Factors Affecting Ownership of Milch Animals by Rural Scheduled Caste Households in Punjab

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Abstract: The agriculture developed State Punjab has 37.45 percent population of Scheduled Castes in rural areas. The Scheduled Castes are predominantly landless and working as agriculture labourers. To supplement their family income by selling milk and to fulfil family need of milk the Scheduled Caste families keep milch animals. The percentage of such households is small; in the Census Survey of 4474 households in randomly selected thirty villages, only 37.73 percent of Schedule Caste households owned milch animals. The econometric analysis through probability models captured the variables like the ownership of land holding, availability of family labour and occupation of head of household raise the probability of owning a milch animal by a Schedule Caste household. The immediate need at policy level is to provide plots of land for sheds for animals, provision of high milk yielding animals at subsidised rate, promotion of female milk cooperative societies at village level etc, and opening of dry and green fodder stalls in every village.

Keywords: Scheduled Castes, landless, milch animals.

Introduction

The agriculture developed in Punjab at a fast rate in terms of production and productivity since the mid-1960s. But, the agriculture development benefits did not percolate to the landless labourers in terms of wages and income. The landless labourers are in majority the Scheduled Castes. Further, the rising mechanisation of farm operations reduced the employment of landless labourers in agriculture in multiple farm operations from sowing to harvesting. As a result, the Scheduled Castes have shifted towards many non-farming activities. To supplement their family income and to utilise the surplus family labour, the Scheduled Caste families keep milch animals; either a cow or a buffalo, rarely goats. Moreover, these milch animals also fulfil their family need of milk. Interestingly, like many land owning households in Punjab, many Scheduled Castes households, who have sufficient family labour, are either not interested to keep

milch animals or leaving to keep these animals due to low profitability in milk selling or lack of resources. Moreover, who have milch animals do not like to increase herd size. In this study, we have tried to explore the factors which determine the ownership of milch animals by the Scheduled Caste households.

Methodology

To find out the milch animal ownership with the Scheduled Castes, a complete census was carried out of the Scheduled Caste households living in the 30 randomly selected villages in 2020. The villages were selected from six geographical zones. The six zones comprises of the following districts: Foot Hill Zone (Gurdaspur, Pathankot, Hoshiarpur, Roop Nagar, SBS Nagar and SAS Nagar), Central Zone (Amritsar, Jalandhar, Kapurthala and Tarn Taran), Northern Malwa (Ludhiana, Moga and Fatehgarh Sahib), Eastern Malwa (Patiala, Sangrur, Malerkotla and Barnala), Southern Malwa (Bathinda, Faridkot and Mansa) and Western Malwa (Firozpur, Fazilka and Muktsar). In the thirty sample villages, 4474 Scheduled Caste households were found to be living and the total number of their family members was 25346.

Section II

Profile of Rural Scheduled Castes in Punjab

The population of Scheduled Castes has widely spread across all the villages of Punjab and since the green revolution their living conditions have improved (Shergill, 2017), but their majority is still living in abject poverty. In Punjab, a significant number of Scheduled Castes i.e. 64.96 lakhs are residing in more than 12000 villages. Out of the total rural population, their percentage is touching to 37.45 percent. Across the geographical regions, the highest percentage of Scheduled Castes falls in the Central Punjab (41.42 percent) and after this in Northern and Southern Malwa. The lowest percentage i.e. 23.25 percent is in Western Malwa. Further, a vast variation exists in the caste composition of the Scheduled Castes. In Punjab, one of the largest Scheduled Caste is of Mazhabis (42.15 percent) and next second big Scheduled Caste group comprises of Ramdasias (34.62 percent). The percentage of other Scheduled Castes is around 24.23 percent.

A large number of Scheduled Castes are mainly working as agricultural labourers (44.38 percent) and 46.54 percent are involved in other low profile occupations in informal sector and very few are in organised sector. The percentage of cultivators is just 6.01 and merely 3.60 percent own land.

Table 1: Profile of Rural Scheduled Castes in Punjab

Sr. No.	Profile of Rural Scheduled Castes (SC)	Number/ Percentage
1.	Rural SC Population (Lakh)	64.96
2.	Percentage of Total Rural Population	37.45
3.	Percentage of Rural SC Population in different Agro-Climatic Regions:	
3.1	Foot Hills	31.96
3.2	Central	41.42
3.3	Northern Malwa	39.09
3.4	Eastern Malwa	31.50
3.5	Southern Malwa	37.52
3.6	Western Malwa	23.25
4.	Caste composition of Rural Scheduled Caste: Population (Percent of Total Rural Scheduled Caste):	
4.1	Mazhabi/Balmiki	42.15
4.2	Ramdasia	34.62
4.3	Other Scheduled Castes	24.23
5.	Occupational Structure (Percent of Total Workers):	
5.1	Cultivators	6.01
5.2	Agricultural Labourers	44.38
5.3	Household Industry	3.07
5.4	Other Occupations	46.54
6.	Land Ownership (Percent owning farm land)	3.60
7.	Household Size (Number of Members)	4.99
8.	Sex Ratio (Number of Females Per 1000 Males)	913
9.	Literacy Rate	63
10.	Percent of Rural Scheduled Caste families living below poverty line	25.0

Source: (i) Census of India, 2011, Govt. of India.

(ii) Statistical Abstracts of Punjab, 2020.

In rural areas the family size of a Scheduled Caste household does not seem big and average family size is around 4.99. The sex ratio is around 913 and literacy rate touches to 63 percent. Lastly, out of total rural Scheduled Caste families, 25 percent are living below poverty line. To supplement their incomes by selling milk and family consumption of milk a Scheduled Caste family keeps a milch animal. In next section we have discussed the characteristics of households who own and do not own milch animals.

Section III

Characteristics of Surveyed Scheduled Caste Households Owning and Not Owning Milch Animals

The surveyed households show that out of 4474 households, 37.73 percent have milch animals either a cow or a buffalo and 62.27 percent have not any milch animal. The characteristics of these two groups of households vary from each other in terms of size of family, occupation, literacy and ownership of land etc. If we look at table-2, the percent of literate head of households is less among those who own milch animals. The milch animals need manual labour for timely feeding, watering and arranging fodder. Moreover, to clean the barn and manage animal dung there is more need of manual labour. Here, the average number of adult male member is almost double with the households who own milch animals than those who have not milch animals.

Table 2: Scheduled Caste Households Owning and Not Owning Milch Animals: Data Summary

Variables	Sub Sample Average/ Percentages		
	y=1 Household Owned Milch Animals	*y=0* Household Not Owned Milch Animals	*All (y)* Overall
Literate Head of Household (Percent)	37	50	54
Adult Male Member Per Household	2.1	1.65	1.82
Adult Female Member Per Household	1.80	1.46	1.59
Head of Household Working as a Labourer (Percent)	92.00	85.00	88
Households have Pucca House (Percent)	63.00	56.00	59
Households have Durable Goods (TV, Refrigerator and two Wheeler) (Percent)	38.00	39.00	39
Households own agriculture land (Percent)	8.00	1.22	3.60
Total Households	1688 (37.73)	2786 (62.27)	4474 (100)

Source: Field Survey.

The female labour participation in work is quiet less of landless Scheduled Caste households and due to mechanisation of agriculture operations have reduced chances of work in agriculture. The female labour besides the domestic work having extra work to look after milch animals. The average number of adult female members is higher in milch animal owning households, than non-milch animal owning households. It means availability of family labour increases the chances of milch animal ownership. Further, the nature of occupation of a head of household also increases the chances of

ownership of milch animals. In the 37.73 percent of milch animal owning households, 92 percent head of households are working as casual labourers in various occupations. The economic condition of milch animal owning households in terms of pucca/concrete house, durable goods and land ownership is better in terms of non-owning milch animals households. Out of milch animal owning households 63 percent have pucca house, 38 percent have durable goods and 8 percent own a small parcel of agriculture land. To conclude, the size of family labour, low literacy but better economic conditions augment the ownership of milch animals with Scheduled Caste households.

In the next section, we have defined these variables which have further taken as independent variables in the probability models.

Section IV

Description of Explanatory Variables

In the following table 3, we have given the significance and description of the explanatory variables used in probability models. The explanatory variables are continuous and dichotomous. In case of dichotomous independent variable, it is essential to note the reference or omitted category. As these variables are interpreted in regression, the exponentiated coefficient exhibit the relative level of the dependent variable for the represented group versus the omitted group (Hair *et al,* 2009).

Table 3: Description of Variables used in Probability Models
Dependent Variable (y): Scheduled Caste Household own milch animals=1, Not own=0

Independent Variables	*Description*
Education level of Head of Household	The education level of head of household is in dummy form, if a person is totally illiterate and literate upto a certain class and can read and write.
Adult Male Members	The adult male members are those having age more than 14 years and residing with family.
Adult Female Members	Like adult male members, this variable depicts the number of females who are more than 14 years.
Occupation of Head of Household	This variable is in dummy form, if a person is involved in regular employment or working as a casual labourer in agriculture or non-agriculture work.
Having Pucca/Concrete House	This variable is a proxy for the economic standard of a family.
Own Durable Goods	The variable includes if a household own refrigerator, TV and two wheelers and indirectly captures the standard of living of a household and earning of such families are better than other families who don't own. The variable is again in dummy form.
Own Agriculture Land (Kanals)	In Punjab very few Scheduled Caste households own agriculture land and who own can grow fodder for milch animals and residue of crop may be used to feed milch animals.

Section V

Ownership of Milch Animals with Scheduled Caste Households: A Comparison of Linear Probability, Logit and Probability Model

In econometrics the discrete outcome or the qualitative response models are specific models for a dependent variable that shows in which one of mutually categories is the outcome of interest. The dependent variable when is not metric and it is in form of dummy variable 'I' and 'O' then mainly three models are widely used: linear probability (LPM), logit, and probit model. First, the linear probability model (LPM) is a regression model in which the dependent variable y is a binary variable taking the value of 'I' if the event occurs and '0' if not. The LPM is affected with the problems of the non-normality of ui, heteroscedasticity of ui and possibility of estimated dependent variable going beyond the 0-1 range. This model also fails to capture the marginal or incremental offers of a variable. To overcome these problems the appropriate models are the logit and probit models (Gujarati, 1995).

The logit model is given as:

$$Pi = \Pr[yi = 1/xi] = \frac{\exp(\beta 1 + \beta 2_d)}{1 + \exp(\beta 1 + \beta 2_d)}$$

and ensures that 0< pi< 1. The maximum likelihood leads to parameters estimators. The probit model emerges from the conditional probability:

$$P = \phi(x'\beta) = \int_{-\infty}^{x'\beta} \phi(Z)dZ$$

where ϕ(.) is the standard normal cdf

$\phi(Z) = (1/\sqrt{2\pi} \ \exp(-Z^2/2)$ which is the standard normal density function (Cameron & Trivedi, 2005).

These different models yield different estimates of $\hat{\beta}$ of regression parameters due to different formulas used for estimating probabilities. Amemiya (1981) suggested that logit estimates multiplied by 0.625 saying that this transformation produces a closer approximation between the logistic distribution and the distribution function of the standard normal. Further, if the coefficients of linear probability model (LPM) $\hat{\beta}_{LP}$ and the coefficients of the logit model $\hat{\beta}_L$ are related by $\hat{\beta}_{LP}$=0.25 $\hat{\beta}_L$ and to make comparable $\hat{\beta}_{LP}$ to probit coefficients multiply by them by 2.5 and subtract 1.25 from the constant term.

Here we have used these three models to analyse the ownership of milch animals with the Scheduled Castes and how the described variables affect the probability of ownership of milch animals with the Scheduled Caste households.

In table 4 and table 5, we have given the results of these three models. Here in table 4, first the defined variables have taken in univariate form. Here two variables are continuous and remaining are in form of dummy variables in the univariate analysis, out of all the seven explanatory variables one variable is insignificant i.e. owning durable goods. The remaining six variables in all three models are significant and differ in magnitude but having same signs. The method to compare magnitude in these three models we have already explained. In all three models, the main variables raises the probability of ownership of milch animals with Scheduled Caste households are ownership of land, occupation of head of households in all these three variables only one variable i.e. ownership of durable goods with households is insignificant and negative in sign. The log likelihood values in logit, probit models are almost same and slightly differ in linear probability model. The R^2 value is almost same in all these models. In logit and probit model R^2 is McFadden R^2

Next, in table 5 we have taken all the defined variables simultaneously. Here again all the variables except the ownership of durable goods are significant. Here again like univariate analysis, the ownership of land, occupation of head of households, literacy level of head of household and availability of family labour increases the probability of ownership of milch animals with the Scheduled Caste households. The R^2 in logit and probit model all are almost same but in linear probity model it is 0.10. The log likelihood represents almost same value in these models.

Policy Implications

To raise the herd size and encourage landless Scheduled Caste households to keep milch animals for additional income and consumption of milk following measures may be adopted: Provision of suitable plots to the landless Scheduled Caste households to construct shed for milch animals, alongwith provide fields on lease out of common village land to grow fodder. To improve the breed of milch animals subsidized loan should be given to purchase milch animals and provide subsidised animal feed and subsidised medicines for the milch animals. To solve the problem of green fodder and dry fodder of these landless households, the government may encourage the fodder stalls in the villages from where these households may easily purchase fodder. The Cooperative Milk Societies of females may be promoted to involve the surplus female labour for producing and selling of milk.

Table 4: Ownership of Milch Animals by Scheduled Caste Households: A Comparison of Linear Probability, Logit and Probit Models (Univariate Analysis)

(Dependent Variable (y): Owning Milch Animals=1; Not Owning=0)

Variables	Linear Probability Model (LPM)					Logit Model					Probit Model				
	Intercept (α)	Coeff. (β)	R^2	In Lik.	LRT	Intercept (α)	Coeff. (β)	R^2	In Lik.	LRT	Intercept (α)	Coeff. (β)	R^2	In Lik.	LRT
Education level of Head of Household: Literate=0 Illiterate=1	0.31	0.11 (8.05)*	0.01	3067.01	64.34	(-)0.80	0.50 (7.97)*	0.01	(-)2924.19	64.34	(-)0.50	0.30 (8.00)*	0.01	(-)2924.19	64.34
Number of adult male members in a family	0.17	0.11 (15.20)*	0.05	29866.5	218.70	(-)1.38	0.46 (14.34)*	0.04	(-)2847.01	218.70	(-)0.85	0.28 (14.56)*	0.04	(-)2846.81	218.97
Number of adult female members in a family	0.09	0.06 (16.23)*	0.06	2971.06	253.82	(-)1.84	0.26 (14.99)*	0.04	(-)2829.45	253.82	(-)1.12	0.16 (15.50)*	0.04	(-)2829.53	253.66
Occupation of head of household: Labourer=1 Other=0	0.25	0.13 (5.83)*	0.01	3082.12	35.67	(-)1.06	0.60 (5.77)*	0.01	(-)2938.53	35.67	(-)0.65	0.37 (5.89)*	0.01	(-)2938.53	35.67
Having pucca house: Own=1; Not own=0	0.33	0.08 (5.21)*	0.01	3085.63	27.21	(-)0.71	0.32 (5.19)*	0.00	(-)2942.76	27.21	-0.44	0.20 (5.20)*	0.00	(-)2942.76	27.21
Own durable goods: Own=1; Not own=0	0.37	-0.01 (0.52)*	0.00	3099.06	0.27	(-)0.050	-0.03 (0.52)	0.00	(-)2956.23	0.27	-0.31	-0.20 (0.52)	0.00	(-)2956.23	0.27
Own Agriculture Land: Own=1; Not own=0	0.36	0.43 (11.42)*	0.03	3034.86	124.25	(-)0.59	1.94 (9.8)*	0.02	(-)2894.24	124.25	-0.36	1.19 (10.45)*	0.02	(-)2894.24	124.25

Note: (i) In Lik. stands for log likelihood.

(ii) LRT stands for Likelihood ratio test.

(iii) Figures in brackets are t value significant at 'x' 1 percent.

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Table 5

Ownership of Milch Animals by Scheduled Caste Households:
A Comparison of Linear Probability, Logit and Probit Model

(Dependent Variable (y): Owning Milch Animals=1, Not Owning=0)

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Variable	*Linear Probability Model (LPM)*	*Logit Model*	*Probit Model*
Education level of Head of Household: Literate=0 Illiterate=1	0.10 (6.76)*	0.46 (6.61)*	0.28 (6.63)*
Number of adult male members in a family	0.07 (9.03)*	0.32 (8.79)*	0.20 (8.84)*
Number of adult female members in a family	0.07 (7.12)*	0.31 (7.04)*	0.19 (7.12)*
Occupation of head of household: Labourer=1 Other=0	0.14 (6.33)*	0.73 (6.26)*	0.44 (6.49)*
Having pucca house: Own=1; Not own=0	0.06 (3.83)*	0.26 (3.77)*	0.16 (3.78)*
Own durable goods: Own=1; Not own=0	0.002 (0.17)	0.01 (0.17)	0.01 (0.19)
Own Agriculture Land: Own=1; Not own=0	0.40 (10.77)*	1.97 (9.51)*	1.20 (10.00)*
Intercept	(-)0.08	(-)2.74	(-)1.68
R^2	0.10	0.08	0.08
Log-Likelihood	(-)2852.45	(-)2713.59	(-)2712.47
Likelihood Ratio Test	-	485.55	487.78

Note: Figures in brackets are t values significant at 1 percent.

Conclusions

In Punjab a very large proportion of Scheduled Castes are residing in rural areas. For their survival, the Scheduled Castes only rely upon the agriculture labour. To supplement income and to fulfil domestic need of milk many Scheduled Caste households keep milch animals; mainly cows and buffaloes. Out of 4474 sample households, 37.73 percent households have milch animals. The Scheduled Caste households who have agriculture land, whose head of household involved in manual labour, and is illiterate and those households who have sufficient family labour have high probability to own milch animals. Further, the households who have pucca house with space to construct a shed for milch animals also keep more milch animals than other households. The households where the head of households are literate and having less family labour and agriculture land there the possession of milch animals is low.

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