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RESEARCH ARTICLE

Comparative Analysis of Adoption Behaviour of Tenant vis-à-vis Owner Farmers for Rice Cultivation

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ABSTRACT

Punjab, one of the major rice-growing states in India, has been facing significant challenges in its agricultural sector, such as declining productivity and increasing input costs. Therefore, this study on comparative analysis of adoption behaviour of tenant vis-à-vis owner farmers for rice cultivation in Mansa district of Punjab was conducted during 2021-2022. For the purpose of data collection, three blocks were selected and from each selected block five villages were randomly selected. Further, from each village fifteen farmers (ten tenant + five owner) were randomly selected. Thus data were collected from 150 respondents. The results revealed that majority of the tenant and owner farmers had low level of extension contacts, social participation and mass media use. On average, majority of the tenant farmers had about six hectares of operational land holding, whereas majority of owner farmers had about five hectares of operational land holding. It was noted that 30 % of the owner farmers sown recommended varieties of rice, however only 11 % of the tenant farmers adopted recommended rice varieties. Majority of the tenant and owner farmers adopted recommended chemicals for weed control and plant protection measures but did not adopt the recommended doses for the same chemicals. Tenant farmers applied 33 average number of irrigations to the rice crop, nevertheless owner farmers applied 26 average number of irrigations to the rice crop. Majority of the tenant farmers (94%) applied more than recommended dose of nitrogenous fertilizers but majority of owner farmers (56%) applied recommended dose of nitrogenous fertilizers. Only 10 % of the tenant farmers had high level of adoption index for GAP of rice crop but it was 40 % in case of owner farmers.

***Key words**: Tenant farming; Adoption behavior; Adoption index.*

Land is one of a farmer's most valuable possessions, as it provides food for the family while also generating revenue. Land leasing is a part of life for many farmers. For individuals who do not own property or do not have enough land to meet their needs, leasing land is a good strategy to ensure future stability. Land may be acquired through different ways, including buying, mortgaging-in, and leasing through rental markets. One of the earliest kinds of agricultural production organization is land leasing/crop sharing. In many nations, it is still a very important issue in current agriculture. Land leasing farming not only maximizes the use of land and labour, but it also generates revenue for both renters and landowners. Because many landowners choose to lease-out property due to different socio-economic needs, and the tenant farmers desire to lease in land to enhance their socio-economic position, leasing as well helps to more efficiently make use of the available land of owners and excess family labour of tenant families. Landless labourers, marginal farmers, and small farmers rented land to supplement their income and refine their living standard. Fixed agricultural resources including tractors, irrigation pumps, and other farm tools are not used to their fullest potential by medium and large landowners. As a result, many large and medium farmers leased-in land to make better use of their permanent agricultural assets. The legalization of land leasing operations can boost the supply of land. It will lessen the chances of losing land ownership. Simultaneously, tenants may seek non-farm jobs to supplement their income. Due to legalization, the productivity efficiency of leased-in land can be boosted, since tenurial security will promote long-term investment and greater resource

usage. It will promote rural families' occupational mobility by lowering population pressure on agriculture land as well as increasing their income from a variety of economic activities (*Singh 2017*). Improved access to leased property for the poor would assist to alleviate poverty and improve their economic and social standing (*Jhansi 2018*). Small farmers have rented land in order to increase their revenue to support their families, so they leased-in acreage to expand their operations (*Kaur and Singh 2011*). Land rents and prices have risen as a result of the increased demand for land. Tenant farmers attempt to maximize the use of land value, which leads to the use of excessive inputs in order to optimize productivity since the farmer is driven to receive larger returns from the land throughout the course of his tenure (*Goswami and Bezbaruah 2018*). Therefore, it was desirable to generate information about the adoption behaviour of tenant farmers under various tenure conditions in Punjab, where rising input costs combined with stagnant crop productivity have resulted in a decline in farm productivity over the years, which has become a major concern for farmers and policy makers.

METHODOLOGY

The present study was conducted in the Mansa district of Punjab. The area was selected as it has large population of tenant farmers mostly engaged in traditional rice-wheat cropping system. The land rent in this area is very high despite poor fertility soils and underground water quality. The large numbers of suicides were also reported from this area. So, the study was conducted to know the adoption behavior of the tenant farmers for rice crop in Mansa district of South-Western Punjab. Mansa has 5 administrative blocks (viz. Mansa, Jhunir, Budhlada, Sardulgarh and Bhikhi) out of which two blocks i.e. Mansa and Bhikhi were randomly selected. From selected block, Mansa, further five villages (Khokhar kalan, Khokhar khurd, Mansa khurd, Bappiana, Khaila) and from block Bhikhi five villages (Ralla, Joga, Dhalewan, Smaon, Hiron kalan) were randomly selected. Further, total 15 farmers (10 tenant farmers + 5 owner farmers) from each selected village were randomly selected for the study. Thus, a total sample of 100 tenant and 50 owner farmers was selected to make a total sample of 150 farmers. For the collection of data, a structured interview schedule was developed. Interview consisted of questions regarding adoption behavior of the farmers related to seed rate used, variety grown, time of sowing, seed treatment, herbicides used, pesticide use, fertilizer applied, management of rice residue management etc in rice crop. For detailed information questions related to area under crop, name of variety, fungicide used for the seed treatment, number of different fertilizers like urea, D.A.P., muriate of potash, farm yard manure etc, farm preparation, number of irrigations, name and dose of different chemicals (herbicides, insecticides, pesticides) etc. were asked from the farmers. Farmers were interviewed by personally visiting them. To get the sample of tenant and owner farmers from selected villages the key informants was also contacted. Adoption Index for good agricultural practices was calculated and correlation analysis of socio-personal characteristics affecting the adoption of good agricultural practices was done by using Karl Pearson's correlation coefficient (r).

RESULTS AND DISCUSSION

The age of the farmers varied from 20-70 years as shown in the Table 1. The data illustrates that 37 per cent of the tenant farmers and more than one half (56%) of the owner farmers belonged to the young age group *i.e.* 20-37 years of age. Whereas, 53 and 34 per cent of the tenant and owner farmers, respectively, belonged to the middle age group (37-54 yrs). Ten per cent of tenant and owner farmers were categorized under old age group. It is evident from the table that majority of tenant farmers are belongs to middle age where as majority of the owner farmers belonged to young and groups. Similar finding has also been reported by *Deb et al., (2016)* in their study on tenancy and agricultural productivity in southern India. A small percentage of the farmers *i.e.* 10 and 14 per cent of the tenant and owner farmers did not have any formal education. It is evident from the data that about 1/4th of the tenant farmers (28%) and owner farmers (24%) had education up to matriculation. It is clear from the data that 20 per cent of the owner farmers were having educational level up to graduation and above whilst, the proportion for tenant farmers was low i.e. only 12 per cent. Thus, the data reveals that tenant farmers had poor education as compared to owner farmers. Earlier, *Bhowmick (2003)* also reported poor education level of tenant farmers.

The data given in Table 1 shows that majority of tenant farmers (83%), and (60%) of the owner farmers had low extension contacts. Only three per cent of the tenant farmers had high level of extension contacts. In case of owner farmers 10 per cent had

Table 1. Distribution of the farmers according to their socio-personal characteristic

Socio-personal characteristics	Farmers (%)	
	Tenant	Owner
Age (yrs.)		
Young (20-37)	37	56
Middle (37- 54)	53	34
Old (54-70)	10	10
Education		
Illiterate	11	14
Primary	16	6
Elementary	13	8
Metric	28	24
Senior Secondary	20	28
Graduation and above	12	20
Extension contacts		
Low (0-3)	83	60
Medium (3-6)	14	30
High (6-9)	3	10
Social participation		
Low (0-1)	53	52
Medium (1-2)	44	40
High (2-3)	3	8
Mass media use		
Low (0-8)	84	74
Medium (8-16)	12	26
High (16-24)	2	0

high level of extension contacts. Earlier, *Vysali K et al. (2019)* reported that majority of tenant farmers had medium level of extension contacts with agricultural extension contacts in Bt cotton. The data presented in Table 1 showed that about half of tenant farmers (53%), and owner farmers (52%) had low level of social participation followed by medium level of social participation. Only 3 per cent of the tenant farmers had higher level of social participation in contrast to 8 per cent in case of owner farmers. Thus, all tenant as well as owner farmers had low level of social participation while earlier*, Kumar et al. (2020)* reported that in Bihar state high percentage of tenant farmers (60%) were part of social groups. The data given in Table 1 shows that 84 per cent of the tenant farmers had low level of mass media use however, in case of owner farmers it was 74 per cent. It could be seen from the data that 26 per cent of owner farmers had medium level of mass media use whereas; only small percentage of the tenant farmers (12%) had high level of mass media use.

The data (Table 2) revealed that majority (45%) of the tenant farmers owned small (1 to 2 ha) land holdings, whereas majority (46%) of the owner farmers owned semi-medium (2 to 4 ha) land holdings (*Prakash et al 2003*). Majority (61%) of the tenant farmers leased in <2.4 ha of land. It was noted that operational land holding of the majority (70%) of tenant farmers was medium (4-10 ha) and for owner farmers it was semi-medium (2 to 4 ha). Thus, data reveals that tenant farmers were working on same or higher scale of operational holding by way of leased-in land. Similar, findings were reported by *Pandey et al. (2000*). For one hectare 20 kg of seed is sufficient for transplanting. The results (Table 2) revealed that all of the tenant and owner farmers applied less than recommended seed rate. Famers generally applied 12 to 13 kg of paddy seed for planting nursery for one hectare area. None of the farmers applied recommended or higher seed rate. Transplanting time is highly crucial in rice cultivation. It was noted that majority of the tenant farmers (87%) transplanted rice after 10th of June. However, in case of owner farmers, 96 per cent transplanted rice after 10th of June. It is clear from the data that tenant farmers tend to transplant rice early. The data conveyed that tenant farmers were at the top in using un-recommended varieties of rice. About 90 per cent of the tenant farmers had adopted un-recommended long duration rice varieties. While in case of owner farmers, 70 per cent were growing un-recommended varieties of rice. As tenant farmers had to pay high land rent, therefore, they preferred long duration rice, high yielding varieties. High rate of adoption of un-recommended rice varieties was due to their high and stable yield as reported by tenant farmers. As per recommendations, rice seed should be treated with sprint 75 WS (carbendazim + mancozeb) by forming slurry of 3g fungicide formulation in 10 to 12 ml water for 1 kg seed before sowing. The data presented in Table 2 indicates that only 8 per cent of tenant farmers treated seed with sprint 75 WS but in case of owner farmers 40 per cent adopted recommended practice *(Borthakur et al. 2015)*. It was noted that 86 per cent of owner farmers followed recommended land preparation practices followed tenant farmers (62%) (*Sharma et al 2001*).

Weeds are major problem in rice cultivation. The data presented in Table 2 depicts that about 80 per cent of tenant farmers and 84 per cent of the owner farmers adopted recommended chemicals for weed management (*Singh et al. 2013*). However, only 18 per cent used the recommended chemical dose, in contrast 38 per cent of the owner farmers used recommended chemical dose

Table 2. Distribution of respondents according to land holdings, GAP and adoption index

Cultivation practice/ Category	% farmers	
	Tenant	Owner
Owned land (ha)		
Marginal (<1)	16	0
Small(1 to 2)	45	12
Semi-Medium(2 to 4)	34	46
Medium(4 to 10)	5	36
Large(>10)	0	6
Leased in land (ha)		
<2.4	61	-
2.4 to 4.8	25	-
>4.8	14	-
Operational land (ha)		
Marginal(<1)	0	0
Small(1 to 2)	0	12
Semi-Medium(2 to 4)	22	46
Medium(4 to 10)	70	36
Large(>10)	8	6
Seed rate		
20 kg ha^{-1}	0	0
<20 kg ha^{-1}	100	100
Time of transplanting		
Before 10th June*	87	96
After 10th June	13	4
Varieties		
Recommended	11	30
Un-recommended	89	70
Seed treatment		
Recommended (Sprint 75 WS)	8	40
Un-recommended	92	60
Land preparation		
Recommended	62	86
Un-recommended	38	14
Weed control		
Recommended chemical	79	84
Recommended dose	18	38
Plant protection		
Recommended chemical	61	62
Recommended dose	8	36
No. of irrigations		
First 15 Days	5	5
15 to 45 Days	12	10
45 to 75 Days	8	5
75 to 105 Days	6	4
After105 Days	3	2
Average	33	26
Nitrogen (N)		
103.5#	6	56
>103.5	94	44
DAP (P_2O_5)		
Nil	67	70
28.75	14	22
>28.75	19	6
<28.75	0	2
Potassium (K_2O)		
Nil	6	72
30	82	14
>30	12	6
<30	0	8
Zinc sulphate ($ZnSO_4.7H_2O$)		
62.50	43	38
>62.50	0	14
<62.50	13	22
Nil	44	26
Adoption Index (AI)		
Low (7.14 to 30.95)	37	6
Medium (30.95 to 54.76)	53	54
High (54.76 to 78.57)	10	40

GAP: Good Agricultural Practices; * Date fixed by Govt. of Punjab; # For each category first row depicts recommended dose of fertilizers for medium fertility soils

for weed control in rice. Similar findings were reported by *Islam et al. (2015*). For chemical plant protection measures, about 60 per cent of the tenant and owner farmers adopted recommended chemicals. However, adoption rate of recommended doses was high for owner farmers (36%) while it was only eight per cent for tenant farmers. Our study confirms the findings of (*Sharma et al., 2020*) and (*Kirar et al., 2009*).

The data presented in Table 2 indicate on average tenant farmers applied a greater number of irrigations to the rice crop. During the first 15 days after transplanting, same number of irrigations were applied by tenant and owner farmers. Between 15 to 45 days after transplanting of rice, tenant farmers applied 12 number of irrigation while 10 by owner farmers. Similarly, between 45 to 75 days interval average number of irrigations applied by tenant and owner farmers were eight and five, respectively. Six number of irrigations were applied by tenant farmers between 75 to 105 day of rice transplanting while owner farmers applied only four irrigations during same period. After 105 days tenant farmers applied three number of irrigation while owner farmers applied only two number of irrigations. Average numbers of irrigation applied to rice during crop season were 34 and 26 for tenant and owner farmers respectively. The excessive irrigation applied by tenant farmers was due to use of long duration varieties and lack of adoption of alternate wetting-drying method. Thus, tenant farmers were applying more irrigation to the rice crop in comparison to owner farmers as by doing so they tend to minimize risk that may affect grain yield. Similar

findings were reported by *Vijay (2012*). Fertilizer-N is recommended at the rate of 103.5 kg N ha^{-1} for medium fertility soils. Majority of the tenant farmers applied more than recommended dose of fertilizer-N (Table 2) representing over use (*Bhatt et al. 2021*). Only about six per cent of tenant farmers applied recommended dose of fertilizer-N while none applied less than recommended. The data exhibited in Table 2 also shows that the 56 per cent owner farmers applied recommended dose of fertilizer-N while 44 per cent applied higher doses (*Singh et al. 2017*). Furthermore, according to recommend practices for rice cultivation under medium fertile soils, phosphorus application may be skipped to kharif crop and should be applied to rabi crops only. However, 67 per cent of tenant farmers skipped use of P_2O_5 to rice in contrast to 70 per cent of owner farmers. About 15 per cent of tenant farmers applied 28.75 kg P_2O_5 ha^{-1} while 19 per cent applied even higher dose. Use of fertilizer-K is recommended for those soils only which show deficiency of potash which is scarce in south-western, Punjab. However, data shows that (Table 1) that majority of tenant farmers (82%) were applying 30 kg ha^{-1} of K to rice crop which is recommended for deficit soils only (*Singh et al.2018*). Conversely, 72 per cent of owner farmers did not apply K_2O as per recommendations. About 15 per cent of tenant farmers and six per cent of owner farmers applied more than 30 kg ha^{-1} of K. Tenant farmers over used K_2O to maximize rice yield. Zn is the commonly applied micro-nutrient India but it is the most deficient micro-nutrient (*Fageria et al., 2003*).). Deficiency of Zn in rice leads to reduced or stunted growth of plants. For rice crop 62.5 kg $ZnSO_4.7H_2O$ ha^{-1} is recommended for optimum yield. The data revealed that 43 per cent of the tenant farmers applied recommended dose of Zn against 38 per cent of the owner farmers. Thus, majority of tenant farmers were not aware about the recommended dose of Zn for rice crop. In case of owner farmers 14 per cent applied Zn more than recommended dose while 22 per cent applied under dose. On the contrary, 13 per cent of tenant farmers practice under use of zinc sulphate to rice crop. Similar findings were reported by *Birari et al. (2000*).

Approximately, 22 million tons of rice residue is produced in Punjab each year, and most of it is burned by farmers. Burning rice residue releases poisonous gases that are harmful for both human and animal health. Moreover, green house gases such as carbon dioxide, carbon monoxide, methane, and nitrous oxide etc. causes global warming. So, data regarding rice straw management behaviour of tenant and owner farmers was studied. The data present (Fig 1) shows that rice residue was burnt by 60 per cent of the tenant farmers on the other hand only 26 per cent of owner farmers resorted to open field burning (*Singh et al.2020*). Tenant farmers reasoned that lack of straw management machinery, short term lease agreement was major reason for open field burning. They resorted to open field burning for timely clearance of field for sowing of succeeding rabi season crop. However, it could be witnessed that only about $1/4^{th}$ of tenant farmers (22%) opted for in-situ management of rice residue as against 60 per cent of owner farmers. The data also revealed that 14 per cent of the owner farmers. About 18 per cent of tenant farmers managed rice residue after removal from the field using rice straw baler. It is evident that tenant farmers had short term goals of higher yields from rented land thus were not adopting sustainable practices which have advantages in long run.

The data given in Table 2 illustrates that about half of tenant farmers (53%) and owner farmers (54%) fall in the medium range (30.95 to 54.76) of adoption index for rice crop. 40 per cent of owner farmers were in high range (54.76 to 78.57) category of adoption index conversely to only 10 per cent of tenant farmers.

Correlation analysis of socio-personal characteristics with adoption index (AI) for rice crop : Adoption of GAP for rice cultivation is affected by various socio-personal characteristics of the farmers. Correlation analysis helps to find out the nature of relationship between independent and dependent variables. To ascertain the relationship orrelation (r) was worked out.

A correlation analysis was conducted between

Table 3. Correlation analysis of socio-personal characteristics affecting the adoption gap with dependent variables AI of rice

Independent variables	(r)
Age	.088
Education	-.007
Land owned	.439**
Operational land holding	.055
Farming experience	.120
Extension contact	.160
Social participation	.197*
Mass media use	-.010

**Correlation is significant at the 0.01 level (2-tailed);
*Correlation is significant at the 0.05 level (2-tailed)

independent and dependent variables to assess the different factors affecting the adoption of GAP for rice cultivation in South-Western Punjab. The variation present in the model has been explained at 5 and 10 per cent level of significance.

Age is also assumed to be a determinant of adoption of GAP for rice crop cultivation. Older farmers should be assumed to have gained knowledge and experience over time and they can be better adopters of GAP for rice cultivation. The data presented in Table 3 showed that the age of the respondents had be non-significant correlation with the adoption of GAP in rice (r =.088) crop. The data given in Table 3 reveals that adoption was not influenced by the age of the respondents. It is considered that education level of the farmer increases their ability to obtain; process and use information relevant to adoption of recommended practices. The Table 3 also indicated that the education is negatively associated with the adoption of GAP (r= -.007) in case of rice crop. Land owned was highly imperative factor in adoption behavior of GAP for rice crop cultivation. Land owners tend to follow the recommended practices to maintain the fertility and sustainability of the land. Thus, Table 3 showed that the owned land of the respondents was found to be significantly and positively (r=0.439**) associated (*Singh et al. 2010*), whereas, operational land holdings showed non-significant association with adoption of GAP for rice (r=0.055) crop cultivation. Farming experience is a measure of human capital invested in farming. The data presented in Table 3 shows that farming experience of the farmers positively but non-significantly associated with the adoption of GAP for rice (r=0.120) crop. The GAP of the rice crop may be more accessible to those who have more extension contacts with extension agents. The data presented in Table 3 shows that extension contacts have a positive and non-significant association with adoption index of rice crop (r=0.160) *(Prakash et al. 2004)*. Membership in the social groups can expose people to a variety of perspectives and can occasionally provide farmers with better access to GAP knowledge for different crops. Table 3 showed that the social participation of the respondents was observed to be positively and significantly associated with adoption index for rice (r=0.197*) crop (*Chanu et al. 2014*). Farmers are probably sufficiently exposed to the media and motivated to use the GAP for rice crop. As a result, it is anticipated that the adoption index of GAP for the rice crop will positively correlate with the use of the mass media. The data presented in Table 3 shows that mass media use is negatively and non-significantly associated with rice crop (r= -0.010)

CONCLUSION

Study concluded that owner farmers have high level of education and mass media use as compared to tenant farmers. Owner farmers have higher levels of extension contacts and social participation when compared with tenant farmers. It was noted that the tenant farmers apply more dose of nitrogenous fertilizers than that of recommended in comparison to owner farmers to get higher yields although not much difference was found in average yield of rice crop in case of both tenant and owner farmers. On an average tenant farmers tend to apply higher number of irrigations in comparison to owner farmers. Tenant farmers preferred burning of the rice residue for management instead of in-situ management and removal of rice residue from the field due to lack of straw management machinery and short term lease agreement. Majority of owner farmers preferred in-situ rice residue management practices for stainability of land. Owner farmers have higher adoption index for good agricultural practices for rice crop in comparison to tenant farmers. Land ownership and social participation positively and significantly influence the adoption behavior of the farmers towards good agricultural practices for rice crop cultivation

CONFLICTS OF INTEREST

The authors have no conflicts of interest.

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