TRACTOR MOUNTED FODDER HARVESTER

A SUCCESS STORY

All India Coordinated Research Project on
FARM IMPLEMENTS AND MACHINERY
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Introduction

Mechanization of fodder cultivation system is of utmost importance for successful white revolution. The major fodder crops are oats, berseem, maize, sorghum, Bajra and Ginni grass. Except scythe, no harvesting equipment is in use for barseem. The available mowers are not used because once the crop is harvested, it has to be chopped again after collection. Since the crop with mower use does not fall in a windrow, labour requirement for collection in a mower becomes quite high. On the other hand mower cum chopper performs all the three jobs (i.e. to harvest, chop and filling a trialer).

Traditional Practices

For Barseem harvesting, mostly scythe is used which is arduous and time consuming. The mowers are not in practice due to separate requirement of chopping. In manual harvesting for maize, sorghum, bajra, oats, guinea grass, local sickles take 120-150 man-h/ha.

Salient Features of Machine

This machine, in a single operation, can harvest, chop and load the chopped fodders in the trailer attached to the machine. The machine consists of a rotary shaft mounted with blades (flails) to harvest the crop, auger for conveying the cut crop, cutters for chopping and conveying chopped fodder through outlet on to the trailer. The blades on the rotary shaft are staggered in 3 rows of 13 blades on each row on a horizontal axis perpendicular to the direction of motion. After the crop is cut, it is conveyed to the chopper by the auger. The chopping mechanism having 4 blades cuts the crops in to pieces and the chopped material is elevated to directly load a trailer. It can be operated by a 40 kW tractor.

Evolution / Design Process

Tall fodder crops upto 1500 mm could be successfully harvested with tractor mounted vertical conveying reaper. During late nineties, the flail type harvester cum chopper was designed to facilitate harvesting and chopping and loading operations simultaneously. Initially, the machine was evaluated at 540 rpm of 26 kW tractor but the machine operation was not satisfactory. Later machine was operated at 1000 rpm of tractor pto on departmental research farm for different fodder crops.

The field trials of machine were carried out at Dairy farm of PAU, Ludhiana and at farmers fields of Gajjam Majra village. For maize and Bajra the machine operation was good when the crop intensity was low. At full crop growth frequent choking was observed and safety pin frequently sheared off. Also it was observed that the power requirement of the machine was quite high as the cutting took place due to impact. The manoeuverability of the machine was also found to be very difficult. Modifications were incorporated by reduction in cutting width, increasing the capacity of auger and chopper casing and changing the machine hitching. During field trials and crop machine and operational parameters were recorded. For large scale popularization 100 ha area was harvested at farmer's fields.

Performance of machine

Bajra, sorghum, maize, barseem and oats with height 100 cm to 282 cm and stalk density 20-80 plants/m^2 were harvested successfully. The machine was operated at a speed of 2 km/h with a 40 kW tractor. The size of cut fodder varied from 4.8 to 10.6 cm with an average of 8.9 cm. The effective width of coverage varied from 1.12-1.26 m with average fuel consumption of 4.5 l/h. It was found that performance of machine was better and no choking was observed if dual clutch tractor is used. The operation of machine for 22 min filled one trailer with chopped fodder which indicated saving on cost of operation by 75% compared to traditional practice. It also harvested lodged and over matured crop without any difficulty. The cost of harvesting one trailer of fodder ranged between Rs 59-104. The field performance results are given in Table 1.

Table 1: Field performance of flail type mower cum chopper

Description	Readings					
	1	2	3	4	5	Avg.
Speed of operation, km/h	1.93	1.97	1.92	2.1	2.07	1.99
Working width, m	1.17	1.12	1.19	1.22	1.26	1.19
Field capacity, ha/h	0.19	0.2	0.19	0.17	0.21	0.2
Size of cut fodder, cm	7.6	4.8	8.2	10.4	10.6	8.94
Labour requirement	One person in addition to tractor driver					
Labour saving compared to traditional harvesting	90%					
Cost of operation, Rs/ha	1114					
Height of cut from ground level, cm	11	13	14	7.5	13	13.5
Time required to harvest trolly load of fodder, min	16	28	18	22	24	21.6
Stalk density, plants/m2	80	78	64	74	65	72.2
Crop height, cm	228	229	238	226	196	223.4

Status of Technology

The machine has been used for harvesting fodder in 100 ha. Three firms have commenced its manufacture to meat the demands of dairy farms of Punjab. The cost of the machine is Rs 70,000 and its cost of operation is Rs 1114/ha.

Appendix-I

Specifications of Flail Type Forage Harvester

Particulars	Dimensions
Machine type	Tractor driven trailed type
Overall machine dimensions, cm (lxwxh)	212 x 260 x 287
Power source	Tractor of 40 kW and above
Type of drive	pto 1000 rpm
Working width, cm	150
Rotor speed at full throttle, rpm	1118
Number of flail rows	3
Number of flails on each row	10, 11 and 11 (staggered)
Width of each flail, cm	5
Shape of flails	C-type
Type of mounting of flails	Hinged type
Number of choppers	4
Length of choppers, cm	33
Width of chopper, cm	5.5
Diameter of chopper casing, cm	85
Width of chopper casing, cm	17
Diameter of auger, cm	22
Length of auger, cm	129
Length of trough, cm	239
Machine weight, kg	670
Machine cost, Rs (approx.)	70000

Appendix-II

List of Manufacturers

1. M/s Sherpur Agro Industries
   GT Road, Focal Point, Sherpur
   Ludhiana (Punjab)

2. M/s Guru Nanak Agril. Implements
   GT Road, Near Pathankot Chowk,
   Jalandhar, Mansa (Punjab)

3. M/s Raj Works,
   Nakodar Road, Jalandhar (Punjab)