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Impact of Sowing through Zero-till Ferti Seed Drill for Paddy-wheat Cropping Pattern in Etawah District of Uttar Pradesh, India

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ABSTRACT

Zero tillage technology through wheat sowing is a special technique of establishing new crop without tillage and seedbed preparation. Wheat crop can be sown 10-15 days early as compared to conventional method of sowing. Paddy-wheat cropping system is the pre-dominant and most profitable cropping system and emerges as the major cropping system in the indo-gangetic plains leading to the Green Revolution. Punjab, Haryana, Western Uttar Pradesh. The impact of zero-till ferti seed drill, was carried out in an area of 36.3 ha at former's fields of different three blocks, Jaswantnager, Basrahar and Barhpura of Etawah district by stratified multi stage random sampling design. Zero tillage implies planting crops in previously unprepared soil. It is also known as zero till, No tillage, direct seeding. This ancient practice continuous to be followed by formers in developing countries. The zero tillage technique also improved the soil environment for crop growth, reduces erosion, conserve time, energy and decrease the cost of farming. Finally, the adaption of zero tillage technology improves farmer's profit and eventually contributes towards reducing poverty and keeping environment clean. However, the long term impact of this technology on food production, natural resources and linkages with poverty alleviation should be further explored.

KEYWORDS: *Zero tillage, paddy-wheat cropping*

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INTRODUCTION

Rice wheat cropping system is very common in India. The speedy development of agriculture is vital for the progress of country and to secure maximum crop production, the best use of the available land has to be made and the latest method of crop husbandry put into practice, there is an increase in the yield with zero tillage and is superior over conventional method of sowing because more net returns were recorded an eco- friendly practice (Nagarajan *et al.,* 2002). Delay sowing due to presence of crop residue reduced crop yield of 30-40 kg per ha per day (Beranwal 1995 and Hobbs 1988) if the crop is sown after mid November. This loss can be saved through early seeding of wheat by zero tillage technique. This technique advances the sowing operation by 10-15 days and also reduces the cost of production by saving energy.

The reason for promotion of zero tillage was on the grounds to reduce cost of production and to avoid delay in planting (Ali *et al.* 2010, Irfaq *et al.* 2005 and Grover *et al.* 2011.) Despite advantages and many year extension, the adoption of zero tillage is limited (Farroq and Sidhique; 2015) due to the constraints like unavailability of seed drill (Tripathy *et al*.2013); extension coverage (Krishna et al.2012) and other field of problems. The line to line spacing of zero-till drill was adjusted at 20cm. The machine was calibrated for 100kg/ha normal condition. The calibrations for fertilizer 100 kg DAP, 20kg sulphur, per hectare was also done.

Material and Methods

The study was carried out in three blocks of Etawah District and stratified multistage random sampling design was adapted for collection of data to impact of zero-till ferti-seed drill for paddy wheat cropping system.

Table1: Mechanization index of Etawah blocks & selected Village.

Sl. No.	Name of Blocks	Mechanization Index & Village	
1	Mahewa	816.55	
2	Jaswantnagar*	783.05	Sishat, Kaist, and pathakpura
3	Bharthana	673.10	
4	Basrehar*	519.60	Pachawali, Itgaon,and Nagla Hiralal
5	Takha	397.20	
6	Chakar Nagar	309.20	
7	Barpura*	273.85	Butar,Saraiaser and Alampura,
8	Saifai	241.67	

On the basis of Mechanization index the block of district were enlisted in descending order. One block was selected randomly from blocks having mechanization index less than average index value and one block was selected randomly having mechanization index nearest to the average index value. Thus, three blocks were chosen for the survey. Now from each selected block three villages were randomly selected and one hundred eight farmers were selected from nine village. For achieving the objectives of the study, the required data were collected through personal interview method with the help of a structured and pre tested schedule. The detailed data related to the size of holding, general information of farmers and area under paddy-wheat cropping system.

The frame of the zero till drill is the size of 185cm x 60cm it is made of two mild steel angle irons (6.5cm x 6.5cm x 0.5cm) welded together to provide the desired strength and rigidity. This is drill of 9 tyne or 11 tyne the machine can be easily be drown with the help of any 35 HP tractor. The height of the machine ranges from 110 cm to 145 cm and weight around 250 kg to 260 kg and even up to 30 kg in same models. The zero till seed cum fertilizer drill has T-type slit openers. This T-type slit openers when attached to a time open a narrow slit 3.5 cm wide, spacing between two furrow openers was 22.5cm having nine furrows. The seed and fertilizer box of existing zero till ferti seed drill was made by using mild Steel sheet. The capacity of seed and fertilizer boxes was 50kg and 50kg. The slope provided in seed and fertilizer boxes were about 23 to 28 degree and 62 degree, respectively. The seed metering device used in drill was fluted roller type, star type agitators were provided in the fertilizer box to avoid bridging of fertilizer. The zero till ferti seed drill was use for raising wheat crop during the *rabi* season over an area of 36.3 ha at formers field. The average height of paddy stubbles was 5.03 cm and average moisture content and bulk density of soil were 17.25% and 1.62 g/cm3, respectively. In the first phase out of the total eight blocks of Etawah district stratified multistage random sampling design was adapted for collection of data to assess the impact of zero till ferti seed drill for paddy-wheat cropping system in three blocks (one from each higher, average and lower mechanization Index group).

A comprehensive questionnaire was developed for the collection of data regarding the production technology of wheat crop in the study area. The questionnaire was pre- tested before actually conducting the interview of the sample respondent. The data was collected for the season *i.e., rabi* (2017).

Results and Discussion

Field Characteristics - Average field size of the sample farmers was 36.3 ha. About 92 percent of the cultivated area (33.3 ha) was allocated to wheat crop an average about 41.4 percent of the wheat area was being cultivated with zero tillage technology, while the remaining was sown under conventional method.

Impact of zero tillage - The respondent were asked about the affect of zero tillage on different parameters.

Seed germination - Almost 92 percent of the farmers were viewed that wheat seed sown through zero tillage technology gave early and good germination while only 7 percent responded for late and poor germination.

Tillering - About 65 percent farmers of the study area briefed that zero tilled wheat plant gave more number of tillers per plant as compared to the conventionally sown wheat. While 22 percent supported decrease in tillering. Almost 13 percent of the respondents told that there was no significant difference.

Crop stand - More than 83 percent of the farmers responded that zero tillage gave uniform crop stand as compared to 14 percent who claimed that crop stand was some what patchy. There were only few cases (3 percent) who told that it was very patchy under zero tillage.

Soil health - About 77 percent farmers reported that no significant impact on soil fertility. While 23 percent reported soil fertility. Majority of the sample respondent ((84 percent) told that it did not have any effect on the soils with respect to soil salinity, while 100 percent of the farmers described that it decreases soil erosion. More than 74 percent claimed that soil become compact with the use of zero tillage technology.

Plant protection - The effect of zero tillage technology with respect to different plant protection factors, weeds, disease, insect population, were also asked. About 38 percent respondent told that weeds infestation increased in the zero tilled wheat fields against 25 percent who said that weeds population decreased while 37 percent told that zero tillage did not have any effect on weeds population .There were no significant effect on disease and insect population as reported by 94 and 91 percent farmers, respectively. Khan *et al*. (2002) have reported that in zero tilled fields there were less than 60% weeds as compared to conventional tillage.

Sowing time - The sowing time was same under both conventional and zero tillage technology which leads towards. It can be concluded that sowing time was not the factor for using the zero tillage technology but it was being applied under the need and desire of the farmers of the area.

Seed rate - seed rate was 100kg/ha in zero tillage technology.

Fertilizer use efficiency - Fertilizer use efficiency indicate that how efficient the fertilizer has been used for crop production. It is measured as the ratio of fertilizer applied and crop yield. Fertilizer use efficiency (18.2kg of wheat/kg of NPK) was more in conventional method of wheat sowing as compared to zero tillage wheat sown(16.8kg of wheat/kg of NPK).

Water use efficiency - Water use efficiency was measured as the ratio of water applied and crop yield. Water use efficiency was 503.10 kg of wheat per ha.inch of water in case of zero tillage and 442.87 kg of wheat per hectare inch of water under conventional method.

Crop yield - The survey result have shown that under zero tillage the average yield was 28.95q/ha, whereas it was 29.85q /ha.in case of conventional method. Effect of tillage system on weed biomass that mean weeds biomass at 35-40 days after transplanting under no tillage was 1.6 t/ha compared to 0.5t/ha under conventional tillage in rice crop.

Economics analysis - Under economics analysis cost of cultivation, net benefits, benefit cost ratio and net margin have been analyzed. Benefic cost ratio based on gross value of zero tillage as compared to conventional method of wheat sowing is slightly lower. Economic analysis showed that zero tillage method was more profitable as compared to the conventional method.

The result suggested that the production function for zero tillage of wheat would start at a lower intercept. The resulted higher yield is due to the enhanced water and fertilizer use efficiently and the yield losses saved due to improvement in sowing time because of the use of zero tillage technology. In addition considerable amount of cost will be saved due to the minimum tillage requirement of the technology and certain other beneficial externalities associated with its use.

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