Comparative Analysis of Socio-Psychological Characters of Farmers Adopting Various Resource Conservation Technologies

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ABSTRACT

Resource conservation technologies (RCT) play a significant role in sustaining and enhancing the productivity of the rice-wheat cropping system at a lower cost of production. The adoption of resource conservation technologies is expected to yield benefits to the farmers in terms of reduced losses due to soil erosion, saving of energy and irrigation costs, savings on labour, increased productivity and water-use efficiency, reduced pumping of groundwater, increased nutrient-use efficiency and adoption of new crop rotations. The present study was conducted with the aim to compare socio- psychological characters of adopter farmers of various resource conservation technologies in Punjab. Four RCTs were selected for the study i.e. zero till drill, happy seeder, laser leveller and green manuring. A sample of 200 farmers comprised of 50 adopter farmers for each RCT was selected by following cluster sampling design from Faridkot, Fazilka, Ferozepur, Gurdaspur, Hoshiarpur, Ludhiana, Mansa and Sangrur districts of Punjab state. The findings revealed that significant difference was found in innovativeness and extension contacts of the adopters of selected resource conservation technologies. In case of innovativeness, zero till adopters were significantly more innovative as compared to laser leveller adopters'. Zero till adopters had highest extension contacts as compared to adopters of other selected RCTs.

Key words: *Zero till drill; Happy seeder; Laser leveller;Green manuring; Resource conservation technology;*

Conservation agriculture has emerged as a way for sustainable intensive crop production system. The conservation agriculture primarily focuses 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 (*Singh et al 2011, Verma et al 2006*). The achievements in resource conservation technologies have been possible with the continuous influx of technologies like zero tillage, bed planting, residue retention and management, brown manuring, nitrogen management through use of leaf colour chart, direct seeded rice, surface seeding etc.

These technologies not only help to improve productivity and farm income but also in creating employment opportunities at various levels. It is, therefore, imperative now to promote resource conservation technologies that would help to conserve the much needed but gradually depleting natural resources while boosting productivity growth. As a part of this strategy, resource conservation technologies play a significant role in sustaining and enhancing the productivity of the rice-wheat cropping system at a lower cost of production. The adoption of resource conservation technologies is expected to yield benefits to the farmers in terms of reduced losses due to soil erosion, saving of energy and irrigation costs, savings on labour, increased productivity and water-use efficiency, reduced pumping of groundwater, increased nutrient-use efficiency and adoption of new crop rotations. In the conventional method of wheat sowing, rice stubbles are burned by most of the farmers in Punjab, due to short window period between harvesting of rice and sowing of wheat. It leads to environmental pollution. The conventional tillage practices after rice harvest also involve extensive ploughing with common cultivator or deep tillage implements for preparation of a fine seedbed for wheat planting which is time

consuming as well as costly. In order to save sowing time and the tillage cost, a new seed drill was introduced in the early 1980s that made it possible to sow wheat in freshly harvested and untilled paddy fields utilising residual moisture. The drill named as zero-tillage drill and the method of wheat sowing with this drill is called as zero-tillage technology (*Ali and Erenstein, 2013*).The zero-tillage technology is widely maintained as an integrated approach to conserve resources that can tackle the problem of wheat yield stagnation in the rice-wheat zone by improving planting time, reducing weed infestation, and enhancing fertilizer and water use efficiency. Another machine happy seeder allows farmers to sow wheat immediately after rice harvesting without the need to burn any rice residue for land preparation. The wheat crop with happy seeder can be sown in standing stubbles of rice which avoids the preparatory tillage of the field and the crop can be sown 7-10 days earlier as compared to the traditional method of sowing (*Dhillon, 2016*). Bed planting in which wheat or other crops are planted on the raised beds in ridge furrow system is also an emerging resource (water) conservation technology. *Ramesh et al (2016)* reported that bed planting has the potential to conserve significant quantities of water (30.00 to 50.00%). Green manuring is one of the effective way of increasing and maintaining the fertility of the soils at a relatively low cost. As per studies, a significant (20 to 25%) amount of irrigation water is lost during its application due to the poor farm designing and unevenness of the fields. Land levelling through laser leveller is one such proven technology that is highly useful in the conservation of irrigation water. In Punjab, considerable efforts are being made to popularize and increase the adoption of RCTs. But, however, specific information regarding socio-psycho traits of farmers and how these traits differ in different technologies is required to make the effective policies and efforts to achieve the desired results in this direction. So, it was considered imperative to study and compare the socio-psycho traits of selected resource conservation technologies.

METHODOLOGY

The present study was conducted in Punjab state of India. In the present study, resource conserving technologies refers to those practices or technologies that enhance resources or input use efficiency such as new varieties that use nitrogen more efficiently, zero or reduced tillage practices that save water, etc. The resource conservation technologies primarily focus 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. Four resource conservation technologies were selected for the present study. The selected RCTs included green manuring, happy seeder, laser land leveller and zero tillage. For the selection of respondents two stage cluster sampling design was used. Data regarding area under selected RCTs were procured from the concerned departments. Clusters for each RCT were identified with the help of procured data. Number of clusters identified was 14 for green manuring (G1 to G14), 12 for zero till drill (Z1 to Z12) and 17 for happy seeder (H1 to H17) and laser leveller (L1 to L17). Out of these identified clusters, four clusters for each RCT were selected randomly except bed planting as no cluster was found in case of bed planting. Thus, a total of 16 clusters were selected for the study. The selected clusters (G6, G10, G7 and G12) for green manuring were spread over Hoshiarpur, Ludhiana, Ferozepur and Sangrur districts. For zero till drill selected clusters were Z4, Z7, Z8 and Z11 and districts covered were Mansa, Gurdaspur, Faridkot and Sangrur. Clusters selected for happy seeder (H6, H7, H8 and H15) were covered under Sangrur, Gurdaspur, Ferozepur and Fazilka districts. In case of lesser leveller, selected clusters were L6, L7, L11 and L15 spread over Fazilka, Ludhiana, Ferozepur and Sangrur districts. In this way, selected clusters for different RCTs were spread over Faridkot, Fazilka, Ferozepur, Gurdaspur, Hoshiarpur, Ludhiana, Mansa and Sangrur districts of Punjab state. At the second stage of sampling design, 50 adopter farmers for each RCT were selected using probability proportional to number of farmers in each cluster. Thus, the total sample was comprised of 200 adopter farmers for the present study. The primary data were collected with help of interview schedule by personal interview method for the crop year 2018-19. After completion of data collection process, collected data were further entered, classified and analyzed on computer based spreadsheet software in order to reach on final results, discussion and conclusion. Statistical tools such as frequencies, percentage, mean and standard deviation were used for the analysis of data.

For the comparative analysis of socio-psychological traits, one way analysis of variance was used. Further, for pair wise comparison of traits, Duncan multiple range test was administrated.

RESULTS AND DISCUSSION

Socio-personal characteristics: It relates to the information regarding socio-personal characteristics of the respondents which included age, education, operational land holding and family type. The information relating to the profile of the respondents has been given in Table 1.

Age: Age is an important social variable as it influences the attitude and values of an individual to a great extent which determine the status of individual in the family and Society. The results indicate that age of the respondents varied from 22-73 years (Table 1). About equal proportion i.e. nearly half of the respondents from each RCT belong to 41-59 years of age group. Data clearly shows that green manuring was also practiced by old aged respondents (24.00%) as compared to other RCTs. Green manuring is a traditional practice to conserve nutrients in the soil. So, this technology is well adopted by farmers of all age group. On an overall about half of the respondents (46.50%) belonged to the age group 41-59 years followed by 40.00 per cent falling in the category of 22-41years. Rest of the respondents (13.50%) was in the age group of 59-73.

Education: It is assumed that educational background of the respondents play a significant role in adoption. With this consideration in mind, the education level of the respondents was studied. It is evident from data presented in Table 1 that laser leveller and zero till was adopted by graduate respondents (36.00% and 34.00% respectively) as compared to other two RCTs where, adopters were educated upto matric level. It may be due to the reason that laser leveler and zero till technologies require more technical knowhow and it was easy for educated respondent to adopt these technologies. On an overall, one third (33.00%) of

Table 1 Distribution of respondents on the basis of their social personal traits

Social-personal Characteristics	Range	Green Manuring (n=50)	Happy Seeder (n=50)	Laser leveler (n=50)	Zero Till Drill (n=50)	Overall (N=200)
Age (years)	22-41	16(32.00)	18(36.00)	22(44.00)	24(48.00)	80(40.00)
	41-59	22(44.00)	24(48.00)	26(52.00)	21(42.00)	93(46.50)
	59-73	12(24.00)	8(16.00)	2(4.00)	5(10.00)	27(13.50)
Education	Illiterate	2(4.00)	-	-	-	2(1.00)
	Primary	-	2(4.00)	1(2.00)	2(4.00)	5(2.50)
	Middle	5(10.00)	3(6.00)	4(8.00)	-	12(6.00)
	Matric	17(34.00)	20(40.00)	14(28.00)	15(30.00)	66(33.00)
	Sr. Secondary	12(24.00)	13(26.00)	11(22.00)	14(28.00)	50(25.00)
	Graduate	11(22.00)	10(20.00)	18(36.00)	17(34.00)	56(28.00)
	Post graduate	3(6.00)	2(4.00)	2(4.00)	2(4.00)	09(4.50)
Land holding (ha)	Marginal (<1)	-	-	1(2.00)	-	1(0.50)
	Small (1-2)	5(10.00)	3(6.00)	3(6.00)	-	11(5.50)
	Semi medium (2-4)	10(20.00)	6(12.00)	13(26.00)	11(22.00)	40(20.00)
	Medium (4-10)	18(36.00)	16(32.00)	18(36.00)	12(24.00)	64(32.00)
	Large (>10)	17(34.00)	25(50.00)	15(30.00)	27(54.00)	84(42.00)
Family type	Joint	26(52.00)	29(58.00)	25(50.00)	29(58.00)	109(54.50)
	Nuclear	24(48.00)	21(42.00)	25(50.00)	21(42.00)	91(45.50)
Mass media exposure	Low (<10)	39(78.00)	36(72.00)	35(70.00)	34(68.00)	144(72.00)
	Medium (10-20)	11(22.00)	14(28.00)	15(30.00)	16(32.00)	56(28.00)
Extension contacts	Low (<10)	46(92.00)	44(88.00)	50(100.00)	45(90.00)	185(92.50)
	Medium (10-19)	4(8.00)	6(12.00)	0(0.00)	5(10.00)	15(7.50)

Figures in parenthesis represent percentage

respondents were matriculated followed by 28.00 per cent who had gained education upto graduate level and 25.00 per cent were upto senior secondary level.

Operational Land Holding: The respondents were categorized into five groups according to their operational land holding (Table 1). The data pertaining to operational land holding of the respondents given in Table 1 clearly state that 36.00 per cent of the respondents of green manuring and laser leveller had medium (4-10 hectare) operational land holdings. While happy seeder and zero till technologies were adopted by the respondents who had large (more than 10 hectare) operational land holdings. It indicates that happy seeder and zero till technologies are still restricted to large farmers only and there is a need to popularize these resource saving technologies among small farmers also. On an overall basis, 42.00 per cent of the respondents had large (more than 10 hectare) operational land holdings, followed by 32.00 per cent having medium (4-10 hectare) operational holdings and 20.00 per cent respondents had semi-medium (2-4 hectare) operational holding.

Family type: Family of the respondents was categorized into two categories nuclear and joint family. The perusal of data given in Table 1 reveals that more than half (58.00%) of the total respondents had joint family and rest of the families (42.00%) were nuclear. About equal proportion of nuclear and joint family system showed the shift of family composition from joint to the nuclear system in Punjab. Technology wise distribution of respondents also indicates the same trend in family systems of respondents i.e. more than half of respondents belongs to joint family.

Mass media exposure: It refers to the frequency of using different media viz. radio, television, farm literature and newspaper by the respondents to gain or improve knowledge regarding RCTs. Mass media exposure plays a significant role in the development of agricultural sector. Farmers learn about new technology, new cultural practices, new machinery and new varieties of different crops. Mass media is the back bone of agricultural extension through which agricultural universities; agricultural experts can easily disseminate the new knowledge to the farmers. It was categorized into three categories using range method viz. low, medium and high on total expected score range. Data in Table 1 revealed that majority of the respondents from each RCT had low mass media exposure i.e. 78.00 per cent of the adopters of green manuring followed by happy seeder (72.0%), laser leveller (70.00%) and zero till drill (68.00%). Trend in mass media exposure of adopters of selected RCTs show that adopters of green manuring had comparatively less exposure to mass media sources than other RCTs.

Extension contacts: To update knowledge of agriculture, the respondents had contacts with different extension functionaries. Extension contacts play a significant role in the adoption of an innovation. It not only helps the farmers to get new information but also change the mindset of the farmers. It was categorized into three categories using range method viz. low, medium and high on total expected score range. It was found that all the adopter farmers of laser leveller had low extension contacts as compared to other RCTs were, near about 90.00 per cent of the respondents had low extension contacts. It was interesting to note that adopters of happy seeder technology had comparatively more extension contacts. The results show that the farmer with more extension contacts tends to adopt happy seeder technology as this technology is new and still under initial stages of adoption.

Psychological Characteristics: Psychological traits are important characteristic of the farmers belonging to different adopters' categories. It is usually assumed that the innovators and early adopters have high innovativeness, risk taking capacity and economic motivation. Since psychological traits have a strong influence on the adoption behaviour of an individual, it was considered important to explore the data of selected respondents on this aspect too.

Innovativeness: It was categorized into three categories using range method viz. low, medium and high on total expected mean score. Data presented in Table 2 revealed that 62.00 per cent of the adopters of zero till drill possessed high level of innovativeness, which is comparatively more to other RCTs. Similarly adopters of happy seeder technology and green manuring were also in high level of innovativeness i.e. 52.00 per cent and 48.00 per cent, respectively. In case of laser leveller 40.00 per cent of the respondents belong to medium innovativeness category. On an overall, half of the adopters of RCTs were highly innovative. It can be concluded from the results that adoption of laser leveller technology does require farmer to be low innovative as compared to other technologies. It may be due to its

Table 2. Distribution of respondents on the basis of psychological characters

Social-personal Characteristics	Range	Green Manuring (n=50)	Happy Seeder (n=50)	Laser leveler (n=50)	Zero Till Drill (n=50)	Overall (N=200)
Innovativeness	Low (1-1.6)	11(22.00)	5(10.00)	11(22.00)	3(6.00)	30(15.00)
	Medium (1.7-2.3)	15(30.00)	19(38.00)	20(40.00)	16(32.00)	70(35.00)
	High (2.3-3)	24(48.00)	26(52.00)	19(38.00)	31(62.00)	100(50.00)
Risk orientation	Low (1-1.6)	12(24.00)	20(40.00)	20(40.00)	15(30.00)	67(33.50)
	Medium (1.7-2.3)	25(50.00)	16(32.00)	22(44.00)	20(40.00)	83(41.50)
	High (2.3-3)	13(26.00)	14(28.00)	8(16.00)	15(30.00)	50(25.00)
Economic motivation	Medium (1.7-2.3)	4(8.00)	2(4.00)	6(12.00)	2(4.00)	14(7.00)
	High (2.3-3)	46(92.00)	48(96.00)	44(88.00)	48(96.00)	186(93.00)

Figures in parenthesis represent percentage

high observability and easy availability to the farmers. The adoption of other technologies had required farmers to be highly innovative due to more risk involved.

Risk orientation: It was categorized into three categories using range method viz. low, medium and high on total expected mean score. Data in Table 2 revealed that 30.00 per cent of the adopters of zero till drill were in high level of risk orientation followed by adopters of happy seeder (28.00%) and green manuring (26.00%). On the other hand adopters of laser leveller technology were comparatively low risk oriented (16.00%). Laser leveller technology involves low risk and further it improve yield also. This may be the reason that farmers with low risk orientation were adopting this technology.

Economic motivation: Economic motivation is an important determinant in the adoption of a new technology. It was categorized into three categories using range method viz. low, medium and high on total expected mean score. The examination of Table 2 reveals that high majority (>90%) of the farmers from each RCT possess high economic motivation. No difference was seen among the adopters of different RCTs as far as their economic motivation was concerned.

Comparative analysis of socio-psychological characters: Means of various socio-psychological variables were calculated and differences were analyzed with the help of statistical tools i.e. one way analysis of variance and Duncan multiple range test. It was observed from the data in Table 3 that there were significant differences in innovativeness and extension contacts of the adopters of selected resource conservation technologies. In case of innovativeness, zero till adopters were significantly more innovative (with mean score 2.33, $p<0.05$) as compared to laser leveller adopters' (mean score 2.09) but at par with adopters of happy seeder (mean score 2.23) and green manuring (mean score 2.17). Adopters of laser leveller were at last position on innovativeness basis among all the

Table 3. Comparative analysis of socio-psychological characters of respondents

Social-psychological Characteristics	Green Manuring	Happy Seeder	Laser leveler	Zero Till Drill	F value	p value
Age	$47.94^{b}\pm12.92$	$45.16^{ab}\pm11.77$	$43.34^{ab}\pm10.38$	$42.72^{a}\pm12.99$	1.88	0.13
Education	$11.60^{a}\pm2.9$	$11.48^{a}\pm2.68$	$12.26^{a}\pm2.78$	$12.34^{a}\pm2.69$	1.28	0.28
Operational land holding	$22.13^{a}\pm18.9$	$23.79^{a}\pm13.82$	$22.45^{a}\pm23.99$	$28.30^{a}\pm20$	1.06	0.37
Innovativeness	$2.17^{ab}\pm0.48$	$2.23^{ab}\pm0.39$	$2.09^{a}\pm0.48$	$2.33^{b}\pm0.32$	3.04*	0.03
Risk orientation	$1.85^{ab}\pm0.56$	$1.82^{ab}\pm0.58$	$1.72^{a}\pm0.51$	$1.95^{b}\pm0.55$	1.57	0.20
Economic motivation	$2.56^{a}\pm0.23$	$2.52^{a}\pm0.22$	$2.51^{a}\pm0.25$	$2.54^{a}\pm0.21$	0.44	0.72
Mass media exposure	$7.08^{a}\pm3.57$	$7.28^{a}\pm4.87$	$7.48^{a}\pm3.37$	$8.04^{a}\pm4.27$	0.52	0.67
Extension contacts	$4.70^{b}\pm3.49$	$5.60^{b}\pm3.29$	3.34a±2.39	$5.62^{b}\pm3.31$	5.81**	0.00

Mean±SD; *significant at 5 percent level of significance ; **significant at 1 percent level of significance

adopters of selected RCTs. On the other hand, it was revealed that zero till adopters had highest extension contacts (mean score 5.62) as compared to other adopters of selected RCTs.

Extension contacts of the zero till adopters were significantly ($p<0.01$) higher than laser leveller adopters (mean score 3.34). There was no significant different was observed in adopters of zero till drill, green manuring and happy seeder as far as extension contents were concerned. It can be inferred from the results that adoption of laser leveller technology does require low innovativeness and extension contacts as compared to other technologies. It may be due to the reason of its favourable attributes which affect adoption i.e. high observability and easy availability. The adoption of other technologies had required farmers to be highly innovative and high extension contacts. All the other socio-psychological characters were found non-significant i.e. no statistical difference was observed in socio-psychological characters of adopters belonged to selected RCTs.

CONCLUSION

The study has identified the socio-psycho characters of the farmers who had adopted different resource conservation technologies. The results revealed that Adopters of zero till, happy seeder and green manuring had higher innovativeness and extension contacts as compared to laser leveller, whereas other factors remain similar in all technologies. This information can be used to develop policies and support programs to enhance the adoption of resource conservation technologies.

REFERENCES

Ali, A and Erenstein, O (2013). Impact of zero tillage adoption on household welfare in Pakistan. *J. Agril. Tech.*, **9:**1715-29.

Dhillon, G.S. (2016). Comparative evaluation of happy seeder technology versus normal sowing in wheat (*Triticuma estivum*) in adopted village Killi Nihal Singh of Bathinda District of Punjab. *J. Appl. and Nat. Sci.*, **8**: 2278-82.

Ramesh, Negi, S.C. and Rana, S.S. (2016). Resource conservation technologies (RCTs)-needs and future prospects: A review. *Agril. Rev.*, **37:** 257-67.

Singh, N.P.; Singh, R.P.; Kumar, R.; Vashist, A.K.; Khan, F. and Varghese, N. (2011). Adoption of resource conservation technologies in Indo-Gangetic plains of India: scouting for profitability and efficiency. *Agril. Eco.Res.Review,* **24:** 15-24.

Verma, V.K.; Gourav, Meena, R.N. and Singh, R.K. (2016). Resource conservation technologies: striving for a sustainable future. National conference on managing soil resource for environmental sustainability: challenges and prospective. Institute of Environment and Sustainable Development, Banaras Hindu University, Varanasi.

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