

# TRACTOR OPERATED PADDY STRAW CHOPPER CUM SPREADER

*A SUCCESS STORY*



*All India Coordinated Research Project on*  
**FARM IMPLEMENTS AND MACHINERY**  
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<p style="text-align: center;"><b>TRACTOR OPERATED PADDY STRAW CHOPPER CUM SPREADER</b></p>
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# TRACTOR OPERATED PADDY STRAW CHOPPER CUM SPREADER

## **Introduction**

Rice is one of the major crops of Punjab, occupying an area of 2.5 Mha. It is mostly combine harvested, and the straw left in the field is a major obstacle for subsequent farm operations. Incorporation of straw in the field requires 6-7 operations which involves high cost and is highly time consuming. Hence farmers resort to burning of the straw, which is not an environmentally benign operation and results in the loss of organic matter. PAU, Ludhiana centre developed a tractor operated straw chopper cum spreading machine in association with a manufacturer for effective straw management in the field. In a single operation, the stubbles left after combining are chopped in to tiny pieces and spread on the field.

## **Traditional Practices**

In Punjab, 78-80% area under rice is machine harvested and 19.6 million tonnes is disposed of by burning every year. For burning purpose, the farmers operate stubble shaver to spread the rice stubbles after combine harvesting of rice. The stubbles are burnt after 3-4 days. It causes atmospheric pollution with great loss of rich organic matter. The commonly used equipment (offset disc harrow, rotavator) are unable to work in straw laden field conditions. The expenditure of incorporation using these common equipment amounts to Rs 2,500/ha.

## **Salient Features of the Machine**

The machine consists of a rotary shaft mounted with blades known as flails to cut the straw and knives for chopping. The cut straw passes on to the chopping mechanism. The cutting unit has 38 flails mounted in 3-rows. The chopping mechanism has 660 mm diameter cylinder with 6-rows of serrated knives and 4 counter rows each having 22 knives fixed at the bottom. Each row on the cylinder has 23 knives and knives are spaced at 90 mm distance. The working width is 2280 mm. The straw is chopped to a size of 50 mm and spread in the field. The capacity of the machine is 4 ha/day and can be operated by a 33 kW tractor.

## **Evolution/Design process**

To solve the problem of paddy straw management in the field, PAU, Ludhiana centre of AICRP on FIM developed tractor operated rice straw chopper cum spreader in association with a manufacturer (M/s Dashmesh Mechanical Works, Amargadh). The machine operated with a 33 kW tractor chops the stubbles at a flail speed of 1000 rpm and chopper speed of 2000 rpm. Trials on the machine was conducted at the research farm of the department and at Lodhowal farm (PAU) under different paddy straw conditions. Field trials were carried out in 119 ha. The power requirement of modified machine was lower than the first prototype. The working width has been reduced to 1490 mm. Two more manufacturers (M/s KS Agriculture Works, Malerkotla and M/s Gurunanak Industries Corporation, Mansa) were involved in industrial promotion.

### Performance of the Machine

Trials on the machine was conducted at the research farm of the department and Lodhowal farm under different straw conditions to find its suitability for paddy straw management. The power requirement was lowered by reducing the working width. The chopper speed of 2000 rpm gave field capacity of 0.4-0.6 ha/h at about 2.5 km/h speed of operation. The fuel consumption and size of cut material were 5-5.5 l/h and 70-100 mm respectively. The field performance results of the machine are given in Table-1.

**Table-1: Field performance results of straw chopper cum spreader on rice straw**

Parameter	Observations
Variety	PR-114
Height of stubbles, mm	400-450
Moisture content of straw (wb), %	50-70
No. of hills/m <sup>2</sup>	30-35
Straw quantity, kg/m <sup>2</sup> (loose and standing)	0.87-1.25
Speed of operation, km/h	2.5-3.0
Field capacity, ha/h	0.4-0.6
Fuel consumption, l/h	5.0-5.5
Chopped straw size, mm	70-100
Flail speed, rpm	1000
Chopper speed, rpm	2000
Labour requirement, man-h/ha	1.25

After straw chopping, some choking problem was observed while using no till seed drill, strip till drill under different treatments. Traditional seed drill was found satisfactory after incorporating the chopped straw by disking twice and planking twice. Performance of the strip till drill was also found to be satisfactory providing desired depth of sowing and seed coverage.

In case of no till drill, choking problem was observed resulting in lower depth of sowing and seed coverage. One operation of rotavator after chopper operation and irrigation was found suitable for operation of strip till drill or no-till drill. The yield of wheat from trials conducted on the farmers fields was found at par with that from traditional practice of sowing. The results obtained with different treatments are given in Table-2.

**Table-2: Field results of wheat crop sown by using different methods of straw incorporation**

<b>Treatment</b>	<b>No. of plants/m<sup>2</sup></b>	<b>Average yield, kg/ha</b>	<b>Cost of operation, Rs/ha</b>
Chopper + rotavator + irrigation + STD	320-360 (337)	4500	1719
Chopper + rotavator + irrigation + NTD	300 - 357 (344)	4537	1452
Chopper + Single harrow + Irrigation + STD	340-376 (358)	4420	1191
Chopper + Single harrow + irrigation + NTD	330-405 (362)	4620	924
2 disc harrow + irrigation + 2 disc harrow + 2 cultivator + 1 Suhaga + Traditional drill	301-363 (325)	4470	3043

### **Status of Technology**

The equipment has been demonstrated in 119 ha through the active involvement of manufacturers. At farmers' fair the machine has been demonstrated to farmers and manufacturers. Since the incorporation of combine harvested rice straw checks the environmental pollution providing rich organic manure there is great acceptability of machine in the Ludhiana and surrounding districts. Three manufactures, M/s Dashmesh Mechanical Works, Amargadh, M/s KS Agriculture Works, Malerkotla and M/s Gurunanak Industries Corporation, Mansa have produced 200 units.

## Specifications of Machine

Machine type	Tractor operated trailed type
Overall dimensions (lxbxh), mm	2600 x 2500 x 980
No. of rows in harvesting unit	3
No. of flails	38
Working width, mm	1490
Cylinder size, mm	660
No. of rows of serrated knives on cylinder	6
No. of knives on each row of cylinder	23
Spacing between knives in each row, mm	90
No. of counter rows	4
Flail speed, rpm	1000
Chopper speed, rpm	2000
Power transmission	<ul style="list-style-type: none"> <li>i. From PTO to machine gear box through universal shaft</li> <li>ii. To the flail and chopping mechanism through belt and puddly from the shaft passing through the gear box</li> </ul>
Speed, km/h	2.5-3.0
Field capacity, ha/h	0.4-0.6
Size of chopped straw, mm	50
Power source	33 kW tractor
Cost, Rs	30,000/-

**List of Manufacturers**

1. M/s Dashmesh Mechanical Works,  
Nabha Molerkotal Road  
Amargadh, District : Sangurur (Punjab)
2. M/s KS Agriculture Works,  
Malerkotla (Punjab)
3. M/s Gurunanak Industries Sales Corporation,  
Near Tinkoni, Opposite BDO Office  
Mansa (Punjab)