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Testing and performance evaluation of animal drawn inclined plate planter for hybrid rice

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Abstract

Farm mechanization has been helpful to bring about a significant improvement in agricultural productivity. Thus, there is strong need for mechanization of agricultural operations. Sowing is the most important operation for growing of the crops. The state evolved a selective mechanization model using a mechanization technology.

The monsoon season is from late June to October and is a welcome respite from the heat. Chhattisgarh receives an average of 1400 mm of rain. The maximum and minimum temperature of the district is 45° c & 8° c respectively. The studies were conducted during year 20017-18 to 2018-19. The average power required for pulling planter was found to be 0.44 hp at an average speed of 2.35 km/h. The actual field capacity of machine was found to be 0.13 ha/h at 25 cm row to row spacing respectively. From the actual and theoretical field capacity the field efficiency of the planter was found to be 72.22%. Cost of operation of the inclined plate planter for rice seeding was estimated as Rs. 32.80 per hour and Rs. 234 per hectare.

Keywords: Animal, plate planter, hybrid rice

Introduction

Presently in the Chhattisgarh state the sowing of seeds is performed by manual labour, by animal drawn seed drill (fluted roller type) or by tractor drawn seed drill. The most important source of power in the farm all over the third world and especially in India is animal. Animals are the largest contributor of farm power in India and yet, the major source of marginal, small and even medium farmers who account for more than 80% of total agricultural holding and 40% of total cultivated (Nirala, S.K. -2011) [2]. Under animal farming system, presently 3 row animal drawn seed cum fertilizer seed drill is available. The draught of this implement was observed 55-60 kg. The heavy weight of the implement also shares an account in this value. More over this seed drill can be used for limited number of crops due to its metering mechanism (fluted roller type). Raipur centre of AICRP on UAE was started in 2001, under Indira Gandhi Krishi Vishwavidyalaya, Raipur. In the past 15 years, this centre has worked for popularization and extension of improved technology under animal farming system. To study the status and scope of utilization of draught animals in the region and to develop mechanically efficient matching equipment to increase versatility of draught animals as source of farm power and perform the job with improved system efficiency in crop production and post-harvest operations without detrimental effect on the draught animals or the operators.

Hybrid crops have very low seed rate and appropriate machine for planting of costly hybrid rice seeds is not available. Use of conventional seed drill for sowing of costly hybrid seeds results in increased seed rate and thereby increase in cost of production. For placement of single seed in soil at distinct plant spacing, planter is useful.

Methodology

The multi crop planter for intercropping, feasibility testing of animal drawn inclined plate planter for hybrid rice to adaptive trials for development of animal drawn implement. In addition to this, improved animal drawn implements were exhibited and demonstrated. The centre carried out training and demonstration on improved animal drawn implements in different villages, KVKs etc of Chhattisgarh State. This study will increase the versatility of the machine and will reduce the operational time. It will be helpful to promote the mechanization of hybrid rice cultivation on animal farms. This study will help to increase the utilization of draught animals in this region.

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To need based study were conducted

- To test the inclined plate planter for correct seed rate and uniform seed placement in Laboratory condition.
- To study the field performance of the machine for hybrid rice seeding.
- Performance and evaluation of the inclined plate planter.
- Economic evaluation of machine.

Animal drawn 3 row inclined plate planter for planting hybrid rice was developed and fabricated at PPC, Central Institute of

Agricultural Engineering, Bhopal as shown in Fig. 3 and supplied to this college for testing of the same for hybrid rice cultivation in Chhattisgarh region. Standard methodology as per Indian Standard Test Codes was adopted for testing of the inclined plate planter for hybrid rice at laboratory and in actual field condition. The study was carried out at SVCAET&RS, Faculty of Agricultural Engineering and Research Farm of I.G.K.V., Raipur during the year 2017-18 and 2018-19. The detailed specification of the machine is furnished in Table 1.

Table 1: Specification of CIAE 3 row inclined plate planter

S. N.	Particulars	Details
1.	Overall Dimension L x W x H, mm	950 x 1480 x 850
2.	No. of rows	Three
3.	Seed metering unit	Inclined plate
5.	Row to row spacing, mm	Adjustable (200 to 500 mm)
7.	Type of furrow opener	Inverted 'T' type (Shoe type)

During lab testing for calibration of inclined plate planter was conducted for hybrid rice at laboratory of Department of Farm Machinery and Power Engg., SVCAET&RS, IGKV, Raipur and it was found that obtained seed rate was 33% higher than

recommended seed rate for hybrid rice with metering plate provided with the implement. Thus new plates were fabricated as per previously designed metering plate studied at department earlier as shown in figure 1.

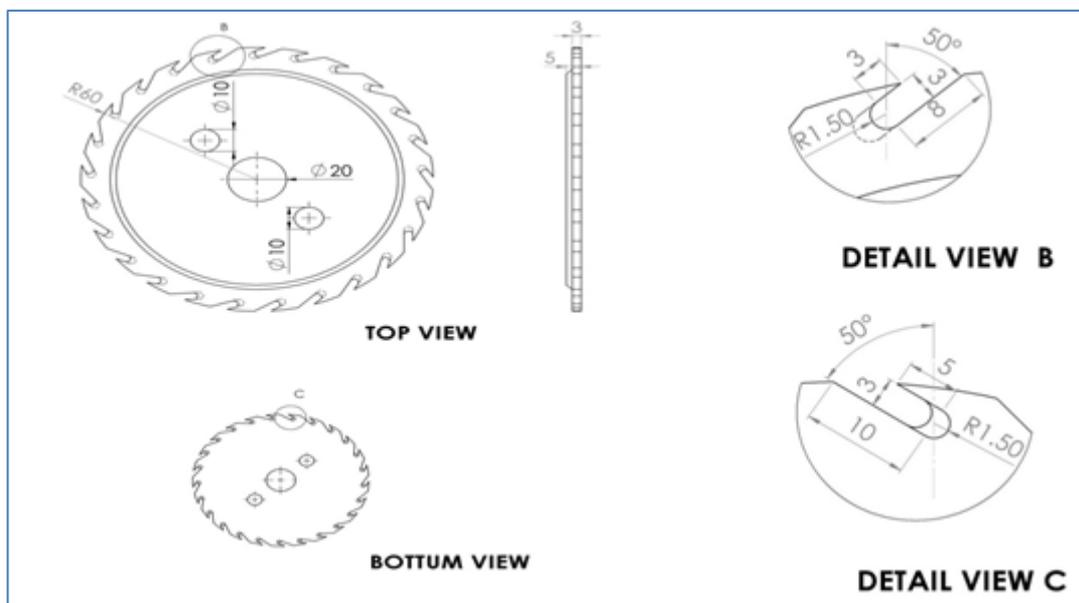


Fig 1: Auto CAD drawing of new metering plate



Fig 2: Newly fabricated metering plate



Fig 3: View of field testing of the planter

Result

Lab Testing

During lab testing of the machine seed rate for hybrid rice was obtained as 22 kg/ha for row to row and plant to plant spacing of 25 x 15 cm.

Mechanical damage of seeds

Visual observations for mechanical damage due to metering

mechanism were recorded and it was found that there was no visual damage to the seed of paddy. However the internal damage of seeds was measured by sowing of seeds in steel trays and found that the seed damage for paddy was not significant at one per cent level of significance. The results are shown in Table 2.

Table 2: Mechanical damage to seeds by planter

Name of Implement	Crop Seed	Weight of broken seeds, g	Total weight of sample, g	Damaged seeds %
3- Row	Paddy	5.6	1000	0.05

Field Performance Results

Field Test Results of Inclined Plate Planter

The data presented in Table 3 shows the two year pooled data of field test results of animal drawn inclined plate planter. Data obtained during 2017-18 and 2018-19 reveals that the average depth of placement of rice seeds in the field was 48.65 mm. The bullocks and buffaloes are the main stay of farm power in India and they still command over 60% of the total cultivable land. About 90% of the tillage operation in India is still carried out by the draught animals (Jena, P.P. and Khandai, S. 2017) [1]. The depth of placement of seeds was adjusted by hitching angle of implement. The average draft recorded was 497 N at an angle of inclination of 36.5° which

was considered to be very well within the pulling capacity of small/medium pair of bullocks. The average power required for pulling planter was found to be 0.44 hp at an average speed of 2.35 km/h where as in conventional planting was obtained 0.69 hp and speed 3.43 km/h respectively (Anon, 2011) [3]. The actual field capacity of machine was found to be 0.13 ha/h at 25 cm row to row spacing and in conventional practice actual field capacity was found 0.17 ha/h respectively (Anon, 2011) [3]. Cost of operation of the inclined plate planter for rice seeding was estimated as Rs. 32.80 per hour and Rs. 234 per hectare. From the actual and theoretical field capacity the field efficiency of the planter was found to be 72.22 %.

Table 3: Field test results of inclined plate planter for planting hybrid rice

S. N.	Particulars	Results (Average)
1.	Depth of seed placement, mm	48.65
2.	Seed to seed spacing, mm	126
3.	Speed of operation, km/h	2.35
4.	Draught requirement, N	497
5.	Power requirement, hp	0.44
6.	Theoretical field capacity, ha/h	0.18
7.	Actual field capacity, ha/h	0.13
8.	Field efficiency, %	72.22
9.	Cost of operation, Rs/h (Rs/ha)	32.80 (234)

Conclusions

- I. 22 kg/ha seed rate was obtained at 25 x 15 cm row to row and plant to plant distance
- II. Draught requirement to pull the 3 row incline plate planter was within the pulling capacity of local bullocks.
- III. 3 row inclined plate planter was found cost effective implement for planting of rice seeds from operational point of view.

References

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