

## Effect of Different Bullock Drawn Implements on Rice Productivity under Biasi System of Rice Cultivation

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### Abstract

Different bullock drawn implements and three varieties IR-36, BD-201 and Swarna were evaluated under biasi system of rice cultivation in East Singhbhum district of Jharkhand to study their suitability in increasing rice productivity under broadcast condition. Plot receiving intercultural operation retained maximum plant population 54.27/m<sup>2</sup> and show least plant mortality. The weeding efficient of biasi plough (88.15%) was found better than the other implement. The implement intercultural plough gave maximum grain (24.73 q/ha) and straw yield 47.23q/ha. Among three different varieties maximum grain yield was found with variety Swarna (28.46 q/ha). The interaction of the varieties and implement indicate that variety and implement were independent in their influence and use of intercultural plough with variety Swarna gave maximum grain yield of 30.80 q/ha which was at par with the other implement suggest the suitability of variety Swarna under biasi system.

**Key words :** Biasi system, Implements, Rice productivity.

Rice is an important crop of the major cropping system prevailing in the Jharkhand and grown in an area of 18.2 lakh ha. The basic aims of biasi system is to increase the yield of rainfed rice system with minimizing operational cost and energy by introducing proper implements and technology. Farmers of this region are not using improved varieties and biasi implements thus the productivity of the system is low. The bushening operation under biasi caused initial set back and mortality of rice plant and reducing plant population and grain yield (1). Therefore, to increase the yield of rainfed rice, introduction of proper implement technology for biasi system is required as

the method is cheaper than manual weeding and also manipulates the soil for better crop growth. On the other hand plant mortality due to mechanical damage can be reduced in biasi by introducing suitable implement and variety. Hence the present study was undertaken to assess the performance of different bullock drawn implement and variety in enhancing rice productivity for biasi system under broadcast seeding condition.

### Methods

A field experiment was conducted in the farmers

**Table 1.** Effect of variety and implement on plant population and mortality.

Implements	Plant population/m <sup>2</sup> (after biasi)				Plant mortality (%)			
	Varieties				Varieties			
	IR-36	BD-201	Swarna	Mean	IR-36	BD-201	Swarna	Mean
Deshi plough	47.8	51.4	60.0	53.07	80.2	76.8	74.7	77.24
Birsa ridger plough	37.6	47.4	54.4	46.47	84.7	78.6	76.9	80.06
Intercultural plough	47.6	52.6	62.6	54.27	78.4	76.2	73.8	76.11
Biasi plough	32.6	43.4	51.0	42.33	85.1	81.9	78.6	81.87
Mean	41.4	48.7	57.0	49.03	82.06	78.39	76.0	78.82
CD at 5%	CD at 5%							
V	2.769	NS						
I	2.914	NS						
I × V	7.809	NS						

**Table 2.** Effect of variety and implement on weed population and weeding efficiency.

Implement	Weed population /m <sup>2</sup> (after biasi)				Weeding efficiencies (%)			
	Varieties			Mean	Varieties			Mean
IR-36	BD-201	Swarna	IR-36		BD-201	Swarna		
Desi plough	33.8	31.6	28.8	31.4	85.4	85.6	86.3	85.78
Birsa ridger plough	28.8	26.2	26.4	27.13	86.6	87.5	85.8	86.63
Intercultural plough	26.6	25.8	24.4	25.6	88.8	80.9	85.7	85.12
Biasi plough	22.0	21.0	20.0	21.0	89.2	87.3	87.9	88.15
Mean	27.8	26.15	24.9	26.28	87.49	85.34	86.42	86.42
	CD at 5%							
V	NS							
I	3.053							
I × V -	NS							

field in *kharif* 2002-03 in East Singhbhum district of Jharkhand around Zonal research station, Darisai of Birsa Agricultural University, Ranchi. The soil was sandy loam and acidic in reaction. Soil was also low in organic carbon (0.36-0.41%), available N (215-240 kg/ha), available P (14.7-19.0 kg/ha) and medium in available K (188-210 kg/ha) content. The experiment was laid out in split plot design with five replications and in main plot variety IR-36, BD-201 and Swarna was taken whereas in the sub-plot different implement like deshi plough, Birsa ridger plough, inter-cultural plough and biasi plough were taken to study the suitability of the variety and implement for the biasi system of rice cultivation. Seeds was sown by broadcasting method at the rate of 100 kg kg/ha of 100 kg/ha and fertilizers dose of 70 : 40 : 20 kg NPK/ha was applied. The whole amount of P and K and half amount of nitrogen was applied. The whole amount of P and K and amount of nitrogen was applied as basal dose and remaining amount of nitrogen was top dressed at tillering and panicle initiation stage. The data related to plant population/m<sup>2</sup>, plant mortality%, weed population/m<sup>2</sup>, weeding efficiencies (%), number of grains/panicle, test weight (g) and grain yield q/ha were recorded at different growth stages and after harvest operation to evaluate the effect of variety, implement and their interaction on productivity of the system. The initial soil samples were analyzed for organic carbon by (Walkley and black wet digestion method, available N by Alkaline permanganate method, available P by Bray P<sub>1</sub> and available K (Flame photometer method) were carried out with the help of standard methods outlined by Jackson (2).

## Results and Discussion

### *Plant Population and Plant Mortality*

Maximum plant population (after biasi) of 57.0 plant/m<sup>2</sup> was obtained in variety Swarna (Table 1). Plant population of Swarna significantly differs from BD-201 and IR-36 having 48.7 and 41.4/m<sup>2</sup> respectively. Among four implements maximum number of plant 54.27 plant/m<sup>2</sup> was obtained when IC plough was used for biasi. But the deshi plough significantly differs from Birsa ridger plough and biasi plough having plant population of 46.47 and 42.33/m<sup>2</sup> respectively. After biasi maximum plant mortality was noticed in the variety IR-36 and minimum in Swarna (76%) showing suitability of Swarna variety for biasi system. Among different implement biasi plough caused maximum plant death of 81.82% and minimum plant mortality of 76.11% was noticed when IC plough was used. These results suggests that use of variety Swarna and IC plough may lead to better plant population and lowest mortality.

### *Weed Population and Weeding Efficiencies*

Table 2 reveal that weed population after biasi operation was lowest (21.00/m<sup>2</sup>) and maximum in weeding efficiency of 88.15% and minimum weeding efficiency of 85.12% was obtained with inter-cultural plough but all the implement used did not vary significantly as weeding efficiency is concerned. The plot operated by biasi plough had the highest weed population of 31.40/m<sup>2</sup> was recorded in the plot operated by deshi plough which is significantly higher

**Table 3.** Effect of variety and implement on yield attributing agronomic character.

Implements	Effective no. of tillers/m <sup>2</sup> Varieties				Number of grains/panicle varieties			
	IR-36	BD-201	Swarna	Mean	IR-36	BD-201	Swarna	Mean
Deshi plough	257.2	264.0	266.0	262.40	125.0	109.6	137.2	123.93
Birsa ridger plough	240.4	270.0	262.2	257.67	131.2	112.0	142.4	128.53
Intercultural plough	209.6	253.2	262.6	241.80	127.8	113.8	139.2	126.93
Biasi plough	190.6	196.6	234.2	207.13	122.4	100.0	134.8	119.07
Mean	224.45	245.95	256.35	242.25	126.6	108.85	138.4	124.62
	CD at 5%		CD at 5%					
V	18.24		5.68					
I	13.25		3.47					
I × V	26.88		7.43					

than other treatment. The weeding efficiency of 84.49% was obtained in variety IR-36 and minimum weeding efficiency of 85.34% was observed in variety BD-201. These results were in agreement with the findings of Pandey et al. (3).

#### *Effective Number of tillers/m<sup>2</sup>*

Effective no. of tillers/m<sup>2</sup> recorded from different varieties is presented in Table 3. It was found that variety Swarna gave maximum number of effective tillers 256.35/m<sup>2</sup> which was statistically at par with variety BD-201 and minimum number of effective tillers i.e. 224.45/m<sup>2</sup> was observed in variety IR-36. Among the implement plot receiving deshi treatment gave maximum number of effective tillers (262.40/m<sup>2</sup>) which was statistically at par with the implement Birsa ridger plough (257.67/m<sup>2</sup>). Effective number of tillers of Birsa ridger plough significantly differed from intercultural plough and biasi plough having effective number of tillers of 241.80 and 207.13/m<sup>2</sup> respectively.

In variety Swarna maximum number of grains/panicle of (138.4) was obtained while the variety IR-36 and BD-201 significantly differs from Swarna having 126.6 grains/panicle and 108.85 grains/panicle respectively (Table 3). Definite trend was reported while different bullock drawn biasi implement were used that may be due to the different variety having different genetic potential. However, maximum number of grains/panicle (128.53) was obtained with Birsa ridger plough which was statistically at par with the implement intercultural plough (126.93 grains/panicle). Similar results were obtained by Khan et al. (4) while studying the effect of different tillage implement on rice productivity.

#### *Grain Yield (q/ha)*

Table 4 reveals that variety and implement influenced the grain yield significantly. Maximum grain yield of 28.46 q/ha was found in variety swarna. The plot receiving biasi operation with intercultural plough gave significantly higher yield of 24.73 q/ha which is

**Table 4.** Effect of variety and implement on grain and straw yield.

Implements	Grain yield (q/ha) Varieties				Straw yield (q/ha) Varieties			
	IR-36	BD-201	Swarna	Mean	IR-36	BD-201	Swarna	Mean
Deshi plough	24.22	18.46	29.8	24.16	35.12	29.72	73.36	46.06
Birsa ridger plough	23.90	18.00	27.98	23.29	34.85	28.98	68.86	44.21
Intercultural plough	24.68	18.72	30.80	24.73	35.79	30.14	75.77	47.23
Biasi plough	23.46	17.78	25.24	22.16	34.02	28.63	62.09	41.57
Mean	24.06	18.24	28.46	23.58	34.94	29.36	70.01	44.77
	CD at 5%		CD at 5%					
V	0.321		0.529					
I	0.470		0.926					
I × V	0.765		1.474					

statistically at par with the other implement.

There is significant interaction indicated that variety and implement were interdependent in their influence. Under variety Swarna with implement, inter-cultural plough gave highest grain yield of 30.80 q/ha which was at par with three other implement.

The increase in yield attributes and grain yield may be attributed to efficient weed management and soil manipulation by different implement leading to minimize crop-weed competition. The results confirmed the findings of Singh et al. (5).

#### *Straw Yield (q/ha)*

Straw yield (q/ha) obtained from different varieties and biasi operation implements revealed that maximum straw yield of 70.01q/ha was obtained from Swarna variety and minimum straw yield of 29.36 q/ha was observed in variety BD-201. Among different bullock drawn biasi implement inter-cultural plough gave maximum straw yield of 47.23 q/ha. However, the interaction between variety and implement was found

to be insignificant and variety Swarna with inter-cultural plough operation gave maximum straw yield of 75.77 q/ha.

Thus it may be concluded that in effective weed management and enhancing rice productivity under biasi system of rice cultivation use of variety Swarna and inter-cultural plough may lead in achieving the desired production level in the rainfed rice growing area of Jharkhand.

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