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Land Titling and Productivity of Major Crops in Punjab

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ABSTRACT

Land ownership is broadly defined as land titling or access to a land title entailing economic, social and developmental impacts. A survey covering 240 agricultural households, 120 each in groups of clear titles and with non- clear titles to land ownership was undertaken to determine the relationship between value of productivity in major crops i.e. paddy and wheat among clear and non-clear title households. The gross returns earned from paddy crop have been worked out as Rs. 141930/ha, net returns as Rs. 96113/ha with 3.10 as the returns per rupee of investment in clear titles group. While in the non-clear title group, gross returns were Rs. 136408 and net returns as Rs. 89315 on /ha basis gave 2.90 as returns per rupee of investment. In case of wheat crop, cost of machine labour was found to higher than human labour cost. Analysis of relationship between land title, productivity and net profit in two major crops of the state i.e. paddy and wheat has shown explanatory variables co-efficient, like human labour, fertilizers and manures, land size and dummy variables of land entitlement as significant towards net returns in case of paddy, while in wheat crop machine power, manures, plant protection chemicals and dummy variable of land entitlement were found to be significant. So, the study brings out the importance of 'clear land titles' having impact on profitability of farm households in the agrarian society.

Keywords: Factors, Land titling, Productivity, Rice, Wheat.

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INTRODUCTION

Land being a natural resource was earlier considered abundant in supply in relation to its demand. With evolution of human civilization, its acquisition started from pastoral stage. With increasing awareness about fertile powers of land, the ownership of it became a source of strength and status symbol. Land Ownership is broadly defined as land titling or access to a land title. Land title is a document that determines the ownership of land or an immovable property. When the farmer is having a clear land title, it is a protection of the rights of title holder against other claims made by anyone else to the property. Various documents establish the land ownership in India like sale deeds that are registered, property tax documents, government survey records, records of revenue department etc. However, these documents are not a government guaranteed title to the property, but only a record of the transfer of property. So, at the time of land transaction, the onus of checking past ownership records of a property is on the buyer. Therefore, land ownership in India, as determined by such sale deeds is presumptive in nature and subject to challenge.

Secure access to land as a productive resource is key to the livelihoods of farmers around the world. The nature of man- land relationship is important for agricultural development in the agrarian economy (Bansal and Grover, 2019). land rights enable farmers to work and invest in their farms with the expectation that they will reap the benefits without fear, that their land may not be confiscated arbitrarily. Formal and informal land rights are, therefore, seen as key to improving the conditions of the poor in developing countries in terms of economic growth, agricultural production, food security, natural resource management, gender-related inequalities, conflict management and local governance processes more generally (Bruce, 2012; de Soto, 2000; Deininger, 2003; Feder and Feeny, 1991).

There is mixed evidence in the literature regarding effectiveness of land titling on productivity. However, general perception especially in Indian conditions where about 80 per cent of farmers are of marginal and small categories indicates the positive association between possession of clear title of land and access to institutional credit. The existing system of land records in India is reminiscent of the colonial system and at present the records kept are worn out and

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the village maps do not represent the ground situation as they have not been updated by the respective state governments. The possession and ownership of land continue to be transferred on the ground without consequential mutation in the records with the result that the records as they exist today hardly reflect the reality regarding ownership of land (Saxena, 2005).

Thus, there is lack of studies on the aspects of land titling affecting positively to land productivity. This study makes an attempt to analyze the association of land titling with increased land productivity among agricultural households in the state of Punjab.

MATERIALS AND METHODS

The study has been led by the ADRT, ISEC, Banguluru and AERC, PAU, Ludhiana is a participant in the study. The study is mainly based on primary survey which included a total of 240 households in the state covering both set of farmers i.e. with clear land titles and without clear land titles in the year 2023. Purposively, two districts belonging to different agro climatic zones have been selected i.e. ShaheedBhagat Singh (SBS) Nagar from sub-mountainous zone and Ludhiana from central zone of the state. From each selected district, one block was selected which is NawanShehar from SBS Nagar and Sidhwan Bet from Ludhiana. From the selected block appropriate numbers of villages were selected from where 120 households have been surveyed in detail with a pre-designed schedule. In this way, a total of 240 households were surveyed. The data has been analysed using appropriate quantitative and qualitative techniques.

Analytical tools used

Simple averages have been calculated to examine the magnitude of different variables on various basis such as; per household, /ha and per cent. The selective position of some important variables has been studied with the help of proportions and averages worked out separately for the clear title and 'non–clear title' groups. The regression analysis was carried out in order to document the relative contributions of various inputs used in the total income from paddy and wheat crop. The form of the regression model is given as under:

$$Y = aX_1^{b1} X_2^{b2} \ldots\ldots X_8^{b8}.e^{u}$$

$$\text{Log } Y = \log a + \sum_{i=1}^{8} b_i \log x_i + \mu$$

Where;

Y = net returns /ha

a = intercept,

X_1 = Human labour (Rs./hectare)

X_2 = Machine labour (Rs./hectare)

X_3 = Seed (Rs./ hectare)

X_4 = Fertilizers (Rs./hectare)

X_5 = Hired human labour (hours/ha)

X_6 = Manure (Rs./hectare)

X_7 = Plant protection measures (Rs./hectare)

X_8 = Land (hectares)

X_9 = Irrigation (Rs./hectare)

X_9 = Miscellaneous (Rs./hectare)

X_{10} = Dummy variable of land title (with title with owner=1otherwise=0)

μ = Error term,

b_i are the regression coefficients.

RESULTS AND DISCUSSION

Certain attributes of respondents give the background of their economic activities, the rationale and impact of implementing the decisions. So, it becomes important to examine these features. Socio-economic characteristics of the sampled households revealed that majority of the respondents fall in the middle age bracket and belong to general category. Farmers in 'clear title group' were more experienced. Size of owned operational holding is larger in ' clear titles' group, whereas leasing- in of land is more in non-clear title group. Crop cultivation was the major contributor of family income. In clear title group, 96 per cent the heads of the family were main cultivators and average size of land owned by the head of the family was 2.50 hectares. The grouping also includes 'leased-in' land. So, about 47 per cent of the households also have titles in the name of other than family members and average rent paid was Rs.108985 /ha. But in the non-clear title group, no piece of land was owned by the head of the household and average size of farm holding came to be 1.18 ha. On an average, 4.41 ha./household was leased-in area in non-clear title

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Table 1: Land holding details of the household (Hectares per household).

Particular	Clear title	Non-Clear Land title
Owned farm land	2.50	1.18
Leased-in	2.18	4.41
Leased-out	0.02	0.01
Fallow land		
Net operated area	4.66	5.58
Net irrigated area	4.66	5.58
Net irrigated area as a % of operated area		
Rent paid for leased-in land (Rs /ha)	108985	115650
Rent received for leased-out land (Rs /ha)	125000	137500

Table 2: Cropping Pattern of the farm household (area under a crop as a percentage of gross cropped area)

Sr. No.	Crop Name	Clear title	Non-clear title
I.	Kharif		
1	Paddy	41.99	40.37
2	Maize	1.45	0.61
3	Fodder	1.50	1.37
	Subtotal (ha)	4.66 (44.93)	5.58 (42.35)
II.	Rabi		
4	Wheat	38.18	27.91
5	Potato	5.14	13.21
6	Fodder	1.61	1.23
	Subtotal (ha)	4.66 (44.93)	5.58 (42.35)
II.	Zaid/Summer		
7	Peas	5.31	1.65
8	Maize (Spring)	3.41	9.09
9	Summer Moong	1.41	4.22
10	Others (Mint, watermelon)	0.00	0.33
	Sub-Total	1.05 (10.13)	2.02 (15.30)
	Grand Total (ha)	10.37 (100.00)	13.20 (100.00)
	Cropping intensity (%)	222.55	236.12

Figures in the brackets indicate the percent to grand total

group directly proportional to the size of holding. In this group, 65 per cent of the households have leased-in land for cultivation or it is in the name of other than family members (Table 1).

As the study area falls in mainly wheat-paddy zone, so these are the predominant crops in *rabi* and *kharif* season, respectively. Paddy is found to be grown on about 42 percent of gross cropped area (GCA) in clear title group and on 40 per cent in non-clear title group. In *rabi* season wheat was being grown on 38 per cent of GCA in clear title group and on 28 per cent of GCA in non-clear title group the other prominent crop of this season was found to be potato, which was being cultivated on 5.41 per cent of GCA in clear title group and on 13.21 per cent in non-clear title group. In clear title group this crop was found only on large farms, while in the other group some medium farmers were also growing potato. Rest of the area was under fodder crops. The third season is zaid/summer season. Peas, was the main crop of this season in clear title group being grown on 5.31 per cent of GCA, whereas maize was the major crop in non-clear title group grown on about 11 percent of the GCA. So, over all maize crop covers 9 percent, summer moong 4 per cent and peas 1.65 per cent of the GCA in non-clear title group in the

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Table 3:Productivity of major crops grown by the selected households (q per ha)

Sr. No.	Crop Name	Clear title	Non-clear title
I.	*Kharif*		
1	Paddy	75.18	72.25
2	Maize	43.58	43.38
3	Fodder	741.35	723.15
II.	*Rabi*		
4	Wheat	50.88	45.08
5	Potato	227.45	225.13
6	Fodder	917.10	912.98
II.	*Zaid*/Summer		
7	Peas	54.48	
8	Maize	61.03	63.40
9	Summer Moong	14.48	13.98

Figures in the brackets indicate the per cent to grand total

Table 4: Value of productivity of selected households–Main product By-product (Rs/ha)

Sr. No.	Crop Name	Clear-title	Non-clear title
I.	*Kharif*		
1	Paddy	141930	136408
2	Maize	53485	53880
II.	*Rabi*		
3	Wheat	110293	98663
4	Potato	249875	237590
II.	Summer/*zaid*		
5	Peas	87518	84563
6	Maize	93365	95370
7	Summer Moong	78053	75415

zaid/summer season. The overall cropping intensity of the sampled farms in clear title group comes to be 222 per cent, increasing with increase in the size of farm holding, where as it was higher at 236 per cent in non-clear title group (Table 2).

Seventeen per cent of households in clear title group and 8 per cent in non-clear title group have gone for changing the land titles in past five year. Aadhar Card and land records (Farad) were the main documents needed for the alteration in titles. Changing the land titles, was a complex legal procedure having many formalities. Thus, time involved in the process, high cost of registration, corrupt practices causing delay in the procedure, bribe amount payment, high cost of documentation involved, have been cited as the major constraints faced by both the groups in changing of land entitlement.

Relationship between land title and productivity

Productivity of major crops grown by the selected farm households

Productivity is an indicator of efficiency in terms of various inputs used for crop production. Being a relative measure, it has been given across categories in Table 3 for the major crops being cultivated by sampled households. In clear title group productivity /ha of paddy crop has been reported as 75 quintals, 43.58 q for maize, 50.88 q for wheat, 227.45 q for potato, 54.48 q for peas, 61.03 q for spring maize and 14.48 q /ha for summer moong.

In non-clear title group, the yields of two main crops *i.e.* paddy at 72.25 q/ha and wheat at 45.08 q/ha were somewhat on lower side, while for rest of the crops, it was almost at par. For summer maize it was

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Table 5: Cost and return structure of paddy crop on sampled holdings (Rs /ha).

Sr. No.	Particular	Clear Title	Non-Clear title
1	Labour cost		
a	Human labour	19590	21518
b	Machine labour	11450	10338
2	Seeds	733	718
3	Seed treatment	88	118
4	Manures and Fertilizers	4505	4453
5	Plant Protection Chemicals		
i	Bio-agents/Botanicals		
ii	Chemicals	7243	7085
6	Miscellaneous expenses	583	545
7	Depreciation on machineries	840	548
8	Irrigation charges	0	963
9	Interest on working capital (@7%)	788	810
10	Total Cost	45818	47093
11	Total main produce yield (q)	75	72
12	Value of output (Rs /ha)	141930	136408
13	Value of by -product (Rs /ha)		
14	Quantity sold (q /ha)	75	72
15	Gross revenue (Rs /ha)	141930	136408
16	Net returns (Rs /ha)	96113	89315
17	Returns per Rupee of Investment	3.1	2.9
18	Subsidy Rs /ha on		
a	Seed	-	-
b	Manure and Fertilizers	-	-
c	Pesticides	-	-
d	Irrigation	-	-
e	Others	-	-
f	Total Subsidy	-	-

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higher at 63.40 q/ha. However, the difference in yields cannot be exclusively attributed to land titles as many other factors like crop variety, use of inputs, soil type, climate have a bearing on it.

Value of Productivity

Productivity when expressed in money terms is called value of productivity. It is sort of price realization of output and is an indicator of income generation. In clear title group, value of productivity of paddy crop including main product and byproduct comes to be Rs 14193/-ha, increasing with increase in size holding, while it was Rs 136408 /-ha in non-clear title group. For maize crop it was estimated as Rs 53485 /ha in- group of clear titles and Rs 53880 /-ha in the other group (Table 4).

In *rabi* season, value of wheat productivity has been, worked out as Rs 110293/-ha in clear title group and Rs 98663/-ha in non-clear title group. It comes to be Rs 249875 /-ha for potato crop in group having clear titles and Rs 237590/-ha in other group. In peas crop, value of productivity was found to be Rs 87518 and Rs 84563/-ha in group of clear title and non-clear title, respectively. For maize crop, it was Rs 93365 and Rs 95370 /-ha, respectively, where as it was Rs 78053 and Rs 75415/-ha for summer moong in respective groups.

Cost and return structure of paddy crop

Paddy was found to be the major crop of *Kharif* season being cultivated on 42 per cent of GCA in clear title group and 40 per cent in non-clear title group. The costs and returns involved in cultivation of this crop have been given in Table 5. Paddy is a labour

Table 6: Cost and return structure of wheat crop on sampled holdings (Rs /ha).

Sr. No.	Particular	Clear Title	Non-Clear title
1	Labour cost		
a	Human labour	6170	5745
b	Machine labour	12393	11368
2	Seeds	2528	2413
3	Seed treatment	8	11.43
4	Manures and Fertilizers	7970	8068
5	Plant Protection Chemicals		
i	Bio-agents/Botanicals		
ii	Chemicals	3890	4308
6	Miscellaneous expenses	788	845
7	Depreciation on machineries	765	378
8	Irrigation charges	52	155
9	Interest on working capital (@7%)	605	582
10	Total Cost	35168	33870
11	Total main produce yield (q)	51	45
12	Value of output (Rs /ha)	100478	89023
13	Value of by -product (Rs /ha)		
14	Quantity sold (q /ha)	44	41
15	Gross revenue (Rs /ha)	110293	98663
16	Net returns (Rs /ha)	75125	64793
17	Returns per Rupee of Investment	3.14	2.91
18	Subsidy (Rs /ha) on		
a	Seed	37	-
b	Manure and Fertilizer	-	-
c	Pesticides	-	-
d	Irrigation	-	-
e	Others	-	-
f	Total Subsidy	37	-

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intensive crop in transplanted conditions, though many operations have become mechanized instead of being performed by manual labour with invention of new technologies. Still, human labour cost has been estimated as Rs 19590 /-ha in clear title group and Rs 21518 /-ha in non-clear title group. On the other hand, machine labour has been worked out as Rs 11450 and Rs 10338 /-ha in clear title and non-clear title groups, respectively. The expenditure incurred on seeds was Rs 733 /-ha and for seed treatment Rs 88 /-ha in group having clear titles, while in the other group it is Rs 718 and Rs 118 /-ha, respectively. The cost of manures and fertilizers used in paddy has been estimated as Rs 4505 and Rs 4453 /-ha in respective groups. Rs 7243 and Rs 7085 have been reported as the cost of plant protection measures i.e. insecticides pesticides etc. on /ha basis in respective groups. Rs 583 and Rs 545 /-ha have been calculated as miscellaneous expenses incurred in acquisition of inputs, cleaning and formation of bunds etc. in two respective groups. Depreciation cost of agricultural machinery has been estimated as Rs 840/-ha in clear title group and Rs 548/-ha in non-clear title group as ownership of farm assets was higher in the former group.

After considering all these variable costs, the interest on working capital comes to be Rs 788/-ha at the rate of 7 per cent annum and Rs 810 /-ha in the two groups, respectively. No irrigation charges have been reported in the clear title group as free electricity was provided to the agricultural sector in the state. But in the other group of non-clear titles Rs 963/-ha have been estimated as irrigation charges, due to large proportion of leased in area, the farmers were paying for water or buying it from others. Thus, total cost of cultivating

Table 7: Resource use efficiency of paddy crop among the sampled households.

Sr. No.	Explanatory variable	Regression coefficients	t-value
1.	Intercept	12.525**	21.418
2.	Human labour	-0.124**	3.432
3.	Machine power	-0.004	1.141
4.	Seed	-0.020	0.377
5.	Fertilizer	-0.060**	3.227
6.	Manure	-0.004**	6.148
7.	Plant protection chemicals	-0.043	1.606
8.	Land(hectare)	0.029*	4.144
9,	Irrigation	0.002	1.566
10.	Miscellaneous	-0.001	1.805
11	Dummy land title(with title owner=1other wise=0)	0.008**	7.050
12	R2	0.281	
13	F Value	10.300	

** significant at one per cent level of probability

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paddy crop was found to be Rs 45818 and Rs 47093 /-ha in respective groups, increasing with increase in size of holding. With 75 q/ ha of yield and whole of it as marketed surplus, the gross returns earned from paddy crop in clear title group was Rs 141930/-ha, while net returns are Rs 96113 /-ha with 3.10 as the returns per rupee of investment. In the other group of non-clear titles the paddy yield has been reported as 72 q/ha and thus gross returns earned comes to be Rs 136408 and net returns at Rs 89315/-ha. This gives 2.90 as returns per rupee of investment in this group. Thus, returns over investment ratio were found to be higher in clear title group. No subsidy was found to be available for paddy crop on the sample farms to the farmers except for free electricity as has been already mentioned. So, total subsidy availed was found to be nil.

Cost and return structure of wheat crop

Wheat is one of the major *rabi* crop of Punjab. It was found to be grown on 38 per cent of GCA in clear title group and 28 per cent in non-clear title group. Human labour cost involved in cultivation of wheat crop has been estimated as Rs 6170/-ha in group having clear titles and Rs 5745 /-ha in the other group (Table 6). Machine labour comes to be Rs 12393 and Rs 11368 /-ha in respective groups. The expenditure incurred on seeds was Rs 2528 and Rs 2413/-ha, respectively with negligible expenses on seed treatment. Fertilizers and manures comprised major chunk of variable cost at Rs 7970 and Rs 8068 /-ha in clear title and non-clear groups, respectively. Also, Rs 3890 /-ha has been estimated as the cost of plant protection chemicals in clear title group and Rs 4308/ha in the other group. Transportation charges involved in acquisition of inputs and disposal of outputs have been considered under miscellaneous expenses and were found to be Rs 788 and Rs 84 /-ha basis in groups of clear titles and non-clear titles, respectively. These were varying with the size of operational holding. Farmers were owning various machines, with almost complete mechanization of farm operations in wheat crop. So, depreciation of machinery comes to be Rs 765 and Rs 378/ha in respective groups. Small amount of about Rs 52 /ha in clear title group and Rs 155 /ha in non-clear title group have been reported as irrigation charges mainly spent on use of diesel engines or purchasing of water for leased in land by the non-clear title group. Interest component calculated on working capital stands at Rs 605 and Rs 582 /ha in the two groups, respectively. Thus, total cost of cultivating wheat crop has been estimated as Rs 35168 in clear title group and Rs 33870/ha in non-clear title group on /ha basis.

The returns structure of wheat crop showed that yield of main product i.e. grains was 51q in group with clear titles and 45 q/ha in the other group. This output has been valued at Rs 100478 and Rs 89023 /ha in these groups, whereas value of by–product i.e. wheat straw has been calculated as Rs 9815 and Rs 9640, respectively. However, marketed surplus of these groups has been at 44 q and 41 q /ha, respectively. The gross returns in these groups have been Rs 110293 and Rs 98663/ha. Thus, the net returns have been Rs 75125 and Rs 64793/ha in these groups. The returns on per rupee of investment have been worked out as 3.14 and 2.91 in respective groups, indicating higher returns

Table 8: Resource use efficiency of wheat crop among the sampled households.

Sr. No.	Explanatory variable	Regression coefficients	t-value
1.	Intercept	12.480**	22.338
2.	Human labour	-0.000914	0.249
3.	Machine power	-0.116425**	4.184
4.	Seed	-0.065863	1.147
5.	Fertilizer	-0.041985	0.941
6.	Manure	-0.003313**	2.836
7.	Plant protection chemicals	-0.076103*	1.994
8.	Land (hectare)	0.008098	0.729
9,	Irrigation	0.000279	0.127
10.	Miscellaneous	0.001852	1.818
11	Dummy land title(with title owner=1otherwise=0)	0.013109**	9.022
12	R2	0.377	
13	F Value	16.590	

** and *significant at one and five per cent level of probability

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in group having clear titles. In case of wheat crop State Agricultural Department is providing subsidy on seeds. So, an amount of Rs 92/ha has been availed as seed subsidy by the farmers having clear titles, which was denied to the cultivators with non-clear titles.

Resource use efficiency of paddy crop

The cost and return structure of paddy crop, discussed earlier, has shown higher yield and thus higher gross returns of this crop in the group having clear titles. Net returns were also high in this group on account of low cost of cultivation. In this light, an attempt has been made to determine the contribution of explanatory variables having influence on net returns of paddy crop. The results of cobb Douglas production function have been given in Table 7.

The net returns of paddy crop have been regressed against the explanatory variables like human labour, machine power, seed, plant protection chemicals, irrigation etc. and land title ownership as dummy variable. In overall sampled households, the value of R^2(co-efficient of multiple determination) has been 0.281, indicating that only 28 per cent of variation in net returns have been explained by the explanatory variables included in the model. Rest of variation can be attributed to other variables. Among the explanatory variables, human labour, fertilizers and manures, land size and dummy variable of land entitlement have been significant towards net returns. However, regression co-efficient for human labour, fertilizers and manures were negative and significant, which means any increase in use of these variables will lead to a decline net return of the crop. On the other hand, this co-efficient was positive for land size indicating an increase of one per cent in land size will increase 0.029 per cent of net returns. Similarly, one per cent increase towards land entitlement will increase the net return by 0.008 per cent on /ha basis.

Resource use efficiency of wheat crop

The yield of both, main product i.e. grains and by product which was wheat straw were found to be higher in clear title group than the other one. So, net returns were also higher in this group. The resource use efficiency of some explanatory variables has been worked out for wheat crop with the help of regression model. In total sampled households, the value of R^2(coefficient of multiple determination) comes to be 0.377 indicating about 38 per cent of variation in net returns being explained by the variables included in the model. Among all the variables machine power, manures, plant protection chemicals and dummy variable (land entitlement) were found to be significant. Negative values of the coefficient point towards more use of machine power, plant protection chemicals and manures in wheat crop. It means an increase in expenditure on these variables will tend to decrease the net returns from the crop. But, one per cent inclination towards land entitlement will increase the net returns by 0.013 percent on /ha basis (Table 8).

CONCLUSION

Land being the basic factor of production in agriculture has a bearing on the scale of business. The issue becomes more relevant with increasing demand for land on one hand but its inelastic supply and immobile nature on the other hand. The gross returns as well as net profit were higher for paddy and wheat crops in case of clear title vis-à-vis non-clear title households owing to higher productivity of crops as well as lower total cost of cultivation. Regression analysis revealed increase in net returns in case of wheat and paddy crops with land entitlement. Thus, the study reaffirms the importance of clear land titles in agricultural growth.

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