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RESEARCH ARTICLE

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Effect of mechanization with different land configuration on economics and energetics of soybean

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ABSTRACT

An experiment was conducted during the *Kharif* season of 2009-10 to study the effect of mechanization with different land configuration on growth and growth attributes of soybean with RBD design. The treatment consisted of six land configuration treatments. *viz.,* T_1 (Flat bed layout), T_2 (BBF layout), T_3 (Ridges and furrow), T_4 (Flat bet + opening of furrow after every two rows at 30 DAS), T_5 (Flat bet + opening of furrow after every 5 rows at 30 DAS), T_6 (Conventional / farmers practice) and replicated four times. Result showed that, significantly higher energy output and energy use efficiency found in tractor drawn broad bed furrow, followed by ridges and furrow. Significantly higher GMR,NMR was found in broad bed furrow, higher B:C ratio was also recorded in broad bed furrow method.

KEY WORDS : Soybean, Land configuration, Mechanization, Economics, Energetics

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INTRODUCTION

Soybean (*Glycine max.* L.) is one of the important oilseed as well as leguminous crop.It is the cheapest and richest source of high quality protein. It supplies most of the nutritional constituents essential for human health. Hence, soybean is called as "Wonder Crop" or "Golden bean" or "Miracle bean". This crop in fact has made revolution in the agricultural economy with its immense potential, quality of food, feed and numerous industrial production commodity. Symbiotically soybean fixes 125-150 kg N ha^{-1} (Chandel and Bhatia, 1989)and leaves about 30-40 kg N ha^{-1} for succeeding crop (Sexena and chandel,1992).In India, soybean is grown over an area of 7.46 m ha with a production of 8.35 m tonnes and with average productivity of 1007 kg ha^{-1}.Madhya Pradesh, Uttar Pradesh and Maharashtra are the major soybean producing states. (Anonymous, 2006).To improve economics potential and energetics of soybean to use mechanization with different land configurations. Patil (2005) conducted an experiment on soybean and reported that higher values of GMR (Rs. 21878 ha^{-1}), NMR (Rs. 12349 ha^{-1}) and B:C ratio 2.29 were recorded in ridges and furrow over (Rs. 17379 ha^{-1} Rs. 7876 ha^{-1} and 1.82, respectively) on flat bed and Jain and Dubey (1998) investigated that highest net returns of Rs. 9075 ha^{-1} and B:C ratio of 2.43 were obtained by ridge planting with two rows followed by ridge planting one row (Rs. 7936 ha^{-1} with B:C ratio 2.27, respectively) and conventional system (Rs. 6797 ha^{-1} with B:C ratio 2.03, respectively). Considering the above facts, attempt was made to study the effect of mechanization with different land configuration on economics and energetics of soybean.

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MATERIALS AND METHODS

An experiment was carried out during *Kharif* 2009-10 at Gadadhi Block, Central Research station, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola (M.S.). The experiment was laid out in Randomized Block Design in Four replications with Six land configuration treatment *i.e.* T_1 (Flat bed layout), T_2 (BBF layout), T_3 (Ridges and furrows), T_4 (Flat bet + opening of furrow after every two rows, at 30 DAS), T_5 (Flat bed + opening of furrow after every 5 rows at 30 DAS), T_6 (Convention / Farmer's practice). In treatments T_1 to T_5 were mechanized culture with tractor. Gross plot size was of 15 m x 4.5m with net plot size of 13.0m x 3.6m. The experimental site was clayey in texture, low in nitrogen content, medium in phosphorus

and rich in potash, soil reaction was found to be slightly alkaline.The economics was also calculated. Observations on energetics *viz.,* energy input, energy output, energy use efficiency were recorded.

RESULTS AND DISCUSSION

The results obtained from the present study have been discussed under following heads :

Effect of mechanization with different land configuration on economics:

Table 1 showed that adoption of broad bed furrow (T_2) recorded significantly higher GMR and NMR(43098 Rs. ha $^{-1}$) and (22067 Rs. ha $^{-1}$), respectively as compared to the ridges and furrow T_3 (40040 Rs. ha $^{-1}$) (19089 Rs. ha $^{-1}$), respectively. This was followed by the treatment opening of furrow after every two row T_4 (37862 Rs. ha $^{-1}$) (17531 Rs. ha^{-1}), respectively and opening of furrow after every five row T_5 (35728 Rs. ha $^{-1}$) (15497 Rs. ha $^{-1}$), respectively proved its superiority over flat bed T_1 (30888 Rs. ha $^{-1}$) (10657 Rs. ha $^{-1}$), respectively and lowest GMR and NMR was obtained in farmers practice T_6 (26730 Rs. ha $^{-1}$) (7119 Rs. ha $^{-1}$), respectively. Higher B:C ratio was observed in broad bed furrow T_2 (2.4) followed by ridges and furrow T_3 (1.9), T4 (1.8), T_5 (1.7), flat bed T_1 (1.5) and lowest in farmers practice T_6 (1.3). Kaushik and Lal (1998) conducted field experiment at IARI, New Delhi noted higher monetary returns under broad bed and furrow planting system by pear millet, pigeonpea and castor.

These results are in the line with the results of Lakhera (2008). They reported that sowing on BBF, opening of furrow in every row and opening in alternate row gave maximum GMR (29329 ‘ ha^{-1}) and NMR (20614 ‘ha^{-1}) but B:C ratio (3.36) was highest with sowing of soybean of BBF and Kaushik and Lal (1998) conducted field experiment at IARI, New Delhi noted higher monetary returns under broad bed and furrow planting system by pear millet, pigeonpea and castor.

Effect of mechanization with different land configuration on energetics:

The value of energy input are shown in Table 2. From this it is clear that the highest value of energy input are in treatment opening of furrow after every two row T_4 (7094.35) followed by opening of furrow after every five row T_5 (7090.90), Ridges and furrow T_3 (6901.41), broad bed furrow T_2 (6876.29), T_1 (6787.58) and lowest value of energy input in farmers practice T_6 (6368.27) is due to the bullock drawn culture. Mechanically drawn treatments (T_1 to T_5) showed more energy input values.

The values of energy input are shown in Table 2. From this it is clear that the highest value of energy output

Table 1: Gross monetary returns, net monetary returns and B:C ratio as influenced by various treatments

Treatments	Gross monetary (` ha^{-1})	Net monetary returns (` ha^{-1})	B:C ratio
T_1 - Flat bed layout	30888	10657	1.5
T_2 – BBF layout	43098	22067	2.4
T_3 – Ridges and furrow layout	40040	19089	1.9
T_4 – Flat bed + opening of furrow after every two rows of 30 DAS	37862	17531	1.8
T_5 – Flat bed + opening of furrow after every five rows at 30 DAS	37862	15497	1.7
T_6 – Farmers practice	26730	7119	1.3

Table 2 : Total energy input (MJ x 10^{-3}), total energy output (MJ x 10^{-3}) and energy use efficiency as influenced by the various treatments

Treatments	Total energy i/p (MJ x 10^{-3})	Total energy o/p (MJ x 10^{-3})	Energy use efficiency	Ratio
T_1 - Flat bed layout	6787.58	49576.30	20.6848	7.3039
T_2 – BBF layout	6876.29	70722.30	28.4892	10.2849
T_3 – Ridges and furrow layout	6901.41	66729.00	26.3714	9.6688
T_4 – Flat bed + opening of furrow after every two rows of 30 DAS	7094.35	62661.20	24.2724	8.8375
T_5 – Flat bed + opening of furrow after every five rows at 30 DAS	7090.90	58810.30	22.8896	8.2890
T_6 – Farmers practice	6368.27	42110.50	19.0789	6.6125

was in treatment broad bed furrow T_2 (70722.3) followed by ridges and furrow T_3 (66729.2), T_4 (62661.2), T_5 (58810.3), T_1 (49576.3) and lowest value of energy output in farmers practice was in T_6 (42110.1).

The values of energy use efficiency are shown in Table 2 from this it is clear that the highest value of energy use efficiency was in treatment broad bed furrow T_2 (28.48) followed by ridges and furrow T_3 (26.37), T_4 (24.27), T_5 (22.88), flat bed T_1 (20.68) and lowest value of energy use efficiency in farmers practice was in T_6 (19.07). The treatments (T_1 to T_5) were mechanically drawn, hence, showed more energy use efficiency values. Above findings are comparable with the findings of Varma *et al.* (2004).

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