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Assessment of seed cum fertilizer drill for wheat sowing after paddy harvesting

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Abstract

The study was conducted to assess the performance of tractor operated seed cum fertilizer drill for sowing of wheat after paddy harvesting. The field tests were conducted on sandy loam soil. The treatments were T1- Wheat sowing using broadcasting method T2-Wheat sowing using tractor operated seed cum fertilizer drill with seed rate of 100 kg/ha. Wheat sowing using seed cum fertilizer drill showed better results over farmers practice and recorded higher yield. The field capacity, depth of sowing and yield was found to be 0.67 ha/h, 4 cm and 12.10 q/ha, respectively compared to 0.50 ha/h, no depth and 6.13 q/ha observed in case of conventional broadcasting method. The mechanized method of sowing resulted in 50% more depth of sowing compared to broadcasting method. The tractor operated seed cum fertilizer drill was found to be better compared to traditional broadcasting method.

Keywords: Wheat sowing, broadcasting, seed cum fertilizer drill

Introduction

India is one of the main wheat producing and consuming country of the world. After the Green Revolution, the production of wheat has shown a huge increase. The major states involved Uttar Pradesh, Punjab and Haryana. They account for nearly 70 percent of the total wheat producton the country. Rice-wheat copping system is very common in India. It contributes to over 70 per cent of total food grain production of the country, with an area of 12 Mha under this cropping system. It is necessary that production of rice and wheat must keep pace with the growing population of our country. Delay sowing due to presence of crop residue reduced crop yield of 30-40 kg per ha per day (Baranwall, 1995 and Hobbs, 1988) if crop is sown after mid November. This loss can be saved through early and fast seeding of wheat using seed cum fertilizer drill compared to broadcasting method. Also the yield by conventional method is very much less than the potential.

Problem identified:

1. Low plant population in rabi crops due to broadcasting
2. Low grain yield of rabi crops
3. Lack of knowledge about tractor operated sowing equipments

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Considering the above points, feasibility testing of seed cum fertilizer drill was done at farmer's fields for three years (2009/2010/2011). The comparison was made between seed cum fertilizer drill and conventional method of sowing (broadcasting). Seed cum fertilizer drill not only conserves the time and energy, but also reduces the cost of cultivation, improves soil environment for better crop yield.

Materials and Methods

Laboratory Testing

The nine furrows tractor mounted seed cum fertilizer drill was tested in laboratory before taking to actual field conditions. AKW-381 variety of wheat was selected for the study. The seed were passed through the grooves of the fluted roller to check the regularity of flow and damage. The line to line spacing of seed cum fertilizer drill was adjusted at 20 cm. The machine was calibrated for 100 kg/ha normal conditions. The calibration for fertilizer per hectare was also done.

Calibration of seed cum fertilizer drill

The seed-drill was calibrated for wheat sowing using the metering mechanism. The seed-drill was placed on a level ground and jacked up to facilitate the rotation of ground drive wheel freely. Laboratory test was carried for ten revolution of ground drive wheel for each exposure length of fluted rollers. The following steps were followed for calibration of seed-cum fertilizer drill (Sahay, 1990).

1. Determine the nominal width (W)of drill

   W = MxS

   Where M is the number of furrow openers and S is the spacing between the openers in metre and W is in metre

2. Find the length of a strip (L) having nominal width W necessary to cover 1/25th of a hectare

   L = $\frac{10000}{W} X \frac{1}{25} = \frac{400}{W}$ metres

3. Determine the number of revolutions (N) the ground wheel has to make to cover the length of strip (L)

   Π x D x N = $\frac{10000}{W} X \frac{1}{25}$

   $= \frac{400}{\pi X D X W}$ rev/min

4. Jack up the drill so that the ground wheel turns freely. Make a mark on the drive wheel and a corresponding mark at a convenient place on the body of the drill to help in counting the revolutions of the drive wheel.

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5. Put the selected seed and fertilizer in the respective hoppers. Place a sack or a container under each boot for seeds and fertilizers.
6. Set the rate control adjustment for the seed and the fertilizer for maximum drilling. Mark this position on the control for reference.
7. Engage the clutch or on-off adjustment for the hoppers and rotate the drive wheel at the speed N

   $N = \frac{400}{\pi X\ D X W}$ rev/min
8. Weigh the quantity of seed and fertilizer dropped from each opener and record on the data sheet
9. Calculate the seed and fertilizer dropped in kg/ha and record on the data sheet.
10. Repeat the process by suitable adjusting the rate control till desired rate of seed and fertilizer drop is obtained.

Plate 1: Tractor operated seed cum fertilizer drill

The seed cum fertilizer drill was field evaluated in comparison to conventional system (broadcasting) for raising wheat crop during the Rabi season over an area of 0.20 ha at farmers field. The test conditions during the assessment of seed cum fertilizer drill are given in Table 1.

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Table 1: Test conditions during the assessment of seed cum fertilizer drill

Sr. No.	Particulars	2009-10	2010-11	2011-12
1.	Farming situation	Irrigated	Irrigated	Irrigated
2.	Location	Farmers field	Farmers field	Farmers field
3.	Type of soil	Sandy loam	Sandy loam	Sandy loam
4.	Field preparation	Ploughing and harrowing for breaking of stubbles of previous paddy crop	Ploughing and harrowing for breaking of stubbles of previous paddy crop g	Ploughing and harrowing for breaking of stubbles of previous paddy crop

Performance of technology with performance indicators

1. Field capacity
2. Depth of sowing
3. Population of established plant in unit area
4. Operating cost of machine, Rs/ha
5. Labour requirement, man-h/ha
6. Yield, q/ha
7. B:C ratio

Results and Discussion

Assessment of seed cum fertilizer drill for wheat sowing at Farmer's Fields

Seed cum fertilizer drill was field evaluated at farmers fields for raising wheat crop after paddy in comparison to conventional method of broadcasting. Depth of sowing of wheat seed using seed cum fertilizer drill was found be 4 cm. It was found that wheat seed was germinated uniformly without any gap using the seed cum fertilizer drill. Data related to machine performance, crop growth and yield are presented in Table 2.

The field capacity by conventional method was found be 0.50 ha/h whereas by tractor operated seed cum fertilizer drill, it was found be 0.67 ha/h. The depth of sowing of seed by seed cum fertilizer drill was found to be 4 cm compared to broadcasting method in which seed remains on top surface of the soil. Labour requirement for sowing of wheat was much less compared to broadcasting method. The plant population in unit area was much more by seed cum fertilizer drill compared to broadcasting

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method. Maximum yield was found to be 12.10 q/ha by seed cum fertilizer drill compared to 6.13 q/ha by conventional broadcasting method. The farmers reported saving in time of sowing as well as in cost of cultivation as the expenditure incurring on field preparation was saved to some extent. There was saving of 50-75 kg/ha seed @150-175 kg ha while seed cum fertilizer drill machine needed only 100 kg seed/ha. Sowing by seed cum fertilizer drill requires less time and gives more yield compared to broadcasting but harrowing is necessary since stubbles of previous crop cause problems during sowing

The average grain yield received with seed cum fertilizer drill machine was about 12.10 q/ha which was higher than convectional system in which it was about 6.13 q/ha. Thus, the farmers appreciated the machine and are ready to accept the technology. They wanted to use the machine for large area seeding. The performance evaluation of 9 rows seed cum fertilizer drill was conducted by rising of wheat crop in field during rabi season. Wheat sowing using tractor operated seed cum fertilizer drill requires less time and gives more yield compared to traditional method of broadcasting of seed but harrowing is necessary before sowing of wheat using seed cum fertilizer drill since stubbles of previous crop cause problems during wheat sowing.

Table 2: Field performance of tractor operated seed cum fertilizer drill for sowing of wheat directly after harvesting of paddy crop

Parameters of assessment	**2009-10**		**2010-11**		**2011-12**	
	Farmers practice/ Broadcasting	Sowing of wheat using seed cum fertilizer drill	Farmers practice/Broadcasting	Sowing of wheat using seed cum fertilizer drill	Farmers practice/ Broadcasting	Sowing of wheat using seed cum fertilizer drill
Field capacity, ha/h	0.50	0.63	0.50	0.63	0.50	0.67
Depth of sowing, cm	-	4.0	-	4.0	-	4.0
Population of established plant in unit area	85	144	80	145	87	144
Operating cost of machine, Rs/ha	180	498	180	498	180	498
Labour requirement, man-h/ha	8.0	1.5	8.0	1.5	8.0	1.5
Yield, q/ha	6.0	12.4	5.9	12.1	6.5	11.8

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Technology Assessed	*Production per unit	Net Return (Profit) in Rs. / unit	BC Ratio
T1- Farmers Practice-Seed sowing in dry soil with broadcast method and seed rate 100 kg/ha.	8.0 q/ha	2038	1.46
T2- Recommended practice –Sowing of wheat using tractor operated seed cum fertilizer drill seed rate 40 kg/ha	16.4 q/ha	8798	2.50

The performance of the drill was found more satisfactory in field after harvesting of paddy.

Conclusion

It can be concluded that tractor operated seed cum fertilizer drill can be acceptable machine for the farmers for sowing of wheat after paddy harvesting since it gives higher yield compared to traditional broadcasting method.

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