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Tractor Operated Garlic Planter

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Introduction

Garlic (Allium Sativum) is the second important bulb crop grown after onion. In India, it contributes about 14 per cent of world area and 5 per cent in production. India ranks second after China in terms of area and production. However, its average productivity is only 5.29 t/ha which is the lowest. Garlic is cultivated in about 209.34 thousand ha area and recorded production of 1264.69 thousand tonnes during the year 2010-11 (Table 2.1). It is grown in large quantities in Madhya Pradesh, Rajasthan, Gujarat, Odisha, Karnataka, Maharastra, and Tamil Nadu. India also exports large quantity of garlic to Pakistan, Nepal, Thailand, Malaysia, USA etc.

Table 2.1 Area, production and productivity of garlic in India (2010-2011)

States	Area ('000), ha	Production ('000), t	Productivity, t/ha
Andhra Pradesh	0.4	4	10
Bihar	4.25	29.75	7
Chhattisgarh	3.9	21.1	5.41
Gujarat	40	275	6.88
Himachal Pradesh	3.6	44.7	12.42
Jammu & Kashmir	2.3	32	13.91
Karnataka	4.2	30.2	7.19
Madhya Pradesh	54	228	4.22
Maharastra	3.5	34.1	9.74
Odisha	11	35.8	3.25
Punjab	3.7	40.5	10.95
Rajasthan	25	150	6
Tamil Nadu	0.4	3.1	7.75
Uttar Pradesh	35.1	190.5	5.43
Uttaranchal	1.2	7.3	6.08
West Bengal	3.5	33.9	9.69
Other states	13.29	104.74	7.88
Total	**209.34**	**1,264.69**	

Source: NHRDF, Nashik

Garlic is an important cash crop of rabi season in the south east and west Rajasthan. It is widely grown in Chittorgarh, Kota, Jhalawar Udaipur, Jodhpur and Banswara districts. Initially, it is grown at small scale but with the growing demand of garlic for export it is cultivated on large scale specially in Jhalawar, Kota, Baran and Jodhpur districts of Rajasthan. It is being sown manually with the help of khurpa or small stick (dibbling method). It requires about 50-60 persons to sow one hectare in one day costing almost Rs. 6000 to 8000/ha.

During the sowing season the scarcity of labour results in delayed sowing thus reducing yield. Therefore, the need to develop an efficient tractor operated garlic planter was felt to increase the cultivation of this cash crop. The use of such planter will also reduce human drudgery during garlic cultivation. Currently, the area cultivated by an individual farmer is increasing for garlic sowing and as such use of tractor operated garlic planter is required to complete the operation in time and to handle large quantity of seeds due to higher seed rate of 450-500 kg/ha.

Salient Features of Garlic Planter

A tractor mounted 15 row garlic planter was developed by MPUAT, Udaipur Centre of AICRP on FIM. The isometric view of tractor operated garlic planter is shown in Fig. 2.1. The machine can plant 15 rows of garlic at a minimum row spacing of 150 mm. The row to row spacing and number of rows can be varied. The seed metering mechanism consisted of plastic roller with six blades like an open impellor of centrifugal pumps. The roller can be changed easily by opening a few nuts and bolts with shaft from the hopper. The capacity of each hopper was about 100 kg of garlic cloves. The planting spacing can be varied by changing sprocket with higher or lower no of teeth. The metering shaft was having 12 teeth. The hopper was made of MS sheet with two partition having rollers of seed metering mechanism confined in small box fitted with main hopper. The furrow openers of standard design were made with inverted T type fitted with two sizes of seed tubes. Large seed tubes (75 mm) were used because of larger size of garlic cloves of Coimbatore variety and 50 mm seed tubes for local variety garlic. Drive wheel of 350 mm diameter was attached with 18 teeth sprocket and chain to provide power to fertilizer and seed box shaft. Fertilizer hopper was also in two parts made with plastic rollers having 12 blades metering mechanism in small boxes fitted under the main hopper. The specifications of tractor operated garlic planter are given in Table 2.2. The commercial model of garlic planter with 17 rows is shown in Fig. 1.2. Commercial model is manufactured by M/s Khedut Agro Engineering, Rajkot.

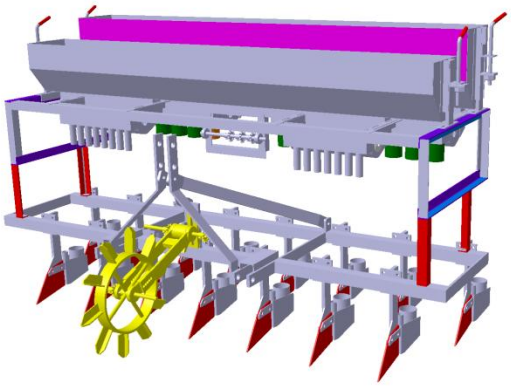

Fig. 2.1 CAD view of tractor operated 15 row garlic planter.

Fig 2.2 Commercial model of garlic planter

Performance of the Garlic Planter

The performance of seed metering mechanism was evaluated in the laboratory for seed rate. The seed rate of 550-600 kg/ha was recorded with local variety of garlic and 850-900 kg/ha of garlic of Coimbatore variety. It mainly depended upon the size of garlic cloves. The recommended seed rate for garlic was 450-500 kg/ha for local garlic and 850-900 kg/ha for special variety from Coimbatore. The machine was operated in the field for placement of garlic cloves at depth of 40-50 mm in the soil. The seed placement of 12 to 20 cloves per meter row length was observed by tractor operated planter. Fine seedbed preparation was required for uniform placement of garlic cloves in field. The plant density of 120 to 136 plants/m^2 was observed after germination. The field capacity of garlic planter was 0.51 ha/h. The overall performance of garlic planter is given in Table 2.3.

Table 2.2 Specifications of garlic planter

S. No.	Particulars	Specifications	
		15 rows garlic planter (developed)	**17 rows garlic planter (commercial)**
1.	Overall dimensions (L x W x H), mm	2280 x 1200 x 1400	2310 x 1380 x 1402
2.	Power source	35 hp Tractor	35 hp Tractor
3.	Weight, kg	325	390
4.	No of row for garlic planter	15	17
5.	Row to rows spacing (adjustable), mm	150 (minimum)	125 (minimum)
6.	Seed metering mechanism (i) Planter (ii) Fertilizer	Plastic roller with 6 blades for seed and 10 blades for fertilizer. Seed roller of 98 x 35 x 48 mm Fertiliser roller of 98 x 24 x 30 mm	Plastic roller with 6 blades for seed and 10 blades for fertilizer. Seed roller of 98 x 35 x 48 mm Fertiliser roller 98 x 24 x 30 mm
7.	Seed tubes	75 mm for Coimbatore and 50 mm for local variety of garlic	75 mm for Coimbatore and 50 mm for local variety of garlic
8.	Furrow opener	Inverted T type	Inverted T type
9.	Seed hopper capacity, kg	100	110
10.	Fertilizer hopper capacity, kg	80	100
11.	Ground wheel dia., mm	350	350
12.	Cost of machine, Rs.	42000	44000

Status of the Technology

The tractor operated prototype of 15 rows garlic planter performed nicely and one 15 row unit was supplied to IARI, New Delhi. The 15 row model was further extended to 17 row commercial model and 20 units were supplied to different farmers in garlic growing region like Jhalawar, Baran, Chittorgarh Jodhpur and Udaipur districts of Rajasthan (Annexure II). In the year 2012 almost more than 270 ha of garlic was sown by these machines.

Table 2.3 Performance of tractor operated garlic planter

S. No.	Parameters	Observations for garlic sowing
1.	Type of soil	Black cotton soil
2.	Effective working width, mm	2125
3.	Working depth, mm	42
4.	Soil moisture,% db (before testing)	11.2
5.	Seed rate, kg/ha (local variety)	550
6.	Type of fertilizer	DAP
7.	Fertilizer rate, kg/h	100
8.	Speed of operation, km/h	3.1
9.	Field capacity, ha/h	0.51
10.	Field efficiency, %	77
11.	Fuel consumption, l/ha	3.7
12.	Cost of operation, Rs./h	510
13.	Cost of operation, Rs./ha	1000

Farmers Feedback

The machine was extensively evaluated for sowing garlic at farmer's field. Farmers who used this machine were happy and found it better over other commercial machine. The sowing of garlic at farmer's field with tractor operated garlic planter in Jhalawar district of Rajasthan is shown in Fig. 2.3. Fig. 2.4 shows the spacing of garlic cloves and germinated crop stand sown by garlic planter at farmer's field. The farmers reported that cost of garlic sowing was reduced from Rs. 6000-8000/ha to Rs. 1800/ha with substantial saving of time due to higher field capacity of 0.5 ha/h.

Fig. 2.3. Sowing of garlic at farmer's field with tractor operated garlic planter in Jhalawar district of Rajasthan.

Fig. 2.4. Spacing of garlic cloves and germinated crop stand sown by garlic planter at farmer's field.

Manufacturer Address

M/s Khedut Agro Engineering
Plot no. 6, Survey No.191
Santidham Society Road, National highway 8-B, Dist.- Rajkot, Gujarat.
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Ta. Kotada Sangani, Dist. Rajkot (Gujarat)
Tel : +91-02827-253312
E-mail: khedut.agro@ymail.com; info@khedutagro.com
http://www.khedutagro.com

Annexure II

Farmers who adopted 17 row tractor operated garlic planter

S. No.	Name of Farmers	Address	District
1.	Manoj Kumar s/o Mohan Lal	Maraita, Khanpur	Jhalawar
2.	Tulsi Ram s/o Narsimh Lal	Maraita, Khanpur	Jhalawar
3.	Ram Niwas s/o Shiv Karan	Mundla, Khanpur	Jhalawar
4.	Mahaveer s/o Chittar Lal	Bad Guwalia, Khanpur	Jhalawar
5.	Ram Narain s/o Sita Ram	Kanwarpura, Khanpur	Jhalawar
6.	Suresh Kumar s/o Prabhu Lal	Thikaria, Khanpur	Jhalawar
7.	Satya Narayan s/o Kalu Lal Patidar	Deevyakhedi, Patan	Jhalawar
8.	Yugal Kishore s/o Ram Prasad	Deval kheda Jhalrapatan	Jhalawar
9.	Hemraj s/o Dev Kishan	Mahla, Atru	Baran
10.	Shambh Lal s/o Prakash Chandra	Bamla, Baran	Baran
11.	Champa Lal Suman s/o K L Mali	Nareda, Baran	Baran
12.	Koshal Nagar s/o R.L.Nagar	Bali, Atru	Baran
13.	Shanti Lal s/o K L Mahajan	Jalwara, Kishanganj	Baran
14.	Laxmi Lal Dhakar	Sukhwara, Bhadesar	Chittorgarh
15.	Devi Lal Janwa	Bhanuja, Badi Sadri	Chittorgarh
16.	Surendra Singh	Mohammedpura	Chittorgarh
17.	Kuldeep Singh	Koliyari, Jhadol	Udaipur
18.	Shanker Lal	Manna Kheda, Mavli	Udaipur
19.	Sugna Ram s/o Pola Ram	Falodi, Jodhpur	Jodhpur
20.	Bhanwar Lal	Mandya, Oosiya	Jodhpur