INTERNATIONAL JOURNAL OF SCIENCE AND NATURE

www.scienceandnature.org

IMPACT OF SEED CUM FERTI-DRILL FOR WHEAT SOWING AFTER PADDY HARVESTING IN MUZAFFARNAGAR DISTRICT, UTTAR PRADESH

Singh, P.K., Pramod Kumar, Shiv Kumar and Shripal
Krishi Vigyan Kendra, Baghra, Muzaffarmagar (U.P), Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut, U.P. (250 110)
Corresponding author-drpramodsoil@gmail.com

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 clay 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 0.66 ha/h, 7 cm and 50.58 q/ha, respectively compared to 0.45 ha/h, no depth and 43.06 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% of the total wheat production the country. Rice wheat cropping system is very common in India. It contributes to over 70% of total food grain production of the country, with an area of 12 million ha under this cropping system. It is necessary that production of rice and wheat must keep pace with the growing population of our country. Delayed 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. The selections of suitable sowing methods play an important role in the placement of seed at proper depth, which ensures better emergence and subsequent crop growth. Wheat is planted with different sowing methods depending upon the availability of soil water, time of planting, amount of residue in the field and availability of planting machine. In India, wheat is sown through broadcasting on a large area after rice harvesting. Broadcasting not only requires higher seed rate but also results in lower plant population.

Drill sowing is recommended method because of its uniform seed distribution at desired depth, which usually results in higher germination and uniforms stand. Due to better crop stand establishments, wheat grain yield was significantly affected by the different sowing methods including broadcast and line sowing methods (Singh and Singh, 1992; Galichenko, 1994; Singh *et al*., 1994a; Singh *et al*., 1994b).

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.
4. High cost of cultivation.

Considering the above points, feasibility testing of seed cum fertilizer drill was done at farmer's fields for six years (2011-12, 2012-13, 2013-14, 2014-15, 2015-16 and 2016-17). 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 & METHODS

Seed cum ferti-drill cultivation of wheat reduces the number of field operation from an average of three to one over conventional wheat cultivation. The conventional tillage (CT) refers to the intensive tillage with multiple passes of a tractor to accomplish land preparation for wheat sowing. Farmers of Muzaffarnagar (U.P) are rapidly adopting seed drill for wheat cultivation. For these study two NICRA villages namely, Shahdabber and Rasoolpur Jatan were selected having large area under seed drill. A total of 234 farmers from 100 ha area who adopted seed drill technology for wheat production selected randomly in six year. From the same villages, an equal number of farmers practicing conventional tillage method were selected. The characteristics and socio economics condition of both types of the households were almost similar. The primary data were collected during the year 2011-12, 2012-13, 2013-14, 2014-15, 2015-16 and 2016-17 from 234 farmers. The On Farm testing experiments were conducted during six consecutive Rabi season of

2011-12, 2012-13, 2013-14, 2014-15, 2015-16 and 2016-17 at two NICRA village (Shahdabber and Rasoolpur Jatan) of District Muzaffarnagar and laid out in large plots with two replications as villages. The plot size adopted was 200 square meter area.

All input and output parameters pertaining to wheat production were based on average value of six year with a view to minimize seasonal fluctuations in the variables. The modern cost concept was considered for the estimation of cost of wheat production. The cost was taken into account in this study to calculate net income and benefit cost ratio. The cost include all directly expenses paid in cash and kind for crop production such as hired human labour, seeds, fertilizers, irrigation, plant protection measure, overhead charges and imputed value of family labour. The overhead charge include land revenue paid to the state government, interest on working capital and fixed capital and charge paid for repairs, maintenance and depreciation of fixed assets (Central Statistical Organization, 2008).

The cost of irrigation was calculated by multiplying the time required to irrigate the field with cost of electricity or diesel consumption per hour. The cost of electricity was taken based on per unit rate fixed by the Uttar Pradesh electrical cooperation limited. The cost on human labour, skill labour and diesel were taken on actual expenditure basis. Gross income included the total value of main crop and by- product. Net income was calculated as the difference between gross income and cost of production. It is expected that the practice of seed drill technology will result in changes in input-use pattern, which in turn will affect the land productivity. Hence, increase in land productivity in wheat is not only due to adoption of seed drill method but also due to the changes in use factors in production.

Laboratory Testing

The seven furrows tractor mounted seed cum fertilizer drill was tested in laboratory before taking to actual field conditions. Different variety i.e. PBW-550, PBW-559, DBW-17, DBW-90, HD+2967, HD-3086 and WH-1105 of wheat was selected for the study. The seed werepassed 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 wasplaced 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 = M x S

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

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

L = 10000

$$L = \frac{10000}{W} \times \frac{1}{25} - \frac{400}{w} \text{ meters}$$

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

$$\Pi \times D \times N = \frac{10000}{W} \times \frac{1}{25}$$

$$\frac{400}{\Pi \times D \times W} \text{rev/min}$$

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.
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

$$N = \frac{400}{\Pi \times D \times W} \text{rev/min}$$

8. Weigh the quantity of seed and fertilizer dropped from each opener and record on the datasheet
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.

FIGURE 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 0.40 ha at farmer's field. The test conditions during the assessment of seed cum fertilizer drill are given in Table 1.
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 & DISCUSSION

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

Field capacity (ha/ha)

Seed cum ferti- 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 7 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 six Rabi season average field capacity by conventional method was found be 0.45 ha/h whereas by tractor operated seed cum fertilizer drill, it was found be 0.66 ha/h. The depth of sowing of seed by seed cum fertilizer drill was found to be 7 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. Similar result was reposted by Murumkar *et al*. (2015)

Plant population

The plant population in unit area was much more by seed cum ferti-drill compared to broadcasting method. The maximum plant population was found to be 150 in rabi-2016-17 while minimum plant population 135 in rabi-2011-12 and average plant population 142 by seed cum fertilizer drill compared to maximum plant population 82 in rabi 2013-14 whereas minimum plant population 78 in 2015-16 and average plant population 81.83 by conventional broadcasting method. Similar result was reposted by Abbas *et al*, (2009).

Yield (q/ha)

The average grain yield obtained with seed cum fertilizer drill machine was about 50.58q/ha which was higher than convectional system in which it was about 43.06 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 7 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. The performance of the drill was found more satisfactory in field after harvesting of paddy.
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 25 kg/ha seed @125-150 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. Similar result was reposted by Sikander *et al*. (2003)

CONCLUSION

It can be concluded that tractor operated seed cum ferti-drill can be acceptable machine for the farmers for sowing of wheat after paddy harvesting since it give maximum plant population, less requirement of labour, reduce cost of cultivation and higher yield compared to traditional broadcasting methods

REFERENCES

Barabwal, S.P. (1995) Fertilizer management in Zero till planted wheat. *Thesis, M.Sc. Ag. (Agronomy). G.B. pant University of Agriculture & Technology, Pantnagar, 78p.*

Galichenko, I.I. (1994) which sowing method is best for winter crops. *Zemledelie, pp23-24*

Singh, R.A. and Singh, R.G. (1992*)* The effects of tillage and plating methods on growth, weed population and yield of semi-dwarf wheat (*Tritticum aestivum* L.). *Libyan J. Agric., (6)55-67*

Singh, G., Singh, O.P., Yadav, R.A., Singh, R.S. and Singh, B.B. (1994a) Effect of seeding methods, seed rates and fertility levels on yield and economics of late sown wheat after rice in flood prone area. Ann. Agrcil. Res., (15): 448-451.

Singh, G., Singh, O.P., Yadav, R.A., Singh, R.S. and Singh, B.B., Singh, G. (1994b). Ann. Agrcil. Res., (15): 506-508

Murumkar, R.P., Usha, R., Dongarwar, D.S., Phad, D.S. Pisalkar, P.S. (2015) Assessment of seed cum fertilizer drill for wheat sowing after paddy harvest. *International Journal of Innovative Science, Engineering & Technology, 2(6), 760-765.*

Abbas, G., Ali, M.A., Abbas, G., Azam, M. and Hussain, I. (2009) Impact of planting methods on wheat grain yield and yield contributing parameters. The Journal of Animal and Plant Science, 19(1) pp-30-33.

Sikander, Tanveer, K., Hussain Imtiaz, M. Sohail, N.A. Kissana and Abbas, S.G. (2003) Effect of different planting methods on yield components of wheat. Asian Journal of plant Sicence, 2(10) pp-811-813.

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

S. No	Particulars	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17
1.	Farming situation	Irrigated	Irrigated	Irrigated	Irrigated	Irrigated	Irrigated
2.	Location	Farmers field	Farmers field	Farmers field	Farmers field	Farmers field	Farmers field
3.	Type of soil	Clay loam	Clay loam	Clay loam	Clay loam	Clay loam	Clay loam
4.	Field preparation	Ploughing and harrowing for breaks of stubbles of previous crop	Ploughing and harrowing for breaks of stubbles of previous crop	Ploughing and harrowing for breaks of stubbles of previous crop	Ploughing and harrowing for breaks of stubbles of previous crop	Ploughing and harrowing for breaks of stubbles of previous crop	Ploughing and harrowing for breaks of stubbles of previous crop

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

S. No	Parameter of assessment	2011-12		2012-13		2013-14		2014-15		2015-16		2016-17		Average
		Demo	FF	Demo	FF	Demo	FF	Demo	FF	Demo	FF	Demo	FF	
1.	Field capacity (ha/ha)	0.65	0.45	0.66	0.45	0.65	0.45	0.69	0.45	0.65	0.45	0.67	0.45	0.66/0.45
2.	Depth of sowing (cm)	7.0	--	7.0	--	7.0	--	7.0	--	7.0	--	7.0	--	7.0
3.	Population of established	135	82	138	82	140	85	144	81	145	78	150	83	142/81.83
4.	Operating cost of machine, Rs/ha	515	350	525	350	525	350	535	350	510	350	530	350	523.33/350
5.	Labour requirement, man –h/ha	2.0	6.0	2.0	6.0	2.0	6.0	2.0	6.0	2.0	6.0	2.0	6.0	6.0/2.0
6.	Yield q/ha	56.00	47.00	54.00	45.00	48.03	38.88	48.75	41.25	48.00	44.00	48.75	42.25	50.58/43.06

Table.3:-

Technology assessed	Year	Production q/ha	Net return in Rs/ha	B: C ration
T_1- Farmers Practice- Seed sowing in wet soil with broadcasting methods and seed rate 125 kg/ha	2011-12	47.00	34625.00	1.20
	2012-13	45.00	37675.00	1.17
	2013-14	38.88	51122.00	2.27
	2014-15	41.25	41362.00	1.25
	2015-16	44.00	43940.00	1.39
	2016-17	42.25	47130.00	1.19
T_2- Demonstration at farmers field - **S**owing of wheat using tractor operated seed cum ferti-drill, seed rate 100 kg/ha	2011-12	56.00	46750.00	1.05
	2012-13	54.00	48125.00	1.03
	2013-14	48.03	66014.60	1.97
	2014-15	48.75	52052.00	1.10
	2015-16	48.00	59780.00	1.08
	2016-17	48.75	57015.00	1.36