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Ramesh Kumar
SMS (Agrill. Extn.) KVK, Ambala, Village Tepla, Post Saha, Ambala, Haryana, India

AK Godara
Professor & Head, Department of Extension Education, CCSHAU, Hisar, Haryana, India

Naveen Saini
Subject Matter Specialist (Animal Science), Krishi Vigyan Kendra, Ambala, Haryana, India

Dalip Kumar Bishnoi
Assistant Scientist, Department of Agricultural Economics, CCSHAU, Hisar, Haryana, India

Nirmal Kumar
Assistant Scientist, Department of Agricultural Economics, CCSHAU, Hisar, Haryana, India

Corresponding Author
Ramesh Kumar
SMS (Agrill. Extn.) KVK, Ambala, Village Tepla, Post Saha, Ambala, Haryana, India

Adoption extent of farmers about zero tillage seed drill technology in Haryana

Ramesh Kumar, AK Godara, Naveen Saini, Dalip Kumar Bishnoi and Nirmal Kumar

Abstract
The study was conducted in Ambala and Kurukshetra districts of Haryana during 2020 and 2021, to determine the adoption status of zero tillage technology. One hundred sixty farmers from eight villages of these districts were chosen randomly. Empirical data was obtained using a well-structured and pre-tested interview schedule and analysed using appropriate statistical procedures utilising the Statistical Package for Social Sciences 26th version (SPSS). According to the findings, more than one-third of the respondents (36.87%) belonged to medium level of adoption closely followed by low level (35.00%) adoption of ZT technology, Further analysed that the majority of them (71.87%) adopted ZT at low to medium degree. Personal attributes like education, land holding, farm equipment availability, mass media exposure, extension contact, economic motivation, risk orientation, and innovativeness all showed a positive and significant association with adoption level of ZT technology at the 0.05 level of probability. While education, land holding, farm power mass media exposure, extension contact and training received on RCT, were significantly contributed towards adoption of zero tillagetechnology.

Keywords: farmers about, zero tillage, drill technology, RCT

1. Introduction
Agriculture nowadays is merely a race to make a profit while dodging productivity and ecosystem challenges, since it exploits natural resources in a way that makes agriculture unsustainable. As a result, an environmentally friendly agricultural method based on resource conservation technology is critically needed. So the conservation agriculture (CA) has become crucial for the future productivity gains to ensure that all the people have physical and economic access to sufficient, safe and nutritious food that meets their dietary and food preferences for an active life (FAO, 2017) [2]. It primarily focusses on resource savings through minimal tillage, ensuring soil nutrients and moisture conservation through crop residues and growth of cover crops and adoption of spatial and temporal crop sequencing. Whereas, it is being currently practiced in about 125 million hectares worldwide including USA (26.50 mha), Brazil (25.50 mha) and Argentina (25.50 mha). However, in India, the practice has been gaining its momentum and covers about 1.5 mha (Jat *et al.*, 2012) [3]. However, SAUs, ICAR institutions, and other extension functionaries are making significant efforts to popularise and increase the adoption of RCTs. As a result, the current study was conducted to determine the status of farmers' adoption of Zero Tillage Technology, which is one of the most essential resource conservation technologies.
Wheat (*Triticum aestivum* L.) is a crop of universal importance. In the widespread rice–wheat system of north-west (NW) India, harvesting is done by large combines and the rice stubbles are usually burnt after harvest, followed by irrigation and preparatory tillage prior to sowing wheat. While in-field remains of crop residues can play an important role in replenishing soil quality and decreasing environmental pollution from stubble burning. To fulfill this need, sowing of wheat through zero tillage and happy seeder is need of hours.
The Zero tillage is an intense form of minimum tillage. It is also known as no till cultivation, direct tillageing etc. Zero tillage is a technique of rising crops or pasture from year to year without disturbing the soil with tillage. In Haryana, a lot of farmers cultivate late-maturing, fine-grained basmati varieties of rice, causing late sowing of wheat. The delay of every succeeding day in planting ahead of November third week decreases the grain yield gradually (Ali *et al.*2010) [1]. For that reason, to avoid delay in planting and reducing the cost of cultivation, farmers have started adopting resource conserving techniques such as zero tillage and surface seeding in wheat cultivation.

2. Material and Methods

2.1. Research design and collection of data

During the years 2020-21, the current study was conducted in the Indian state of Haryana. Ambala and Kurukshetra were chosen at random as the two districts. Two villages were chosen from each selected block, namely Gadouli and Ganouli from Narayangarh block and Balana and Anandpur Jalbera from Ambala I block from Ambala district. Similarily, Shahabad and Ismailabad blocks were selected from Kurukshetra district, Raipur and Rai Majra village from Shahabad block; Thol and Mandheri from Ismailabad block were selected from Kurukshetra district. From each selected village, 20 farmers were selected through simple random sampling technique. As a result, a total of 160 farmers were interviewed for the research. The primary data was collected using an ex-post facto research design, in which respondents were chosen via multistage sampling. Face-to-face interviews were conducted with respondents utilising a well-structured and pre-tested interview schedule created specifically for this purpose.

2.2. Measurement of Variables

Farmers' responses to 11 practises were collected on a three-point continuum scale of fully adopted, partially adopted, and no adoption, with weightings of 3, 2, and 1 for each practise, respectively, to determine their adoption level. The total weighted score for each practise was calculated independently, and total weighted score and weighted mean score were constructed using the results. Respondents were classed as low (up to 18), medium (19-25), or high (26-32) in terms of their overall use of zero tillage technology based on an equidistant technique of computing categories.

2.3. Analysis of data

To compute frequency, percentage, mean, coefficient of correlation, and multipal regression analysis, data were tabulated and analysed using relevant statistical tools such as the 26th version of the Statistical Package for Social Sciences (SPSS) and OPSTATE. They provide an overview of the influence of a variety of personality traits on farmers' adoption of zero-tillage technology.

3. Results and Discussion

The study's findings are presented and analysed under the following main headings and subheadings:

3.1. Farmers Adoption level of zero tillage seed drill technology

Table 1. indicates that the field was laser leveled, equal and proper spacing between tynes and adjustment of depth control wheels for seed depth, highest adoption level with WMS2.39, ranked Ist, followed by paddy harvesting manually (Basmati) or by SMS combine WMS 2.29 and adequate moisture in field while sowing, WMS 2.04 ranked IV and V, respectively. While, low adopted by spreading residue uniformly after sowing as mulch WMS 1.49 and drilling in Single pass WMS 1.30 ranked X and XI, respectively.

Table 1: Farmers' adoption level of zero tillage seed drill technology

(n=160)

Sl. No.	Practices	Fully adopted	Partial adopted	No adoption	Total weighted score	Weighted mean score	Rank order
1.	The field was laser leveled	103(64.40)	16(10.00)	41(25.60)	382	2.39	I
2.	Paddy harvesting manually (Basmati) or by SMS combine	84(52.50)	38(23.80)	38(23.80)	366	2.29	IV
3.	Put the loose residue aside before drilling	9(5.60)	72(45.00)	79(49.40)	250	1.56	VII
4.	Spreading residue uniformly after sowing as mulch	4(2.50)	71(44.40)	85(53.10)	239	1.49	X
5.	Equal and proper spacing between tynes	101(63.10)	21(13.10)	38(23.80)	383	2.39	I
6.	Calibrated the drill	22(13.80)	71(44.40)	67(41.90)	275	1.72	V
7.	Adjustment of depth control wheels for seed depth	100(62.50)	22(13.80)	38(23.80)	382	2.39	I
8.	Drilling after dew dries	48(30.00)	47(29.40)	65(40.60)	303	1.89	VII
9.	Adequate moisture in field while sowing	84(52.50)	37(23.10)	39(24.30)	326	2.04	VI
10.	Balanced the machine before drilling	43(26.90)	58(36.30)	59(36.90)	245	1.53	IX
11.	Drilling in Single pass	10(6.30)	89(55.60)	61(38.10)	208	1.30	XI

Figures in the parenthesis represent the percentage

3.2. Farmers' overall Adoption of zero tillage seed drill technology

Data related to overall Adoption level of zero tillage seed drill technology are revealed in Table 2. presents that 36.87 percent of farmers belonged to medium level of adoption followed by low level (35.00%) and high (28.13%) level of adoption. Further analysis of data reveals that majority of the respondents (71.87%) possessed 'low' to 'medium' level of adoption of zero tillage seed drill technology, it means that respondents had not followed the full package of practices recommended by the SAUs. It could be the chance of lack of proper technical know-how, lack of availability of ZT drill when needed and may be due to laborious task for residue handling for smooth functioning of ZT drill but as It is gaining importance and becoming popular gradually in nowadays among farmers and it was also observed that they were interested to know all about of this as it is time and cost-saving technology. So the adoption rate can be enhanced by the providing of technical knowledge and proper hands-on training including methods demonstrations on ZT operation and proper managing and use of paddy residues before ZT applying. The study gets support from Singh *et al.* (2012) [5] and Singh *et al.* (2017) [4].

Table 2: Farmers' overall Adoption of zero tillage seed drill technology

(n=160)

Sl. No.	Adoption level	Adoption score	Frequency	Percentage
1.	Low	Up to 18	56	35.00
2.	Medium	19-25	59	36.87
3.	High	26-32	45	28.13

3.3. Relationship between farmers' adoption level of zero tillage with their personality traits

Table 3 advocates that correlation coefficient between the farmer's personality traits like education, availability of farm equipment's, mass media exposure and extension contact, had positive significant at 0.05 level of probability and land holding, farm power, economic motivation, training received (RCT), risk orientation and innovativeness were found to be highly significant at 0.01 level of probability. However, remaining traits namely age, farming system were found to be non- significant association with the adoption towards of zero tillagetechnology.

While in case of the regression coefficient, education, land holding, farm power mass media exposure extension contact and training received on RCT, were found to be significant at 0.05 level of probability, whereas, remaining personality traits did not significantly contribute towards adoption of zero tillage technology.

Table 3: Relationship between farmers' adoption level of zero tillage with their personality traits

(n=160)

Sl. No.	Variable	Correlation Coefficient	Regression Coefficient	't' value
1.	Age	0.098	0.037	0.691
2.	Education	0.182*	1.749*	2.297
3.	Land Holding	0.206**	1.750*	1.961
4.	Farm Power	0.214**	1.790*	1.716
5.	Availability of Farm Equipment	0.189*	0.066	0.204
6.	Mass Media Exposure	0.190*	1.761*	2.236
7.	Faming System	0.000	0.970	1.263
8.	Extension Contact	0.179*	1.749*	2.131
9.	Economic Motivation	0.288**	0.379	0.744
10.	Training Received (RCT)	0.285**	1.723*	2.065
11.	Risk Orientation	0.330**	0.833	1.838
12.	Innovativeness	0.245**	0.026	0.087

Dependent variable- knowledge

*Significant at 0.05 levels **Significant at 0.01 levels

R^2=0.56

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