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Review Article

Machine Performance Parameters and Economics of Different Cultivation Practices for Sowing of Chickpea

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ABSTRACT

The study was carried out at instructional farm of IGKV, Raipur. The cost economics of the operation under different sowing techniques was varied due to different field capacity and fixed and variable cost of the implements. The lowest cost of operation of sowing was observed in treatment (zero till seed cum fertilizer drill, 1428.83 ₹/ha) followed by treatment (happy seeder, 1506.01 ₹/ha) where as it was found to be highest for the treatment (raised bed seed cum fertilizer drill, 9963.60 ₹/ha) followed by treatment (conventional seed cum fertilizer drill, 5042.55 ₹/ha). The lowest energy consumption of sowing was observed in treatment (happy seeder, 3765.92 MJ/ha) followed by treatment (zero till seed cum fertilizer drill, 4632 MJ/ha) where as it was found to be highest for the treatment (conventional seed cum fertilizer drill, 6555.85 MJ/ha) followed by treatment (raised bed seed cum fertilizer drill, 4834.87 MJ/ha). It was concluded that performance of happy seeder was superior than other drills.

Key words: *Seed cum fertilizer drill, Theoretical field capacity, Field efficiency, Bulk density*

INTRODUCTION

Tillage is one of the major crop production operations and is an important contributor to the total cost of production. It is estimated that tillage and sowing almost consumes 25% of the total operational energy in wheat production[6]. There is an urgent need to reduce the cost of cultivation and increase the productivity/unit area to meet the present global market challenge and help the farmer and the nation by developing and adopting conservation tillage practices. Zero tillage technology is positive edge over the conventional practices in terms of economics, water saving, diesel saving and eco-friendly. The direct drilling of chickpea in to harvested rice stubbles from a reasonable wheat yield has not been possible without prior burning or removal of straw. Presently, crop residues in combine-harvested rice fields are being burnt for cleaning fields before planting of chickpea causing a serious atmospheric pollution.

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Crop yields had been similar in zero tillage and conventional tillage but zero tillage is superior in erosion control, resource use and operational costs over conventional tillage[2]. To overcome the problem straw burning and effective use of zero tillage with suitable machinery was tested at instructional fields of IGKV, Raipur.

MATERIAL AND METHODS

The findings of the present study envisage that for feeding the ever growing population and to earn higher returns, farmers should adopt the recommended management practices for rice-chickpea cropping system. This several equipment not only ensures maximum yield but also save fuel, energy, time of sowing, hence it is a most profitable practice. Evaluation of different chickpea sowing technologies under paddy residue conditions were conducted in a harvested paddy field. Field of paddy was harvested with combine. Chickpea variety (JG-130) was sown with different farm machines in four treatments (Fig.1) *viz.*, Happy seeder, zero till seed cum fertilizer drill, Conventional seed cum fertilizer drill and Raised bed seed cum fertilizer drill in harvested paddy fields.

Fig. 1: Sowing of chickpea with different zero tillage technology

RESULT AND DISCUSSION

Physical parameters of soil

The moisture content, and bulk density of the soil before sowing operation was the average moisture content at 15 cm depth was found to be 26.97%. Average bulk density was observed 1.36 g/cc and porosity was measured 50.62% before sowing of chickpea by sowing machines and after 80 days of sowing the moisture content and bulk density of field was found to be 15.97% and 1.40g/cc.

Machine performance parameters

The maximum depth of sowing was observed in case of raised bed seed cum fertilizer drill (4.41 cm) followed by conventional seed cum fertilizer drill (3.82 cm) where as it was found to be minimum for the happy seeder (3.22 cm) followed by zero till seed cum fertilizer drill (3.45 cm). The reason of less depth of sowing of happy seeder and zero till seed cum fertilizer drill than conventional seed cum fertilizer drill and raised bed seed cum

fertilizer drill was due to less tillage operation. Table 1 and 2 shows parameters pertaining to sowing treatments.

Table 1: Measurement of sowing machine parameters

Machine Parameters	Treatment (Happy Seeder)	Treatment (Zero Till Seed Cum Fertilizer Drill)	Treatment (Conventional Seed Cum Fertilizer Drill)	Treatment (Raised Bed Seed Cum Fertilizer Drill)
Seed rate, kg/ha	38.34	27.56	42.68	26.02
Depth of cut, cm	3.74	3.87	4.37	4.90
Width of machine, cm	225	225	225	180
Speed of operation, km/h	3.4	3.2	3.7	3.5
Theoretical field capacity, ha/h	0.76	0.72	0.83	0.63
Actual field capacity, ha/h	0.62	0.56	0.69	0.52
Field efficiency, %	81.70	77.78	83.13	82.53
Energy requirement, MJ/ha	3765.92	4632.40	6555.85	4838.67
Cost of operation, Rs/h	1506.01	1428.83	5042,55	9963.60

Table 2: Working width of sowing machines

S. No.	Sowing machine	Number of furrow openers	Spacing between two furrow openers (cm)	Width of cut (cm)
1.	Happy seeder	5	45	225
2.	Zero till seed cum fertilizer drill	5	45	225
3.	Conventional seed cum fertilizer drill	5	45	225
4.	Raised bed seed cum fertilizer drill	4	45	180

COST ECONOMICS

The cost economics of the operation under different sowing techniques was wide ranging due to different field capacity and fixed and variable cost of the implements. The lowest cost of operation of sowing was observed in zero till seed cum fertilizer drill, 1428.83 ₹/ha followed by happy seeder, 1506.01 ₹/ha where as it was found to be highest for the raised bed seed cum fertilizer drill, 9963.60 ₹/ha followed by conventional seed cum fertilizer drill, 5042.55 ₹/ha.

CONCLUSION

It is evident that there was less loss of moisture in case of happy seeder and zero till seed cum fertilizer drill compared to other treatments. Because, of the reason that no tilling of soil in these treatment. The higher soil moisture loss was obtained in case of conventional seed cum fertilizer drill and raised bed seed cum fertilizer drill. The higher soil moisture loss is therefore, due to tilling of soil to a deeper depth. In happy seeder, all the paddy straw was remained in the field itself and spreaded uniformly. While in other used machinery maximum loose paddy straw was removed manually for better operation of the machines.

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