.39 | 16.62 | 23.07 | 9.04 | 11.54 | 18.16 | 15.03 | 3.44 | 9.79 | 9.98 | 7.28 |

Figures in a column followed by different letter (s) differ significantly but common letter (s) do not differ significantly at 1% and 5% level of probability as adjusted by DMRT. CV= Coefficient of Variance, NS= Not Significant

## CONCLUSION

From the results it can be concluded that among tested six rice varieties variation exists in different growth parameters and yield as well as yield contributing characters during *aus* season and BRRI dhan48 is high yielding than others in northwest condition. Therefore we can explore BRRI dhan48 as high yielding *aus* rice variety to farmers.

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