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Performance of *rainfed* upland *kharif* greengram under land surface modification in NBPZ of Assam

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Abstract

The field experiment was conducted during the *Kharif* season of 2016 and 2017 at the Biswanath College of Agriculture, Assam, to study the influence of land surface modification along with residue incorporation *viz.* Broad Bed Furrow and Flatbed in *Kharif* green gram. The experiment consisted of six treatments in terms of land surface modification viz. Flatbed with crop residue incorporation, flatbed without crop residue incorporation, Broad Bed Furrow 60-30cm bed size with residue incorporation, BBF 60-30cm bed without residue incorporation, BBF 120-30cm bed with residue incorporation and BBF 120-30cm bed without residue incorporation. The study results revealed that the BBF of 60-30cm and BBF 120-30cm size bed were superior over the flatbed concerning growth, yield attributes, and yield of the *Kharif* green gram.

Introduction

In India, about 56% of the total cultivated area falls under *rainfed* agriculture. Among various factors of crop production like improved varieties, method of sowing, time of sowing, spacing, rational use of water and nutrients, weeds, pests and diseases, Land configuration is the most critical factor for optimizing the production potential of crops (Bhat and Mahal, 2006). The land configuration practice includes raised bed preparation, ridges and furrows, broad bed furrows etc. Proper land configuration based on weather conditions *viz.*, heavy rainfall, drought or acidity or salinity hazards acts as management practices for crops (Deshmukh *et al.*, 2016)

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Methodology

The field experiment conducted on sandy loam during, *Kharif* season of 2016 and 2017 at Biswanath College of Agriculture, Assam Agricultural University, Biswanath Chariali. The treatments consisted of Flatbed with crop residue incorporation, Flatbed without crop residue incorporation, Broad Bed Furrow 60-30cm bed size with residue incorporation, BBF 60-30cm bed without residue incorporation, BBF 120-30cm bed with residue incorporation and BBF 120-30cm bed without residue incorporation. During the green gram growing period, the total rainfall received was 480.4mm and 526.4mm against the overall evaporation of 226.6mm and 207.8 with 25 and 27 rainy days in 2016 and 2017, respectively. For incorporation of crop residues, after threshing of rice in nearby plots of the experiment grown in the autumn season, the strawweight was recorded and carried to the field and weights were taken. Then incorporation of rice straws (residues) was done by uniformly spreading them in the plots as per the treatments after the first opening in the plot where green gram has to be grown. The remaining plots were kept without crop residues. Recommended doses of fertilizers were applied in the crop as per the package of practices of Assam. The green gram variety 'Pratap' was sown in 15.08.16 and 16.08.17 which was then harvested on 24.10.16 and 22.10.17 in 2016 and 2017, respectively.

Results:

1. Plant height (cm): The plant height of green gram during 2016 and 2017, at 60 DAS and harvest, BBF 60-30cm and BBF 120-30cm with and without rice residues incorporation resulted in a similar effect and proved significantly superior to flatbed methods. (Fig. 1, Fig. 2 and Fig. 3).

2. Dry matter accumulation (g/m2): Dry matter accumulation at 30 DAS and 60 DAS and harvest in 2016, and 30 DAS in 2017, the effect of both the BBF at 60-30cm and 120-30cm with and without rice residues incorporation were statistically at par but significantly higher over the flatbed methods. (Fig. 4, Fig. 5 and Fig. 6).

3. Leaf area index (LAI): During both the year, at all the crop growth stages, significantly higher leaf area index was recorded under the treatment BBF at 60-30cm with residue incorporation This was followed by BBF 120-30cm with residue incorporation and BBF 60-

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30cm without residue incorporation, all being at par in effect and proved significantly superior to the flatbed method. (Fig. 7, Fig. 8 and Fig. 9).

4. Yield attributes and yield

The treatment BBF 60-30cm both with incorporation produced a significantly higher number of clusters plant-1 over the rest of the treatments during both 2016 and 2017(Table1).In respect to several pods cluster-1 in 2016, BBF 60-30cm and BBF 120-30cm with and without residue incorporation showed at par effect but significantly higher over flatbed methods. While in 2017, the effect of BBF 60-30cm on several pod cluster-1 was significantly higher over the rest of the treatments. Higher values were recorded in respect of the number of seeds pod-1 and 1000 seed weight under BBF 60-30cm with residue incorporation and the lowest values were recorded under flatbed. A similar result of increased yield attributes of green gram *viz.*, number of clusters plant-1 and pod cluster-1 due to the land configuration of BBF compared to the flatbed method was also reported by Tomar *et al.* (2013).

Both the treatment BBF 60-30cm and BBF 120-30cm with and without residue incorporation resulted in statistically similar seed yield and produced significantly higher values over both the flat methods of with and without residue incorporation (Table 2). The highest seed yield (9.58 q ha-1 and 10.63 q ha-1 in 2016 and 2017, respectively) was recorded with the treatment BBF 60-30 cm with residue incorporation followed by BBF 60-30cm without residue incorporation. Increased seed and stover yield of chickpea and safflower by 12.5% and 10.7% in BBF planting over the traditional flatbed method were also reported by Khambalkar, *et al.* (2014).

Conclusion

From the study, it can be concluded that the land surface modification in terms of moisture conservation practice of BBF 60-30cm size and BBF 120-30cm with residue incorporation resulted in better performance in respect of growth, yield attributes and yield of *Kharif* green gram.

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Table1. Effect of land surface modification with residue on yield attributes of greengram

Treatments	Cluster plant^{-1}		Pod cluster^{-1}		Length of pod (cm)		Seeds pod^{-1}		1000 seed weight (g)	
	2016	2017	2016	2017	2016	2017	2016	2017	2016	2017
land surface modification										
M_1: Flat bed with residue	2.35	2.53	2.09	2.23	7.62	7.93	7.94	7.32	30.84	30.98
M_2 : Flatbed without residue	2.33	2.41	2.07	2.13	7.39	7.88	7.81	7.17	30.78	30.98
M_3: BBF 60-30cm with residue	2.59	2.75	2.33	2.51	7.88	8.02	8.84	8.80	30.84	31.07
M_4: BBF 60-30cm without residue	2.47	2.67	2.23	2.36	7.72	7.98	8.56	7.94	30.78	30.42
M_5: BBF 120-30cm with residue	2.56	2.68	2.33	2.45	7.70	8.02	8.72	8.16	31.34	31.35
M_6:BBF 120-30cm without residue	2.45	2.53	2.21	2.37	7.67	7.83	8.45	7.84	31.08	31.13
SEm+	0.06	0.07	0.06	0.07	0.16	0.12	0.30	0.29	0.46	0.31
CD (P=0.05)	0.17	0.20	0.17	0.20	NS	NS	NS	0.87	NS	NS

Table 2 Effect of land surface modification and residue management on yield of greengram

Treatments	Seed yield (q ha^{-1})			Stover yield (q ha^{-1})			Harvest Index (%)	
	2016	2017	Pooled	2016	2017	pooled	2016	2017
land surface modification								
M_1: Flat bed with residue	6.73	7.45	7.09	19.06	22.08	20.57	26.09	25.22
M_2 : Flatbed without residue	6.63	6.98	6.82	18.90	21.61	20.26	25.96	24.41
M_3: BBF 60-30cm with residue	9.58	10.63	10.10	27.62	29.26	28.44	25.75	26.64
M_4: BBF 60-30cm without residue	9.44	10.11	9.77	26.10	28.11	27.10	26.56	26.45
M_5: BBF 120-30cm with residue	9.04	9.69	9.36	24.96	27.99	26.47	26.58	25.71
M_6: BBF 120-30cm without residue	8.95	9.33	9.14	24.75	27.11	25.93	26.55	25.60
SEm+	0.36	0.41	0.19	0.97	0.75	0.41	0.27	0.47
CD (P=0.05)	1.09	1.23	0.62	2.91	2.25	1.23	0.81	1.40

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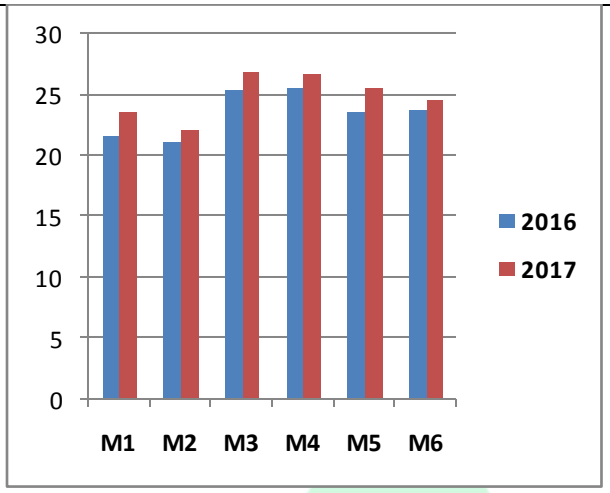

Fig 1. Plant height (cm) at 30DAS

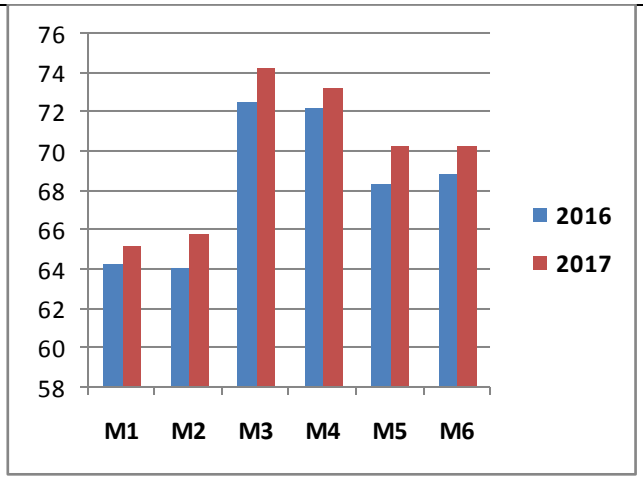

Fig 2. Plant height (cm) at 60DAS

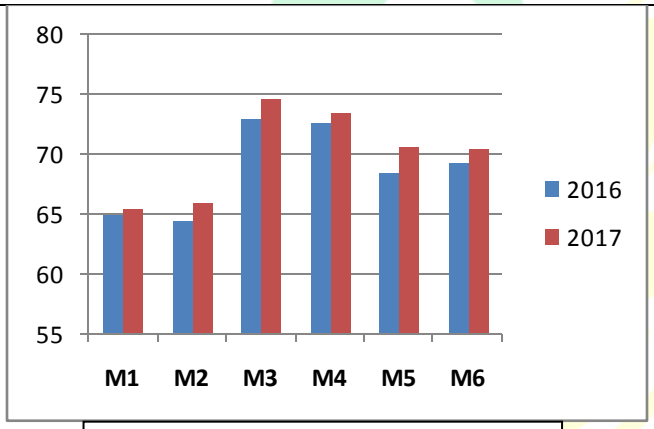

Fig 3.Plant height (cm) at harvest

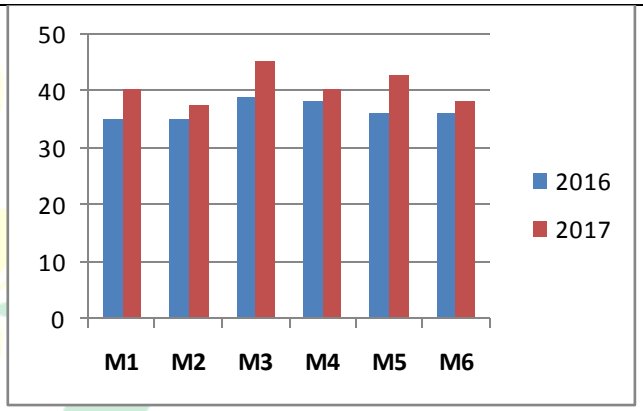

Fig 4. Dry matter accumulation (g/m^2) at 30DAS

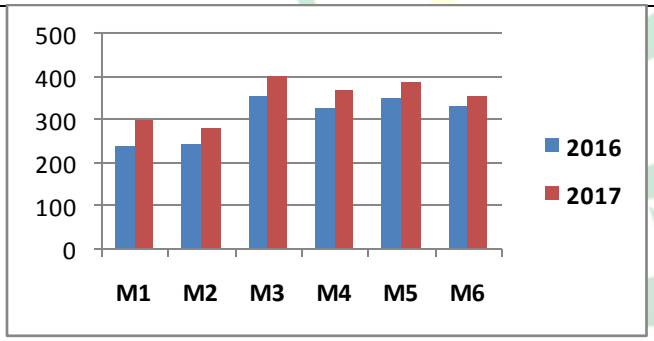

Fig 5. Dry matter accumulation (g/m^2) at 60DAS

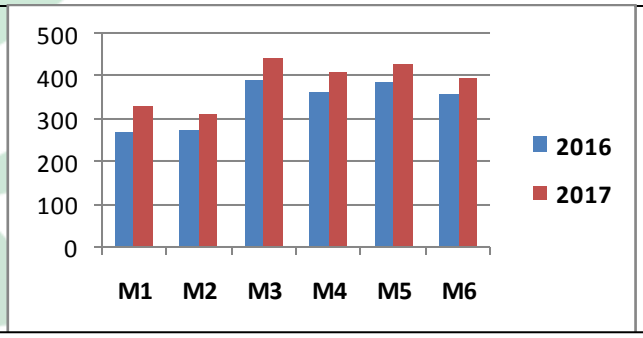

Fig 6. Dry matter accumulation (g/m^2) at harvest

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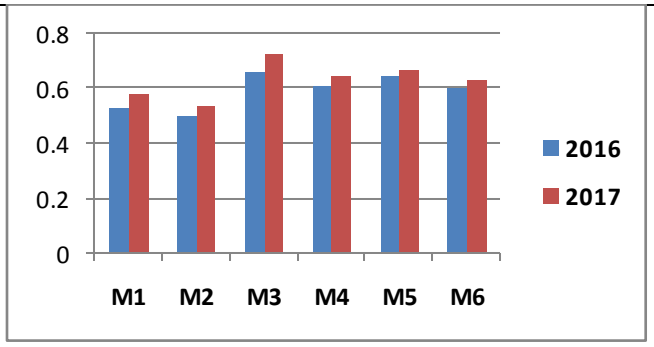

Fig 7. Leaf area index at 30DAS

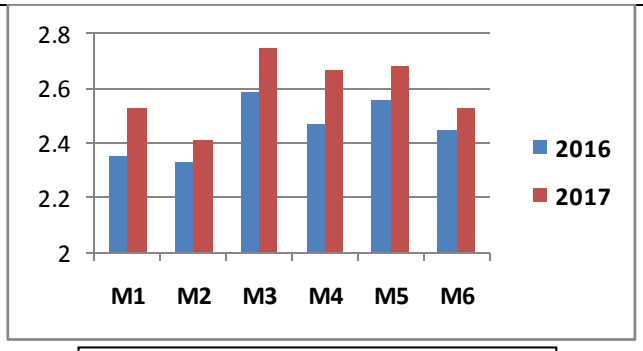

Fig 8. Leaf area index at 60DAS

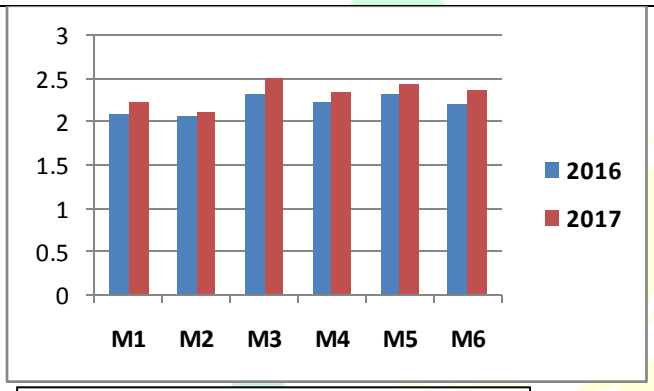

Fig 9. Leaf area index at harvest

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