Original Research Article

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

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ABSTRACT

The study was conducted that the comparison between planting of onion by manually operated onion bulblet planter over a hand planting method (Traditional method of planting) in college of Agricultural Engineering JNKVV Jabalpur. A manually operated onion bulblet planter was developed with inclined plate metering device. The performance evaluation of developed planter in term of field efficiency and missing hill percentage. And it also compare the cost and time of operation of developed planter over a hand planting. The results showed that the field efficiency was 83.33% with chisel type furrow opener and the missing index percentage was 2.22 %. It observed that the cost of planting by manually operated onion bulblet planter was Rs. 1790.81 per hectare of land as compared to the hand planting method for one hectare of land was required 65 man days and cost of Rs. 9300.

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

1. INTRODUCTION

Most of the farmer use traditional methods for sowing/ planting such as broadcasting and seed dropping behind the plough, which effects germination due to non uniform placement of seeds at proper depth. All methods of onion planting depend heavily on manual labour. In daily life onion are important vegetable, it is unfortunate that not much development has been made in mechanizing cultivation practices in onion production. Mechanization will lead to reduction of labour demand, uniform rate of production and high yield that occur a relatively short period of time of time in each growing season.

The performance of manually operated garlic planter at Jabalpur. They compared the cost economics and labour requirement of the planter with the traditional method. The result show that the capacity of manual planter for sowing of garlic crop was 0.019 ha/h with including 2 person (Singh and Shrivastava, 2006).

The performance parametes measured during field test included i.e. seeding depth, miss index, multiple index and seed damage. The results indicated the seeding depth and spacing was 12.3 and 22.7 cm respectively. Also, miss index, multiple index and seed damage were measured as 12.23, 2.43 and 1.41 % respectively (Bakhtiari and Loghavi, 2009)

The need of mechanization, the planter was developed to improve planting efficiency and reduce drudgery involved in manual planting method. The aim of study was to comparison between planting of onion by manually operated onion bulblet planter over a hand planting method (Traditional method of planting).

2. MATERIAL AND METHODS

The study was conducted in the year 2016-17 at college of agricultural engineering, JNKVV, Jabalpur Madhya Pradesh. After completion of the fabrication, the machine was tested both the laboratory and field for 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. There was comparison of operational cost with manually operated planter and traditional method of planting.

Procedure for field testing

The onion bulblet planter was testes in well prepared land and following data were obtained. The field test were conducted on the farm field College of Agricultural Engineering JNKVV Jabalpur Madhya Pradesh on an area of 30 m^2. The type of soil was black cotton soil (Vertisol). Clean and fresh onion bulbs were selected (35 mm in diameter) for testing. There are some parameter used for planter testing:-

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= $\frac{Effectivefieldcapacity}{Theoreticalfieldcapacity}$ X 100

2.4 Missing hill percentage

Missing hill percentage is useful to know the precision of metering unit of planter. The missing hill percentage was calculated by using formula:

Missing hill percentage = $\frac{nt-na}{nt}$ X 100

Where,

n_t= number of hills present in a row for given row length, theoretically

n_a= Actual number of hills observed in a row for same length.

2.5 Cost of Operation

2.5.1 Fixed costs

2.5.1.1 Depreciation:

This cost reflects the reduction in value of a machine with use(wear) and time (obsolescence). While actual depreciation would dependon the sale price of the machine after its use, on the basis of differentcomputational 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.

2.5.1.2 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

2.5.1.3 Insurance, taxes and shelter

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

2.5.2 Variable Cost

2.5.2.1 Repair and maintenance

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

2.5.2.2 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.

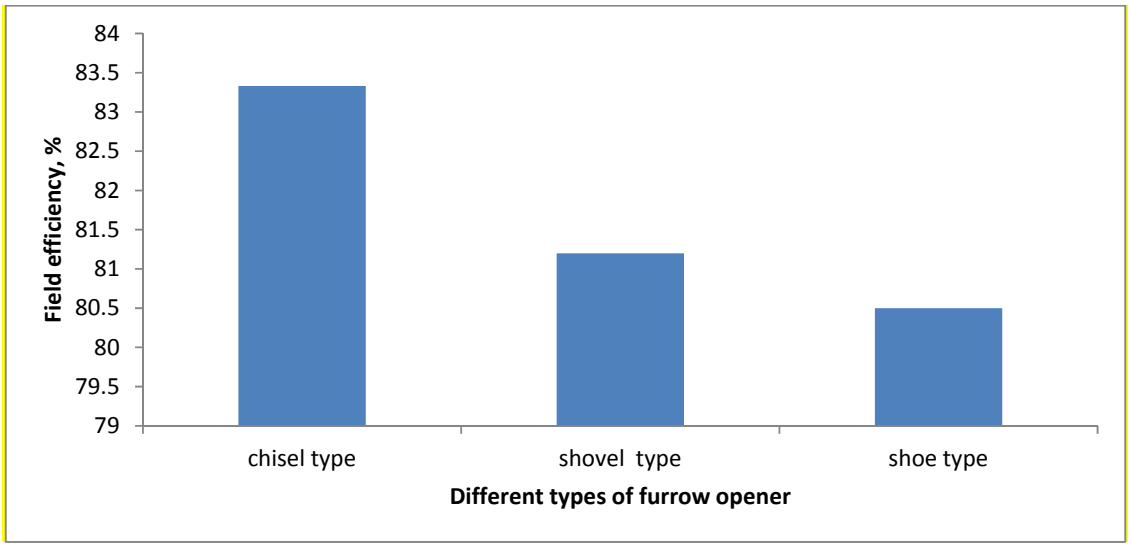

Fig .1 Effect of different shapes of furrow opener on field efficiency at 17.2 % moisture content and at 1.8 km /h.

3.2. Missing hill percentage :

The observation of number of hills were taken in randomly selected 3 rows in the field. The missing hill percentage was calculated. The missing hills was calculated for those bulb which fall on the row and distance between two adjacent bulb more than 1.5 times than the recommended theoretical distance. There was 180 bulbs in three rows and missing hills was 2.22% the number of miss were only 4.

Missing hill percentage:= (4/180) x 100 =2.22%

As shown in fig2 the average missing hill percentage by onion bulblet planter was 2.22% while manually 6.01 %.

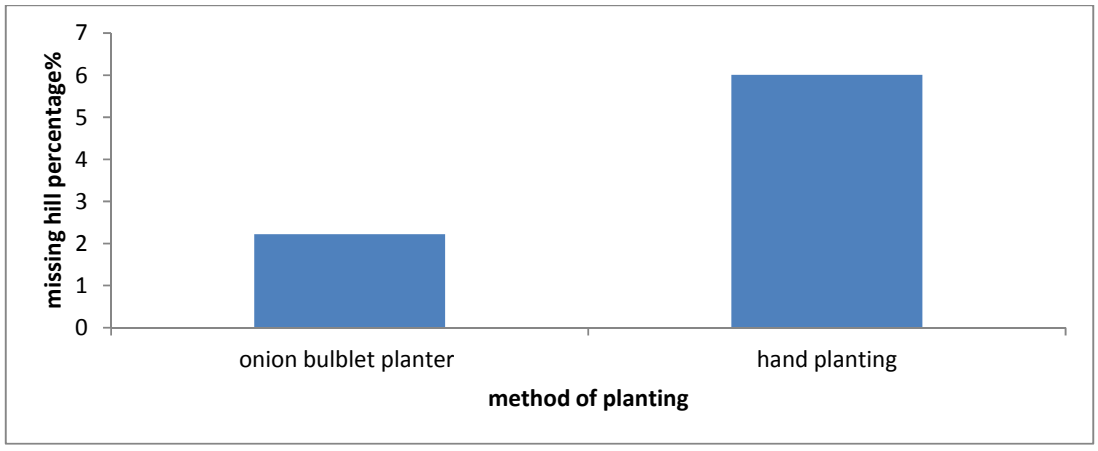

Fig 2 Comparison of different planting method

Fig. 3 In view of field testing

3.3 Cost Economics

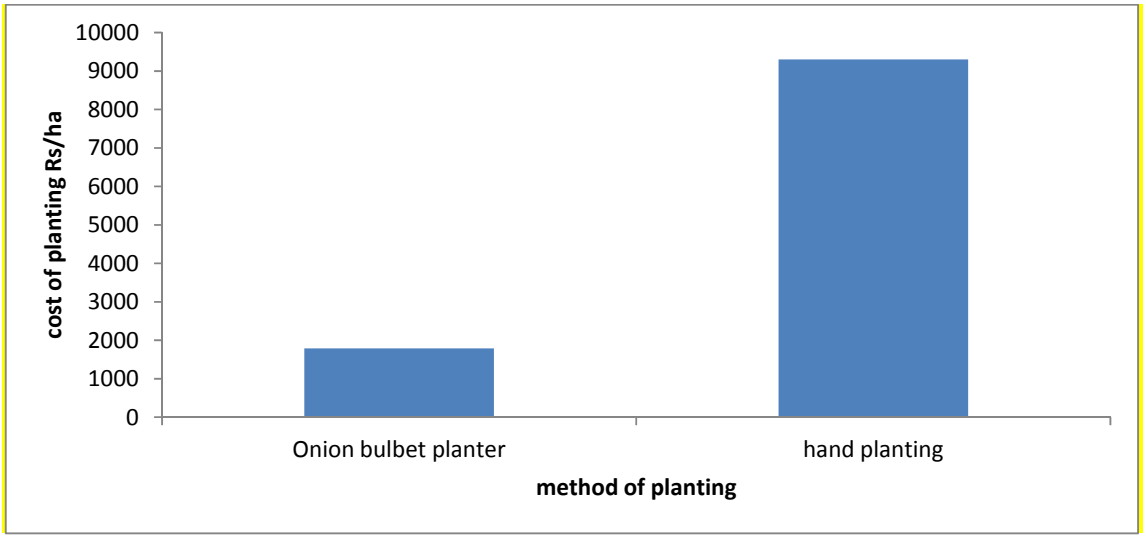

Fig. 4 Comparison of Cost of planting for different method for onion bulblet planting

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.

Table 1: 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 (1 to 6)	Fixed cost (Rs./year)	775
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

It was found that the cost of machine mainly depend upon its annual use. The cost of planting by manually operated onion bulblet planter was Rs. 1790.81 per hectare of land as compared to the hand planting method for one hectare of land was required 65 man days and cost of Rs. 9300.

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 .

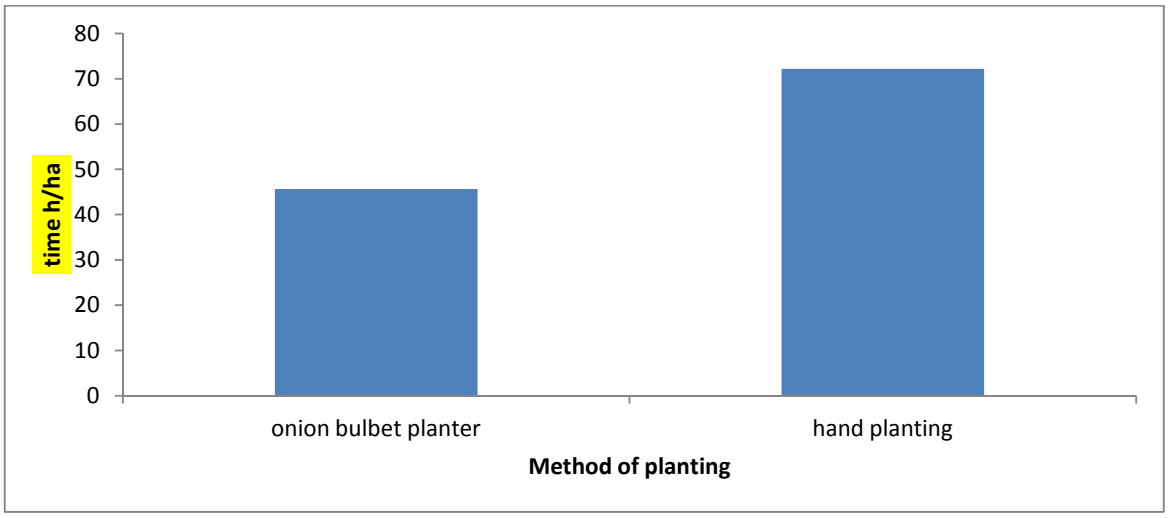

Fig. 5 Comparison of different method of planting in time

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.

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