

SUCCESS STORIES

On

1. Tractor Operated Straw Baler
2. Tractor Operated Aero-blast Sprayer
3. Tractor Operated Strip-till Drill
4. TNAU Tractor operated Three Row Plug Type Vegetable Transplanter
5. Custom Hiring of Tractor Operated Straw Combine in Haryana State
6. CIAE Multicrop Thresher
7. Tractor operated Raised Bed Planter
8. Tractor Operated Laser Land Leveler



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4. TNAU Tractor Operated Three Row Plug Type Vegetable Transplanter

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Introduction

In Tamilnadu chili and brinjal are cultivated in 86315 and 10420 ha, respectively. These vegetable crops are cultivated traditionally using manual labourers except for tillage. Shortage of farm labourers affects planting operation of vegetables by way of poor field coverage and poor quality of planting which ultimately reduces the yield. Transplanted crops mature in shorter duration and requirement of labour is reduced. There is tremendous scope to mechanize transplanting operation by applying inputs judiciously.

Traditional Practices and necessity for development of equipment

Presently nursery preparation including soil preparation, seeding, and maintenance and transplanting operations is performed manually. The mechanization of bare root vegetable planting is complex task because the seedlings of many species are extremely tender which requires special care in handling. The advantages of mechanized nursery and transplanting are control of the plant growth during propagation and the survival and growth of the plants after transplanting.

Evolution and design process

The need of precision transplanting equipment for vegetables seedlings was felt in Tamilnadu for saving of labour, costly hybrid seeds of vegetables. The commercial vegetable also growers expressed need for nursery raising equipments. Thus mechanization of soil filling, seeding, germination and the raising of seedlings was planned.

For all the three crops (chili, tomato, brinjal) media mix was optimized. The best medium was cocopiat and vermin-compost in 1:1 ratio. The nursery raising system was designed for the optimized portable seedling tray with 98 cells. The components of the system were media bin, bucket elevator, media sieve, screw conveyor, media mixer and tray conveyor. The capacity of nursery raising system

was 750 trays/h. The three row (plug type) vegetable transplanter was designed and tested first under lab conditions. The planting angle, capacity and losses were assessed.

Salient features

Tractor mounted plug type vegetable transplanter (Fig.4.1) consisted of main frame with hitching system, ground wheel, shoe type furrow openers, compaction wheel, operator's seats, two depth control wheels and plug type metering mechanism. It employed press wheels inclined at an angle of 15° with the vertical as soil covering device. The plant spacing can be adjusted by changing sprockets / pulleys or by changing in alternate holes. The power is transmitted from ground wheel (750 mm diameter) to gearbox through chain and sprockets. For transmitting power from gearbox to discs, belt and pulley are employed. In transplanting three discs of 460 mm diameter are used. The power was reduced at a ratio of 2:1 from gearbox to discs. The auxiliary frames provided to mount furrow openers, furrow closures, operator's seat and two depth control wheels.

Performance result

The impact of the seedling with soil block helps in its placement. For chilli, brinjal and tomato the machine performance was tested at forward speed of operation of 1.4 km/h. The average field capacity of transplanter was 0.14 ha/h (Fig. 4.2). Average field efficiency of machine was 75% for chilli, tomato and brinjal with 450 mm row spacing. The working width of machine was 1350 mm (Table 4.1).

Table 4.1: Performance results of Tractor mounted Plug type transplanter

Parameter	Values
Soil moisture content (d.b), %	12-13
Working width, mm	1350
Row spacing, mm	450
Speed of operation, km/h	1.4
Field capacity, ha/h	0.14
Field efficiency, %	75
Draft, kg	250



Fig. 4.1: Plug type vegetable transplanter



Fig. 4.2: Plug type veg. transplanter in operation

Economics of machine

The cost of machine is Rs 35,000/-. For crops having labour requirement of 30 man-days/ha and wages of Rs 60/day or above, the machine use is recommended at 1.4 km/h speed of operation.

In second case the machine operation at 1.2 km/h is recommended of labour wage and labour requirement of crops are Rs 50/day and 40 man-days/ha, respectively.

The machine operation at 1 km/h speed of operation is economically feasible in places where manual labour rate is Rs 70/day and labour requirement for crops varies 35-40 man-days/ha.

ANNEXURE I

Specifications of Plug type vegetable transplanter

Type	Semi-automatic
Overall dimensions (L x B x H), mm	1800 x 1600 x 1400
Weight, kg	350
Number of rows	3
Suitability for crops	Chilli, brinjal, tomato
Main frame size (LxBxH), mm	1100 x 850 x 80
Auxillary frame (LxBxH), mm	1200 x 750 x 40
Diameter of ground wheel, mm	750
Discs in transplanting mechanism:	
Number	3
Size, mm	460
Cost, Rs.	35000
Power requirement, kW	33.57 kW tractor or above

ANNEXURE -II

List of manufacturers

The Principal Investigator
Zonal Research Centre, Agril. Engg. College
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