Original Research Article

COMPARATIVE STUDY ON MANUALLY OPERATED ONION BULBLET PLANTER OVER A TRADITIONAL METHOD OF PLANTING

ABSTRACT

The basic requirement for small scale cropping machine are they should be suitable for small farms, simple design and technology and versatile for use in different farm operations. A manually operated onion bulblet planter was designed and developed to improve planting efficiency and reduce drudgery involved in manual planting method. It was made of durable and cheap material affordable for the small scale peasant farmers. The operating, adjusting and maintaining principles were made simple for effective handling by unskilled operators (farmers). Field efficiency was 83.3% with chisel type furrow opener. It observed that for planting one hectare land the planter require Rs 1790.81/ha which is much less compared to the hand planting method required 65 man days and required additional of Rs 9300.

***Keywords**: onion planter, field efficiency, chisel type furrow opener*

1. INTRODUCTION

Farm mechanization has been helpful to bring about a significant improvement in agricultural productivity. Thus, there is strong need for mechanization of agricultural operations. The factors that justify the strengthening of farm mechanization in the country can be numerous. The timeliness of operations has assumed greater significant in obtaining optimal yields from different crops, which has been possible by way of mechanization. The time taken to perform sequence of operations is a factor determining the cropping intensity. So as to ensure timeliness of various operations, it is quite inevitable to use such mechanical equipments which have higher output capacity and cut down the number of operations to be performed. This has helped in increasing area under cultivation and increase in cropping intensity. Higher productivity of land and labour is another factor, which clearly justifies farm mechanization. Not only the output per hour is more, the total labour requirement is also reduced.

Most of the farmer use traditional methods for sowing such as broadcasting and seed dropping behind the plough due to undulating topography, small land holdings and higher cost of equipment, which effects germination due to non uniform placement of seeds at proper depth.

Precision and timely sowing are essential for getting good plant stand, higher yield and optimum utilization of rainfall and reduction in the incidence of pests and diseases.

Considered the above factors and need of small farm mechanization, the present study related to a manually operated onion bulblet planter was designed and developed to improve planting efficiency and reduce drudgery involved in manual planting method. . It was made of durable and

cheap material affordable for the small scale peasant farmers. The operating, adjusting and maintaining principles were made simple for effective handling by unskilled operators (farmers).

2. MATERIAL AND METHODS

The study was conducted in the year 2015 at college of agricultural engineering, JNKVV, Jabalpur. After completion of the fabrication, the machine was tested both the laboratory and field for small onion bulbs. The field was prepared before evaluation. Instruments like measuring metallic and steel tape, stop watch, weighing balance were used to evaluate the planter. Cost of operation was calculated and was compared with other methods.

2.1. Theoretical field capacity

It depend upon theoretical speed and width of implement. The theoretical field capacity was calculated as:

Theoretical field capacity(ha/h) $=\frac{S \times W}{10}$

Where, S speed of travel Km/h

W = theoretical width of implement, m

2.2. Effective field capacity

For calculating effective field capacity, the time taken for actual work and that lost for other activities such as turning, cleaning, refilling of seed box, adjustment of machine and time spent for machine trouble were taken in to consideration. By calculating the area covered per hour, the actual field capacity was calculated.

2.3. Field efficiency

Field efficiency is the ratio of the effective field capacity and theoretical field capacity and expressed in percentage. Field efficiency was calculated as:

Field efficiency= $\frac{Effective\ field\ capacity}{Theoretical\ field\ capacity} \times 100$

2.4. Cost of Operation

2.4.1. Fixed costs

2.4.1.1. Depreciation:

This cost reflects the reduction in value of a machine with use (wear) and time (obsolescence). While actual depreciation would depend on the sale price of the machine after its use, on the basis of different computational methods depreciation can be estimated by straight-line method as given below:

(D) = $\frac{P-S}{L \times H}$

Where

D = average depreciation cost (Rs. /year)

P = purchase price of the machine (Rs.)

S = residual value of the machine (Rs.)

L = useful life of the machine (years)

H= working hours per year

The depreciation cost per hour can be estimated by dividing “D” by the number of hours the machine is expected to be utilized in a year. Residual value of the machines may be taken as 10 per cent of the purchase price.

2.4.1.2. ***Interest***

An annual charge of interest was calculated by taking 10 per cent of purchase price of the machine. Interest was calculated by using the formula given below

$$\mathbf{I} = \frac{P+S}{2} \times \frac{i}{H}$$

Where

I = Interest on capital Rs./h,

P = purchase price of the machine, and

S = residual value of the machine.

i = interest rate in fraction

H= working hours per year, hours

2.4.1.3. ***Insurance, taxes and shelter***

Insurance and taxes were estimated taking as 2 per cent of average purchase price of machine.

2.4.2. **Variable Cost**

2.4.2.1. ***Repair and maintenance***

The cost of repair and maintenance was assumed to be 10 per cent of purchase price.

2.4.2.2. ***Wages and Labour charges***

The cost of labour was estimated taking the prevailing rate of Rs. 150 /day.

3. RESULT AND DICUSSION

3.1 Field efficiency:

As fig.1 shows that chisel type furrow opener is more suitable as it provided higher efficiency i.e. 83.3 % as compared to shovel and shoe type furrow opener for the moisture content17.2% at the speed of 1.8 km/h.

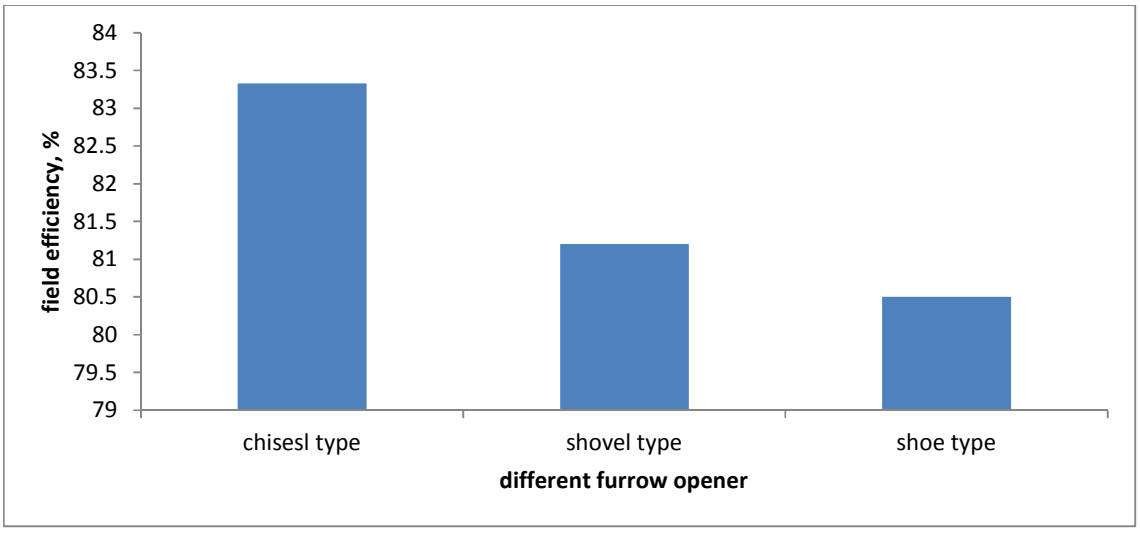

Fig .1 Effect of different shapes of furrow opener on field efficiency at 17.2 % moisture content and at 1.8 km /h.

3.2. Missing hill percentage :

As shown in fig 2 the average missing hill percentage by onion bulblet planter was 2.22% while manually 6.01 %.

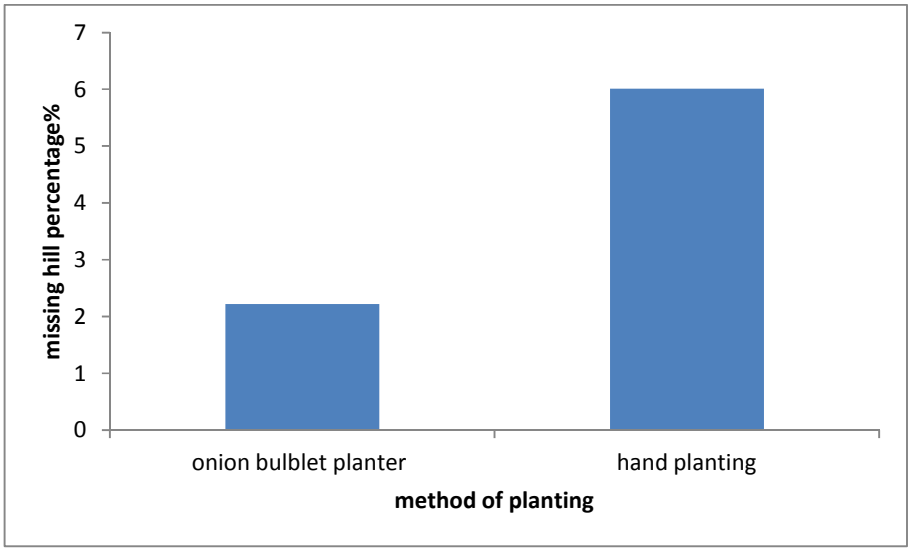

Fig 2 comparison of different planting method

3.3 Cost Economics

The cost of operation of the machine per hour as well as per hectare is presented in Table 1. The machine cost is taken which may be used in other farm operation also. The annual use of the machine taken in to account is only 200 h/year.

From calculation, it is found that cost of operation of the machine mainly depends upon its annual use. In present assumption the fixed cost was found to be Rs.3.8 /h whereas, operational cost as Rs.40 /h including both fixed and operational cost the machinery cost per hour was calculated as Rs. 43.8 /h. For planting one hectare of land the manual onion bulblet planter required Rs 1790.8 /ha. Which is much less as compared to traditional method of planting which required 65 man days and required additional cost of Rs. 9300.

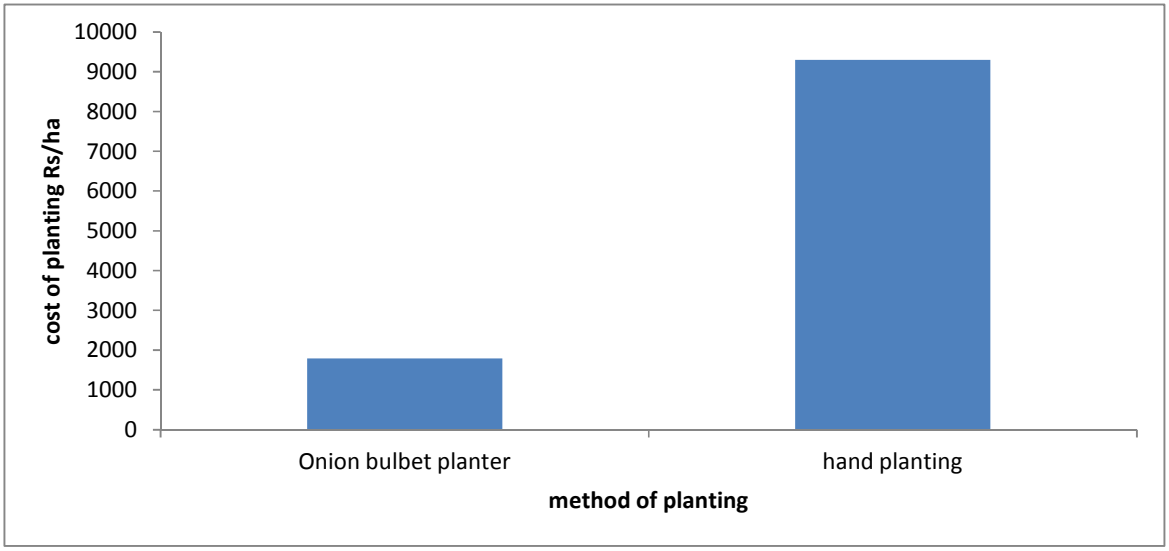

Fig. 3 Comparison of Cost of planting for different method for onion bulblet planting

Table 1 Calculation of cost of calculation per hour and per ha by manual operated onion bulblet planter

S No	Particulars	Amount
1	Cost of machine , Rs	5000
2	Life of machine (y)	10
3	Annual use (h)	200
4	Depreciation, Rs	450
5	Interest, Rs	275
6	Housing, Rs	50
Sum of	Fixed cost (Rs./year)	775

(1 to 6)		
A	Fixed cost (Rs./h)	3.87
B	Operational cost	
1	Repair and maintenance, Rs	37.5
2	Wages of 2 operator (Rs 150/day*), Rs.	2.5
Total of B	Operational cost (Rs/h)	40
Total of (A+B)	Machinery cost, (Rs./h)	43.87
	Cost of operation, Rs./ha	1790.80

Assumptions:

- 1 day i.e. 8 hour of work
- Life of machine = 10 yr
- Annual use = 200 h

3.4. Timeliness of operation

It was calculated that the manual operated onion bulblet planter required 42.4 hours to complete 1 hectare of land . Fig 4 shows the comparison of the onion bulblet planter consumes less time for planting than the hand planting method .

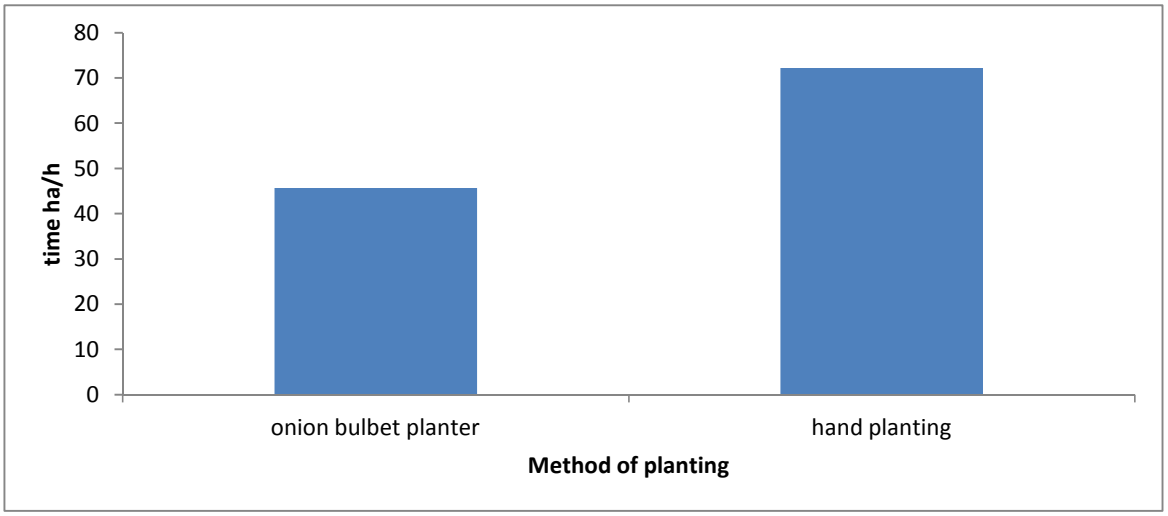

Fig. 4 Comparison of different method of planting in time

The difference of about 25 hrs for planting of onion bulbs results in to saving of cost labour and provides timeliness of planting. The maintenance of planting time ultimately results in to increased productivity, as we know every day delay in planting result in to 2% of reduced yield.

4. Conclusion:

The study concluded that the missing hill percentage was less when compared to hand plating (Traditional method of planting). The cost of operation for planting one hectare of land the manual onion bulblet planter required Rs 1790.8 /ha. Which is much less as compared to traditional method of planting which required 65 man days and required additional cost of Rs. 9300. Time and labour can be saved with the planter compared to traditional method of planting. the planter is useful for small and marginal farmers who cannot afford large machinery and for fields where large machinery is not suitable.

5. REFERENCE

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