

## EFFECT OF PLANTING METHOD ON MUSTARD BORO INTER MIXED CROPPING SYSTEM

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### Abstract

A field experiment was carried out at Multi Location Testing (MLT) site, Debiddar and Chandpur during Rabi season of 2015-16 to find out the suitable boro rice planting method with cost and return of inter mixed cropping system in Cumilla region. The treatment combinations used were T<sub>1</sub> : Boro rice (broadcast) + Mustard, T<sub>2</sub> : Boro rice (Line sowing) + Mustard, T<sub>3</sub> : Sole Mustard, T<sub>4</sub> : Sole boro rice. Results revealed that all the mixed cropping combinations showed superior in terms of gross return, gross margin and rice equivalent yield (REY) than sole cropping. The highest rice equivalent yield (8.52 t ha<sup>-1</sup>) was found in the treatment combination of boro rice line sowing + mustard. From the cost and return analysis it was observed that the combination of boro rice line sowing with mustard (T<sub>2</sub>) gave the highest gross return (Tk. 127800 ha<sup>-1</sup>) and gross margin (Tk. 77400 ha<sup>-1</sup>) where sole crop of mustard (T<sub>3</sub>) gave the lowest gross return (Tk. 65120 ha<sup>-1</sup>) and gross margin (Tk. 21450 ha<sup>-1</sup>) which indicated the advantage of mixed cropping over the sole.

### Introduction

Mixed cropping of mustard with *Boro* rice is a popular practice in some areas (about 3700 ha) of Cumilla and Chandpur districts to utilize the residual moisture especially in low lying areas (DAE, 2016). The direct seeding of Boro rice (*Oryza sativa*) + Mustard (*Brassica campestris*) as mixed crop innovative practice is explored by the farmers under AEZ 19, 22 and 30 (Hossain *et. al*, 2015). This practice is gradually increasing at low laying areas of Cumilla region, where only boro rice is being cultivating in whole year. At first farmers' sowing rice seeds in broadcast method and hereafter they sow mustard seeds. Mostly farmers are practicing direct seeded Boro rice (var. BRRI dhan29) as mixed crop with mustard (Tori 7) by broadcast method with traditional crop management practices. Farmers of these area used different ratio of mustard seeds with 100 % boro rice. Most of the farmer's sowed mustard and boro rice in broadcasting method instead of line sowing. That's why, intercultural operations like weeding and fertilizer application etc. sometimes makes a problem which resulted low grain yield of rice. So, this experiment was undertaken as a location specific problem oriented program to find out the suitable rice planting method in mustard boro mixed cropping system with cost and return in Cumilla region.

### Material and Methods

The experiment was carried out at MLT site, Debiddar and Chandpur during *Rabi* season of 2015-16 to find out the suitable rice planting method in Mustard- Boro inter mixed cropping system with cost and return in Cumilla region. The soils of the experimental areas belong to the AEZs 19, 22 and 30 (FRG, 2012). The soils of the experimental plots were clay loam in texture. The experiment was laid out in Randomized Complete Block design with five dispersed replications. It was consisted with four treatments as follows:  $T_1$  : Boro rice (broadcast) + Mustard,  $T_2$  : Boro rice (Line sowing) + Mustard,  $T_3$  : Sole Mustard,  $T_4$  : Sole boro rice. According to the treatments, seeds of mustard (var. BARI Sarisha-14) and boro rice (var. BRRI dhan58) were broadcasted and line sown on 09-11 November 2015 @ 8 and 40 kg ha<sup>-1</sup>, respectively. The unit plot size was 100 m<sup>2</sup>. The lands were fertilized with 18.43, 16, 20, 7, 1.43 and 1.36 kg N-P-K-S-Zn and B ha<sup>-1</sup>, respectively. 2/3rds urea and total amount of other fertilizers were applied during final land preparation as basal and rest 1/3rd urea was applied as top dress at 30 days after broadcasting (BARI, 2014). Plant protection measure and all other management practices were done for mustard and boro rice as and when necessary. Mustard was harvested on 04-06 February 2016, whereas boro rice on 24-26 April, 2016. Data on the different crop parameters were collected from the 10 randomly selected sample plants and then average was taken which was further analyzed by software program Statistix10. Rice equivalent yield (REY) and economic analysis were calculated to ascertain the efficiency of intercropping. Rice equivalent yield was calculated by converting yield of mixed crops to the yield of rice on the basis of prevailing market prices of individual crops.

## Results and discussions

### Yield and yield attributes of Mustard

Yield attributes and yield of mustard in mustard boro inter mixed cropping situation are presented in the Table 1. Results indicated that plant populations of mustard were varied with the variation of planting system among the treatments. Plant height of BARI Sarisha-14 showed statistically no significant difference among the treatments in mustard boro intercropping system. It was revealed that the higher number of pods plant<sup>-1</sup> (50.78) was recorded in  $T_3$  (sole mustard) and lowest number of pods plant<sup>-1</sup> (43) was obtained from  $T_1$  (Boro rice broadcasting + mustard). The highest number of seeds pod<sup>-1</sup> (26.50) was recorded in  $T_3$  treatment and lowest number of seeds pod<sup>-1</sup> (23.60) was recorded in the treatment  $T_1$  which was statistically identical with  $T_2$ .

Table 1. Yields attributes and yield of mustard as a inter mixed crop with boro rice at Muradnagar, Cumilla and Hatila, Hajigonj, Chandpur, 2015-16

Treatments	Plant population m <sup>-2</sup> (no.)	Plant height (cm)	Pods plant <sup>-1</sup> (no.)	Seeds pod <sup>-1</sup> (no.)	Seed yield (t ha <sup>-1</sup> )
$T_1$	88.54	99.08	43.00	23.60	1.52
$T_2$	94.14	94.44	47.98	23.72	1.60
$T_3$	97.48	95.84	50.78	26.50	1.64
$T_4$	00	00	00	00	00
LSD <sub>(0.05)</sub>	6.968	Ns	6.629	2.04	0.167
CV %	12.40	6.07	13.57	9.70	10.21

$T_1$  = Boro rice (broadcasting) + mustard,  $T_2$  = Boro rice (Line sowing) + mustard,  $T_3$  = Sole Mustard,  $T_4$  = Sole boro rice

Seed yield of mustard was higher (1.64 t ha<sup>-1</sup>) in T<sub>3</sub> (sole mustard) followed by T<sub>2</sub> (Boro rice line sowing + mustard) and the lowest (1.52 t ha<sup>-1</sup>) was obtained from T<sub>1</sub> (Boro rice broadcasting + mustard). The seed yield of mustard decreased with the increasing of rice population in the mixed cropped situation might be due to competition for soil nutrients and less light interception between the main and the intercrops compared to sole cropping of mustard. Similar relationship in mixed cropping situation was also found by Bhowal *et al.* 2014.

#### Yield and yield attributes of Boro rice

The result indicated that most of the yield attributes of boro rice were significantly influenced due to mixed cropping with mustard (Table 2) except plant height, panicle length and number of seeds per panicle. Results revealed that plant populations of rice were varied with the variation of planting system among the treatments. The higher number of tiller hill<sup>-1</sup> (12.66) was recorded in T<sub>4</sub> (sole boro rice) which was statistically identical to T<sub>2</sub> and the lower number of tiller hill<sup>-1</sup> (10.53) from T<sub>1</sub> (Boro rice broadcasting + mustard). The highest grain yield of boro was recorded in sole situation T<sub>4</sub> (5.16 t ha<sup>-1</sup>) might be due to cumulative effect of yield contributing characters of boro rice. The lowest grain yield was recorded in the treatment T<sub>1</sub> (4.40 t ha<sup>-1</sup>) where boro rice var. BRRI dhan58 were broadcasted with mustard.

Table 2. Yield attributes and grain yield of boro rice as a inter mixed crop with mustard at Muradnagar, Cumilla and Hatila, Chandpur, 2015-16

Treatments	Plant population m <sup>2</sup>	Plant height (cm)	Tiller hill <sup>-1</sup> (no.)	Length of penical (cm)	Seed penical <sup>1</sup> (no.)	Grain yield (t ha <sup>-1</sup> )
T <sub>1</sub>	38.33	84.73	10.53	23.00	220.87	4.40
T <sub>2</sub>	33.20	87.36	11.06	23.16	223.80	4.79
T <sub>3</sub>	00	00	00	00	00	00
T <sub>4</sub>	35.00	84.80	12.66	23.41	224.00	5.16
LSD (0.05)	2.79	Ns	3.270	Ns	Ns	0.365
CV %	6.66	0.90	14.51	2.05	2.76	11.46

T<sub>1</sub> = Boro rice (broadcasting) + mustard, T<sub>2</sub> = Boro rice (Line sowing) + mustard, T<sub>3</sub> = Sole Mustard, T<sub>4</sub> = Sole boro rice

#### Rice equivalent yield (REY) and Cost and return analysis

REY and Cost and return of mustard boro inter mixed cropping system are presented in the Table 3. Gross return as well as gross margin was found higher in mixed crop cultivation in comparison to sole cropping of mustard and boro rice. From cost and return analysis, it was documented that T<sub>2</sub> treatment (Boro rice line sowing + mustard) made the highest gross margin Tk. 53250 ha<sup>-1</sup> followed by T<sub>1</sub> (Tk. 46620 ha<sup>-1</sup>).

Table 3. Cost and return analysis of mustard boro mixed cropping system at Muradnagar, Cumilla and Hatila, Chandpur, 2015-16

Treatments	REY (t ha <sup>-1</sup> )	Total cost (Tk. ha <sup>-1</sup> )	Gross return (Tk. ha <sup>-1</sup> )	Gross margin (Tk. ha <sup>-1</sup> )	BCR
T <sub>1</sub>	7.94	72480	119100	46620	1.64
T <sub>2</sub>	8.52	74550	127800	53250	1.71
T <sub>3</sub>	3.82	35540	57300	21760	1.61
T <sub>4</sub>	5.16	56250	77400	21150	1.36

T<sub>1</sub> = Boro rice (broadcasting) + mustard, T<sub>2</sub> = Boro rice (Line sowing) + mustard, T<sub>3</sub> = Sole mustard, T<sub>4</sub> = Sole boro rice, Unit price of mustard Tk. 35/kg, Rice Tk. 15/kg, REY= Rice Equivalent Yield

The lower gross margin (Tk. 21150 ha<sup>-1</sup> and Tk. 21760 ha<sup>-1</sup>) was obtained from sole practices of T<sub>3</sub> and T<sub>4</sub> respectively. Some of research findings also documented higher gross margin or net return in mixed or intercropping system than sole crop (Sarker and Pal, 2004; Razzaque *et al.*, 2007; Alam *et al.*, 2008). The finding of the research result also supports the findings of Farhad *et al.* (2014) who reported that intercropping is more profitable than the sole cropping and reduces the risk of mono cropping.

#### Farmers' opinion

The farmers obtained more yield and benefit from mustard boro rice as inter mixed cropping (Boro rice in line sowing with mustard) than the sole cropping.

### Conclusion

Considering the yield and economic return it can be concluded that boro rice in line sowing with mustard is the most profitable when grown as mixed crop and risk of cultivation of mono crop can be reduced by mixed cropping.

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