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Knowledge of adopter and non-adopter farmers regarding super seeder for crop residue management

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Abstract

The agriculture ecosystem has observed a transformative shift with the introduction of advanced technologies for sustainability and one such innovation making like a wave is Super Seeder. Keeping in mind the environment sustainability through the agricultural technologies and knowledge of farmers, a study was conducted in Karnal district of Haryana state among 80 adopter and non- adopter farmers of Super seeder. Results revealed that one fourth of the respondents had low level of knowledge, while 45.00 percent of the respondents had medium level of knowledge and rest (30.00%) of the respondents demonstrated high level of knowledge regarding super seeder technology. Age, education, subsidiary occupation, size of landholdings, annual income, social participation, mass media exposure and socio-economic status were significantly associated with level of knowledge among respondents. It was found that 53.85 percent of the respondents with high socio-economic status had high level of knowledge. The mean comparison of level of knowledge among adopters and non-adopters showed that the mean score of knowledge among adopters was 23.03, with a standard error of 0.76, whereas the mean score of knowledge among non-adopters was 21.33, with a standard error of 0.55. Furthermore, the z-value for level of knowledge was 2.02*, indicating that level of knowledge was statistically significant at 5% level.

Keywords: Sustainability, technology, knowledge, super seeder

Introduction

Wheat grows on approximately 29.3 million hectares (Mha) in India, yielding 103.6 million tonnes (MT) with a productivity of 3,533 kg ha-1 (FAO, 2021) [2]. This makes Haryana the fourth most important state in the nation for growing wheat, after Madhya Pradesh, Punjab, and Uttar Pradesh. With a yield of 48.36 quintals ha-1 and a production of 12.36 MT, Haryana produces 11.28 percent of all wheat produced in India. Rice-wheat farming replaced conventional crops (oilseeds, pulses, pearl millet, and maize) in Haryana and Punjab in the late 1970s and early 1980s. Sustainable resource use was not a problem because farming practices were changed to guarantee that the nation generated enough food. Currently, a very productive rice-wheat region in the Indo-Gangetic Plain exists in Haryana and Punjab, contributing over 69% of global food production (approximately 84% wheat and 54% rice), (Singh *et al* 2014) [11]. Despite its significance, there have been problems with crop management and residue generation in wheat and rice crops. While burning of paddy straw is an issue in many states, Punjab and Haryana have the highest numbers of reported cases, (PIB 2022). Because of its ease of use, low cost, increased automated harvesting, short window between rice harvest and wheat sowing, and lack of useful applications for leftovers, burning is the most used method for managing rice crop wastes.One of burning's main benefits is that it helps clean land as soon as possible before the next crop is harvested, which promotes seed germination and reduces the risk of residue-borne diseases (Mandal *et.al*. 2004) [10]. Under this arrangement, farmers benefit more, but they also deplete natural resources like groundwater, soil fertility, soil fauna and flora. In addition, they harmed agro-ecosystem, increased insect pest and disease resistance, decreased soil organic matter, and did other things to the agro-ecosystem. Thus, the process of burning not only leads to the huge loss of biomass but also causes different type of environmental problems (Kumar, *et al* 2015) [9]. It has been estimated that this crop rotation will result in around 40 million tonnes of crop waste, (Kathpalia *et al* 2022) [7]. Every year, around half of the 50 MT of rice straw that is burned takes place in northwest India between October and November (Kaur *et al* 2022) [8]. Thus, Punjab's and Haryana's air quality has been drastically declining. Using crop wastes as mulch for surface management provides a number of benefits. By preserving soil, utilising a sensible temperature regime, managing weeds, and enhancing soil health, these conserve irrigation water. For a comparable yield in summer crops, conserving irrigation

water with straw mulch can save up to 70–300 mm (Jalota *et al* 2007). [4] Reducing water evaporation using crop straw mulching. A notable rise in the sustainability score is also largely attributable to crop residue retention. The last ten years have seen the development of a variety of equipment to address the issue of paddy straw burning, including a straw baler, a straw chopper-cum-spreader, zero drills, happy seeders, super seeders, etc. Accordingly, the Super Seeder is the most productive recent technology for placing wheat in paddy fields without burning straw in order to maintain soil nutrition value also. So, keeping in mind the need and importance of Super Seeder a study was conducted with following objectives:

1. To study the knowledge level of farmers regarding Super Seeder
2. To delineate the factors associated with knowledge level
3. To draw the mean comparison of knowledge among adopters and non-adopter farmers.

Methodology

The study was conducted in Karnal district of Haryana state among 80 adopter and non- adopter farmers of Super Seeder farm technology. The study was carried out in the 3 blocks of the district namely Karnal, Kunjpura and Gharaunda. The villages undertaken for the study were Mughal majra, Nabipur, Nalwikhurd, Naiwal, Subhri, Amupur, Sharafabad, Sarsi, Ganger and village Ramba from Karnal block; fromKunjpura block village Kunjpura and Mohamadpur, from Gharaunda block villageGudhawere undertaken where maximum number of farmers had adopted Super seeder farm technology. On the whole, a total of 40 Super Seeder adopter farmers and 40 non-adopter farmers were selected. Interview schedule was prepared to collect the desired information as per objectives of the study. Data were collected with survey method with the help of well-structured interview schedule. Statistical techniques like frequency, chi square, t-test, weighted mean scores and rank order were

Results and Discussion

Knowledge level of Super Seeder Adopters

The Table 1. Illustrates the level of knowledge among the Super Seeder adopters. One fourth of the respondents had low level of knowledge, while 45.00 percent of the respondents had medium level of knowledge and rest (30.00%) of the respondents demonstrated high level of knowledge.

Table 1: Knowledge level of farmers regarding Super Seeder

(n=40)

Knowledge level	Frequency	Percentage
Low (15-19)	10	25.00
Medium (20-25)	18	45.00
High (26-30)	12	30.00

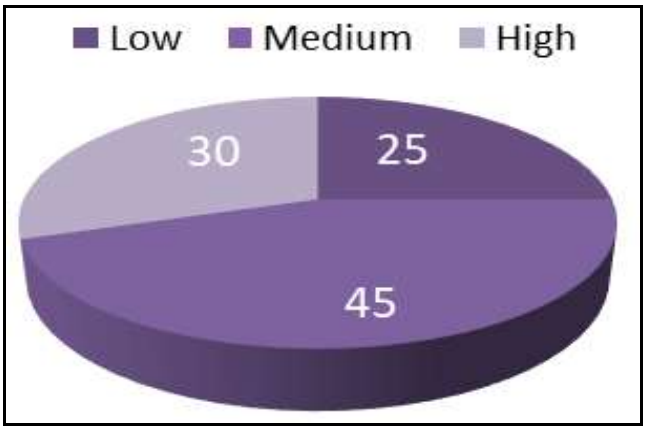

Fig 1: Knowledge level of farmers regarding Super Seeder

Knowledge statements regarding Super Seeder

The Table 2 presents the respondents' level of knowledge regarding the super seeder. According to the findings, overwhelming majority (90.00%) of the respondents were aware that the super seeder is a viable option for managing crop residue. Additionally, 77.50 percent of the respondents recognized that burning stubble contributes to pollution. Furthermore, all respondents (100%) acknowledged that the super seeder is utilized for sowing wheat in fields with standing stubble. Moreover, three-fourths of the respondents were aware that this process eliminates the need for a separate implement since all the required operations are completed in a single operation. Regarding the management of paddy straw (60.00%) of the respondents were familiar with the fact that the Super Seeder comprises a rotavator and zero till drill. Furthermore, 42.50% of the respondents were aware that burning residues leads to a reduction in soil nutrient fertility. An additional 70.00 percent of the respondents recognized that the super seeder technology is eco-friendly. Additionally, 45.00 percent of the respondents were aware that maintaining optimal soil moisture content is crucial. Regarding the technical aspects, half of the respondents (52.50%) had knowledge about rotor speed, and 70.00 percent were aware of the importance of using recommended seed and fertilizer rates by calibrating the planter. Near about fifty percent of the respondents (47.50%) were unaware that this technology is attached to the tractor with a three-linkage system.

Table 2: Knowledge statements regarding Super Seeder

(n=40)

Knowledge statements	YES (2)		No (1)	
	Frequency	Percentage	Frequency	Percentage
Super seeder is one of the best options for crop residue management (CRM)	36	90.00	4	10.00
Stubble burning creates pollution which effects human, animal health and greenhouse gas emission	31	77.50	09	22.50
Super seeder is used to sow the wheat in the field with standing stubble after harvesting the paddy crop	40	100.00	00	00.00
With adoption of super seeder for preparation of seed bed and sowing, no separate implement is required as all these operations along with straw management is done in a single operation	30	75.00	10	25.00
Super seeder consists of rotavator and zero till drill for managing the paddy straw and sowing of wheat respectively	24	60.00	16	40.00
When the paddy crop residue is burn, during the time of wheat sowing, reduces the soil nutrients fertility and releases harmful gaseous into the environment	17	42.50	23	57.50
Super seeder is an eco-friendly technology which helps to conserve the soil moisture content	28	70.00	12	30.00
Residues incorporated effectively into the soil across the field so that the residues load becomes uniform across the field	25	62.50	15	37.50
Optimal soil moisture content should be ensured at the time of sowing so as to have uniform crop establishment.	18	45.00	22	55.00
Set rotor speed at 200-220 rpm and operate tractor in 1st gear at a speed of 1-1.5 km/h	21	52.50	19	47.50
Ensure optimal depth of planting through adjustment of depth control wheels.	17	42.50	23	57.50
Tractor with double clutch of 60-75 hp should be used to operate the machine	18	45.00	22	55.00
Use recommended seed and fertilizer rate through calibrating the planter.	28	70.00	12	30.00
After the operation all parts of machine should be cleaned and washed properly.	22	55.00	18	45.00
Super seeder is attached by tractor with the help of three-linkage	21	52.50	19	47.50

Association between socio economic variables and knowledge level of farmers regarding Super Seeder

The Table 3 presents the relationship between socio-economic variables and the level of knowledge regarding the super seeder adopters. Results revealed that age, education, subsidiary occupation, size of landholdings, annual income, social participation, mass media exposure and socio-economic status were significantly associated with level of knowledge among respondents. Age was found to be significant at chi-value of 10.37*, indicating that knowledge regarding the technology increased with age. In contrast, level of education was significant at chi-value of 11.13*, representing that higher level of education was positively associated with increased knowledge. Caste was found to be non- significant, indicating that it did not play a role in determining the level of knowledge. Majority (53.85%) of the respondents who earned above 4 lakhs had a high level of knowledge. Exact half of the respondents who were member of more than one organization had high level of knowledge. Socio-economic status was also significant, 53.85 percent of the respondents with high socio-economic status had high level of knowledge.

Table 3: Association between socio-economic variables and knowledge level of Super Seeder

(n=40)

Socio-economic variables	Knowledge level			
Age	**Low**	**Medium**	**High**	**Total**
up to 35 yrs.	6(50.00)	4(33.33)	2(16.67)	12(30.00)
35+ to 50 yrs.	3(16.67)	11(61.11)	4(22.22)	18(45.00)
above 50 yrs.	1(10.00)	3(30.00)	6(60.00)	10(25.00)
Total	10(25.00)	18(45.00)	12(30.00)	40(100.00)
χ^2 *Cal*=10.37*				
Caste				
General caste	8 (27.59)	14 (48.28)	7 (24.13)	29 (72.50)
Backward class	2 (18.18)	4 (36.36)	5 (45.46)	11 (27.50)
χ^2 *Cal*=1.74				
Level of Education				
No formal Schooling	1(12.50)	3(37.50)	4(50.00)	8(20.00)
Up to Middle	6(31.58)	12(63.16)	1(5.26)	19(47.50)
Senior Secondary and above senior secondary level	3(23.08)	3(23.08)	7(53.84)	13(32.50)
χ^2 *Cal*=11.13*				
Subsidiary occupation of the family				
Nil	7(41.18)	6(35.29)	4(23.53)	17(42.50)
Business and services	1(7.14)	10(71.43)	3(21.43)	14(35.00)
Custom hiring	2(22.22)	2(22.22)	5(55.56)	9(22.50)
χ^2 *Cal*=9.69*				
Size of land holdings				

Marginal (up to 1 ha)	6(66.67)	2(22.22)	1(11.11)	9(22.50)
Small (1-2 ha)	1(9.09)	8(72.73)	2(18.18)	11(27.50)
Semi-medium (2-4 ha)	2(15.38)	6(46.15)	5(38.46)	13(32.50)
Medium (4-10 ha)	1(14.29)	2(28.57)	4(57.14)	7(17.50)
χ^2 *Cal*=15.11*				
Type of family				
Nuclear	5(22.73)	7(31.82)	10(45.45)	22(55.00)
Joint	5(27.78)	11(61.11)	2(11.11)	18(45.00)
χ^2 *Cal*=5.88				
Size of family				
Up to 4 members	5(35.71)	6(42.86)	3(21.43)	14(35.00)
5-8 members	3(16.67)	8(44.44)	7(38.89)	18(45.00)
Above 8 members	2(25.00)	4(50.00)	2(25.00)	8(20.00)
χ^2 *Cal*=2.08				
Annual Income				
Rs.2,00000 - 3,00,000	5 (55.56)	3 (33.33)	1 (11.11)	9 (22.50)
Rs.300000 - 4,00,000	3 (16.67)	11 (61.11)	4 (22.22)	18 (45.00)
Above Rs. 4,00000	2 (15.38)	4 (30.77)	7 (53.85)	13 (32.50)
χ^2 *Cal*=10.13*				
Social participation				
No organization participation	6 (54.55)	4 (36.36)	1 (9.09)	11 (27.50)
One organization participation	2 (11.77)	10 (58.82)	5 (29.41)	17 (42.50)
More than one organization participation	2 (16.67)	4 (33.33)	6 (50.00)	12 (30.00)
χ^2 *Cal*=9.83*				
Mass media exposure				
Low (4-6)	5 (50.00)	4 (40.00)	1 (10.00)	10 (25.00)
Medium (07-09)	3 (18.75)	10 (62.50)	3 (18.75)	16 (40.00)
High (10-12)	2 (14.29)	4 (28.57)	8 (57.14)	14 (35.00)
χ^2 *Cal*=10.82*				
Socio-economic Status				
Low (5-8)	5 (55.56)	3 (33.33)	1 (11.11)	9 (22.50)
Medium (09-12)	4 (22.22)	10 (55.56)	4 (22.22)	18 (45.00)
High (13-16)	1 (7.69)	5 (38.46)	7 (53.85)	13 (32.50)
χ^2 *Cal*=9.71*				

*Significant at 5% level of significance
Figures in parentheses indicate percentage

Mean comparison of level of knowledge among adopters and non-adopters

The Table 4 presents the mean comparison of level of knowledge among adopters and non-adopters. The mean score of knowledge among adopters was 23.03, with a standard error of 0.76, whereas the mean score of knowledge among non-adopters was 21.33, with a standard error of 0.55. Furthermore, the z-value for level of knowledge was 2.02*, indicating that level of knowledge was statistically significant at a 5% level.

Table 4: Mean comparison of level of knowledge among adopters and non-adopters (n=80)

	Adopters (40) (Mean ± Standard error)	Non-adopters (40) (Mean ± Standard error)	Z-value
Knowledge	23.03±0.76	21.33±0.55	2.02*

*Significant at 5% level of significance

Conclusion

The study revealed that Super Seeder is one of the most effective technology used for sowing of wheat sowing and which saves the environment also. In order to deploy inputs without affecting the environment, it is essential to make the agricultural sector sustainable. In addition to providing the farmers with numerous benefits, the Super Seeder resolves a significant issue. As a result, managing the stubble becomes easy and convenient forthe farmer as there is no longer of need to burn crop residue. Super Seeder is the most productive tool for placing wheat in paddy fields without burning straw in order to maintain soil nutrition value also. Knowledge of the farmers regarding Super Seeder was found low and medium among the selected farmers, so it can be concluded that with increase in knowledge of the farmers adoption of the super seeder can be the most effective environment friendly agricultural technology.

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