TRACTOR MOUNTED CULTIVATOR SEED PLANTER

A SUCCESS STORY

भाकृअनुप
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ALL INDIA COORDINATED RESERCH PROJECT ON
FARM IMPLEMENTS AND MACHINERY
CENTRAL INSTITUTE OF AGRICULTURAL ENGINEERING
Nabi Bagh, Berasia Road, Bhopal - 462 038, India

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Designed and Development	:	**R Manian** **VM Duraisamy** **VJF Kumar** *TNAU, Coimbatore*
Compilation	:	**VM Duraisamy** *TNAU, Coimbatore*
Editing		**MM Pandey** AICRP on FIM *CIAE, Bhopal*
Art, Cartography & Proof Reading	:	**Yashwant Bhokardankar** **SS Mandvikar** *CIAE, Bhopal*
Word Processing	:	**Zackaria V John** *CIAE, Bhopal*
Reprography	:	**RS Kushwaha** *CIAE, Bhopal*

Introduction

Timely sowing of seeds in dry land to utilize available moisture is important. Though bullock drawn seed drills are available, the field capacity of these units is low. Most of the farmers owning a tractor also own a cultivator. Hence it was felt that the development of a seed planter mounted on a cultivator would be useful to the farmers.

Traditional Practices for Sowing

The traditional method of sowing is dropping seed behind the country plough manually. For farmers owning tractors, the traditional practice in many parts of Tamil Nadu, is broadcasting followed by one operation of cultivator. Both these methods are inefficient since there is wide variation in depth of sowing and also seed distribution is not proper. For sowing operation, tractor owners have to own a seed drill or seed-cum-fertilizer drill. Moreover **groundnut** seeds cannot be broadcast and hence have to be sown behind the country plough only. Hence there was need for development of an efficient tractor drawn seed planter. A planter attachment to existing design of cultivator will not only obviate need for a separate machine for planting but will also improve versatility of cultivators.

Salient Features of the Machine Developed

The planter uses a cup feed type metering mechanism. The seed box along with the cup feed type metering

mechanism is mounted on the cultivator frame and seeds are dropped in furrows behind the cultivator shovels. Detachable side wings are attached to the existing shovel type furrow openers of cultivator which help in placing the seeds at the required depth. Power to rotate the seed metering discs is obtained from the ground wheel through a clutch. A square bar is provided at the rear of the unit to cover the seeds in the furrows. Row to row spacing is adjusted by changing the position of cultivator tynes. The seed to seed spacing can be varied by changing the sprocket mounted on the metering shaft. While sowing headlands have to be left unseeded for turning. Marker is provided for easy operation. The operator can stop the dropping of seeds by disengaging the clutch provided for this purpose. The unit should be operated at speeds below 4 km/h. The cost of the planter attachment to the tractor mounted cultivator is Rs. 9500/- and its cost of operation is Rs. 300 per ha as against Rs. 600 per ha by conventional method of sowing behind the country plough. The specifications of the tractor mounted cultivator seed planter is given in Appendix-I.

Evolution/Design Process

The project on development of the machine was taken up during 1985-86. A seed planting mechanism was attached to a nine tyne cultivator having the provision to adjust spacing between tynes. A trapezoidal seed box made of 18

gauge mild steel sheet was used. The seed metering mechanism consisted of nine rotor housings mounted at intervals of 20 cm, each having seed rotor and funnels fixed at the bottom of the housing. The seed tubes were connected to the bottom of funnel. During calibration, it was observed that positive and negative variation in seed rates among individual seed metering rotors was considerable. It was also noticed that improper adjustment of rubber provided in this type of seed metering mechanism either damaged the seed or altered the seed rate. It could not remain proper service for more than 2 ha.

Hence during 1986-87, the seed metering mechanism was changed to the cup feed type. Two seed boxes were provided, one having five metering discs and the other having four metering discs. Each seed box was divided into two compartments, the main compartment for seeds and the other having seed metering discs. Shutters were provided in between compartments for easy flow of seeds from the seed box to the seed metering discs. The existing shovels of cultivator were fixed with detachable side wings by means of nuts and bolts in order to convert it into a furrow opener. It was noticed that clods got stuck between lugs of the ground wheel used for transmitting rotary motion to the seed metering discs. Hence number of lugs on the ground wheel were reduced from 24 to 18. A dog clutch was fitted to the main drive shaft of seed rotor to stop

flow of seeds whenever required. Laboratory tests showed that variation in recommended seed rate was the lowest at 25 rpm of seed metering discs. Beyond 30 rpm missing seeds were frequent. Results of field tests also confirmed that beyond 40 rpm corresponding to forward speed of 5.50 kmph, seeds were ejected out of the funnel.

During 1987-88 extensive evaluation trials were carried out at farmers' fields in four villages. The following modifications were made based on the observations during field trials:

(i) The frame was modified for easy adjustment of row to row spacing
(ii) Ground wheel was fitted on left side of the planter with projection of 150 mm
(iii) Chain cover was provided
(iv) In the seed box MS sheets were replaced with GI sheets to prevent rusting

The cultivator seed planter (Fig.1) was tested in farmers fields for feasibility trials and prototypes of the seed planter were given to farmers for its popularization. This seed planter was used by the farmers for sowing groundnut, Bengalgram, sorghum, maize, cotton, blackgram, greengram and soyabean. Based on feedbacks received

from the farmers, the following modifications were made during 1993-94:

(i) Height of seed box was raised from 210 mm to 400 mm to avoid sharp bends in seed tubes.

(ii) To simplify the manufacturing process, seed box was modified by changing split type seed box with a single seed box without any partitions. Brushes were also removed (Fig.2).

Performance of the machine

The cultivator seed planter was tested in the laboratory and then tested extensively in the field for sowing groundnut and Bengal gram. The laboratory calibration of seed metering mechanism was done using a seed drill test bench with variable speed drive for metering the groundnut kernals. Results of the laboratory tests are presented in Table 1. The tests were conducted at 15, 20, 25, 30, 35 rpm of seed metering rotor corresponding to a forward speed of 2 to 4.5 km/h.

Fig. 1:Tractor mounted cultivator seed planter

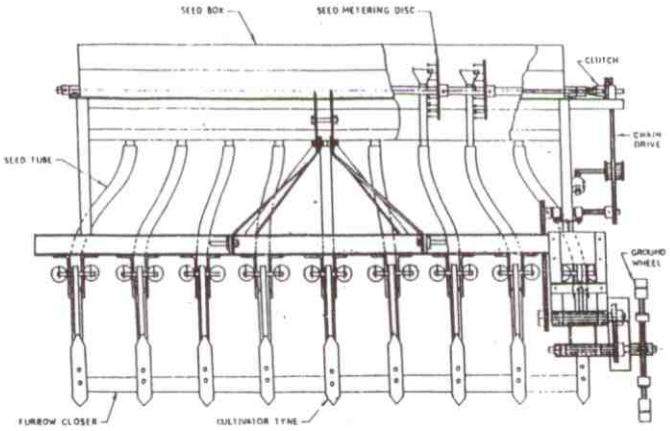

Fig. 2: Schematic drawing of Tractor mounted cultivator seed planter (*Modified*)

Table 1. Results of laboratory test of seed metering discs with groundnut

Sl. No.	Seed metering speed, rpm	No. of seeds dropped in 2 minute		Broken seed, %
		Theoretical	Actual	
1.	15	540	531-580	0.5-2.0
2.	20	720	716-760	0.5-2.0
3.	25	900	893-937	0.9-2.0
4.	30	1080	1089-1148	1.4-2.1
5.	35	1260	1090-1258	1.3-2.8

The variation from recommended value was minimum at 25 rpm corresponding to the forward speed of 3.6 km/h.

Extensive field trials of the planter have been carried out at University farms and farmers fields. The performance of the machine is presented in Table 2.

Table 2. Results of field tests for different crops

Sl. No.	Variables	Output value
1.	Field capacity, ha/h	0.44-0.68
2.	Field efficiency, %	73-81
3.	Ground wheel skid, %	7-9

Sl. No.	Variables	Output value
4.	Depth of sowing, cm	4.0-7.2
5.	Fuel consumption, l/ha	7.02
6.	Cost of sowing (1999), Rs/ha a) By seed planter b) By traditional method	 300 600

Results of trials to determine plant spacing obtained by the planter for groundnut crop is presented in Table 3. The plant to plant spacing was measured in all nine rows for a travel of 10 m. The required spacing between plant to plant was 13.33 cm at 22.5 cm row spacing. The mean value ranged from 11.37 cm to 13.70 cm for different rows.

For different rows, the standard deviation varied from 6.41 to 10.33 and the coefficient of variance varied from 0.56 to 0.5. About 60-83 per cent plants were within 5-15 cm range of plant spacing.

The cost of planter was estimated to be Rs.9500/- (1999) and the cost of operation was Rs.150/h. The cost of sowing was Rs.300/ha as compared to Rs.600/ha for sowing behind country plough.

Table 3. Frequency distribution of seed spacing for different rows

Spacing, cm	Frequency in different rows								
	1	2	3	4	5	6	7	8	9
0-5	9	8	9	13	7	4	2	2	2
5-10	24	24	28	28	32	23	23	28	29
10-15	30	22	16	10	15	18	18	16	23
15-20	4	4	5	7	3	2	7	7	6
20-25	2	2	4	3	3	2	1	1	2
30-35	-	1	1	1	-	1	-	2	1
35-40	1	1	2	-	-	-	-	-	-
40-45	-	1	2	-	-	-	-	-	-
45-50	-	-	1	-	-	-	-	-	-

Status of Technology

The tractor mounted seed planter was extensively tested in an area of more than 100 ha on research farms and more than 1000 ha in farmers' fields for its feasibility. Besides, to it considerable number of demonstrations were conducted under Frontline Demonstration (FLD) Projects on Oilseeds and Pulses programmes. More than 900 prototypes have been sold to farmers and different agencies (Appendix-II). At present nine firms are manufacturing production of this machine (Appendix.III).

Specifications of Tractor Mounted Cultivator Seed Planter

i.	Name of Implement	:	Tractor mounted cultivator seed planter
ii.	Suitability to crops	:	Groundnut, Bengal gram, sorghum, maize, black gram, green gram and soybean
iii.	Overall dimensions, mm		
	Length	:	2300
	Width	:	2000
	Height	:	1140
iv.	Weight, kg (Unladen)	:	418
v.	Recommended forward speed, km/h	:	3.6
vi.	Nominal working width, mm:		2025
vii.	Power requirement	:	26 kW hp tractor of or above
viii.	Type of metering mechanism:		Cup feed type
ix.	Number of rows	:	Nine
x.	Row spacing, mm	:	225
xi.	Mechanism for driving metering:		Ground wheel disc
xii.	Power transmission system	:	Chain and sprocket
xiii.	Hopper		
	(a) *Number*	:	2
	(b) *Capacity, kg*	:	65 and 55
	(c) *Material*	:	GI Sheet
xiv.	Clutch for metering system		
	(a) *Type*	:	Dog clutch
	(b) *Location*	:	On seed metering shaft

xv.	Furrow opener		
	(a)	*Type*	: Shovel
	(b)	*Material*	: Spring steel
xvi.	Covering device		
	(a)	*Type*	: Bar
	(b)	*Material*	: Mild steel
xvii.	Ground wheel		
	(a)	*Shape*	: Round with spokes and lugs
	(b)	*Material*	: Mild steel
xviii.	Tractor hitch		: Category - 2

Appendix-II

Production and Supply of machine

1. Prototypes fabricated and sold by TNAU centre of AICRP on FIM:

(I)	KVK and other centres	: 38
(ii)	R&D organisations	: 4
(iii)	Farmers	: 6
	Total	**: 48**

2. Prototypes manufactured and sold by manufacturers : **850**

Appendix - III

LIST OF MANUFACTURERS

i. M/s TUCAS Limited,
Tudiyalur (P.O), Coimbatore - 641 034

ii. M/s Sree Annapoorna Farm Equipments
8-A, Iyer Hospital Road, Trichy Road, Singanallur
Coimbatore - 641 005

iii. M/s Velmurugan Industries,
Vaiyappamalai, Tiruchengodu Taluk,
Salem District, Tamil Nadu

iv. M/s Beracha Engineers,
436, Maruthamalai Road, P.N.Pudur (P.O),
Coimbatore - 641 034

v. M/s Valumpuri Industries,
Maruthamalai Road, P.N.Pudur (P.O),
Coimbatore - 641 034,

vi. M/s Kovai Engineering Works
88, Iyer Hospital Road,
Sowripalayam (P.O), Coimbatore - 641 028

vii. M/s Trident Dynamics Ltd (AGRO).
3/507, Bharathi Nagar, K-vadamadurai,
Coimbatore - 641 017, Tamil Nadu

viii. M/s.Vigneshawara Textile Engineers,
No.84, Extension Street No.1,
Singanallur, Coimbatore - 641 005

ix. Universal Agro Industries
SF No. 374/5 Near Bimetal Bearings,
Maruthamalai Road, P.N.Pudur
Coimbatore - 641 041

..... *A Step Towards Farm Mechanization*

Sustenance of a desirable level of agricultural productivity goes hand in hand with mechanization of different farm operations, which aims at achieving timeliness of operations, efficient use of inputs, improvement in quality of produce and safety and comfort of farmers, and reduction in loss of produce and drudgery of farmers.

The All India Coordinated Research Project (AICRP) on Farm Implements and Machinery (FIM) with its 21 Centres in different parts of the country, has been endeavouring to develop, test and popularize need based farm implements and machinery for different regions. The research and development activity under AICRP on FIM involves design, development, testing and design refinement of farm implements and machinery. Prototype manufacturing activity is for multiplication of research prototypes for multi-location trials, development of manufacturing technology for new machines and promoting their manufacture by involving local manufacturers. Prototype feasibility testing activity of a Centre includes identification of farm mechanization needs under local agro-climatic conditions and identification and adaptation of machines to fill the identified mechanization gaps through their feasibility trials.

One-hundred-forty-two farm implements and machinery have been designed and developed under the AICRP on FIM. Seventy-nine of these have been commercialized. This publication is one among the series of such publications being brought out by the Project on successful technologies.

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