

## **Milk Production as Supplementary Source of Income for Rural Scheduled Caste Households in Punjab**

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### **Abstract**

*The mechanisation of farm operations has reduced the absorption of landless scheduled caste labourers in agriculture. The high prevalence of illiteracy and lack of technical skills make it difficult for these labourers to get employment in highly competitive urban labour markets. Most of the male landless scheduled caste labourers commute daily in search of work to nearby urban areas, but cultural constraints restricts the movement of the female labourers outside their villages. The female labourers are confined mainly to domestic work and are free for many hours during a day. These female labourers and male labourers who don't work anywhere else can be profitably involved in dairy farming. Many scheduled caste households keep a small herd of milch animals and even sell surplus milk. The low yielding milch animals, the problem of space to keep the animals and no land to grow fodder hinder the expansion in herd size of milch animals by scheduled caste households. The suitable policy measures like provision of high yielding milch animals, rationing of fodder, subsidized medicines and veterinary services and some land to grow fodder may help to expand dairy farming in scheduled caste landless households.*

**Keywords:** Landless, Scheduled Castes (SC), Dairy, Employment

**JEL Classification:** Q12, Q15

### **Introduction**

The commercialisation of agriculture in Punjab has completely restructured the rural economy. Now, the agricultural production is not meant only for the self consumption at village level, but it is mainly for sale in the market. The highly monetised agriculture production system further introduced the cash transactions in the agriculture labour markets and replaced long existed patron-client relationships.

Prior to green revolution the landless scheduled caste households were mainly dependent upon land owning castes for employment and other means of livelihood. The green revolution has mechanised most of the farm operations with the result many male and female agriculture labourers became redundant. The male scheduled caste agriculture labourers shifted towards many non-farming activities and many of them also daily commute to nearby towns in search of work. The adult female members of these scheduled caste households are mainly involved in domestic work and occasionally get employment in agriculture during busy agriculture season in cotton picking and paddy transplantation. To absorb this

female labour and to supplement the family income of the landless scheduled caste households the dairy farming is the most suitable and productive venture. Most of the SC households in Punjab are not owning any milch animals.

Since the 1960s onwards the literature pertaining to dairy farming in Punjab and other states mainly focussed upon the production, productivity, profitability and scale of livestock enterprise [Sharma (1965), Dhawan and Johl (1967); Dhawan and Johl (1969); Srivastava *et al.* (2020)]. Few studies are on the economics of milk production by small farms [Singh *et al.* (1977)] and employment generations in dairy farming (Grewal and Rangi, 1980). Next, some studies compared the productivity in milk production by cross breed and indigenous cows in Punjab (Sankhayan and Joshi, 1975). But, we have not come across in the literature any study on milk production by scheduled caste households. Over the years as dairy farming matured in Punjab and small number of farms became totally commercial the problems of such farms have discussed by very few scholars (Shergill, 2006). Lastly, with the globalisation, multinationals allowed to operate in dairy sector in India and some studies are on the efficiency of supply chains of multinationals and state run cooperative milk societies (Vandeplas *et al.*, 2013). Keeping in view this

possible gap in the literature, the present paper has studied the existing situation of ownership of milch animals and milk production by the surveyed scheduled caste households.

**Data Sources and Methodology**

To carry out the field survey, whole State was divided into six zones i.e. Foot Hills, Central, Northern, Eastern, Southern and Western Malwa. From all the zones thirty villages were selected and from each zone number of villages selected was broadly in proportion to the population of rural scheduled castes of the state. First a complete census of all scheduled caste households in these 30 villages was conducted during 2019-2020. There were 4474 scheduled caste households in these 30 villages. Out of these 4474 scheduled caste households only 33.73 percent owned milch animals; 66.27 percent were not having any milch animals. In all 30 villages and 300 scheduled caste households were sampled. From each village 10 scheduled caste households selected at random keeping in view the different herd size of the surveyed households. To carry out the analysis of data we relied upon the multinomial logit model.

In econometrics, qualitative response models are models for a categorical dependent variable. The categorical variables may be unordered, sequential and ordered. In case if categorical variables are in ‘m’ categories and P1....Pm are the probabilities associated with these categories (Maddala, 1986).

The probabilities in binary form may be expressed in the following functional form (F) where β’ is coefficient of ‘x’ variable:

$$\frac{P_1}{P_1+P_m} = F(\beta_1'X) \dots\dots\dots(i)$$

$$\frac{P_{m-1}}{P_{m-1}+P_m} = F(\beta_{m-1}'X) \dots\dots\dots(ii)$$

These imply  $\frac{P_j}{P_m} = \frac{F(\beta_j'X)}{1-F(\beta_j'X)} = G(\beta_j'X) \dots\dots\dots(iii)$

Because  $\sum_{j=1}^{m-1} \frac{P_j}{P_m} = \frac{1 - P_m}{P_m} = \frac{1}{P_m} - 1 \dots\dots\dots(iv)$

and  $P_m = \left[ 1 + \sum_{j=1}^{m-1} G(\beta_j'X) \right]^{-1} \dots\dots\dots(v)$

and hence from (iii)

$$F_j = \frac{G(\beta_j'X)}{1 + \sum_{j=1}^m G(\beta_j'X)} \dots\dots\dots(vi)$$

The observations are from multinomial distribution with probabilities given by (v) and (vi). From the occupational

point of view the logistic is the easiest to handle in lieu of usage distribution of u. Therefore, G (β’<sub>j</sub>X) is nothing but exp G (β’<sub>j</sub>X) and equations (v) and (vi) can be written as:

$$P_j = e^{\beta_j'X_j D} \quad (j=1,2,\dots,m-1)$$

and  $P_m = 1/D \dots\dots(vii)$

where  $D = 1 + \sum_{K=1}^{m-1} (e^{\beta_j'X})$

The estimation of model (vii) is based on samples of size n where xi denote the observations on the variables x. The probabilities are obtained by substituting xi for x in equations (vii).

This model is commonly referred to as the multinomial logit model. The model has been used by Theil (1969) to study choices of transportation modes and by Schmidt and Strauss (1969) to study determinants of occupational choice. We have used this model to explain the factors determining the probability of the ownership of milch animals among sample households. The dependent variable is the total number of milch animal owned by each surveyed household which is in unordered form.

**Results and Discussion**

**Profile of the Milch Animal owning Sampled Households:**

The family size of the sampled scheduled caste households was around 5.6 which is near to state average family size. The average of adult female member per household is slightly higher than average adult male members (Table-1).

The caste composition of the household is: Mazhabi (43 percent) and Ramdasia (34 percent) and others around 23 percent. A majority of these households follow the Sikh religion. The average age of head of household is 51 years and 93 percent of households were represented by male as household head. There was wide prevalence of illiteracy among sample households, 66 percent were illiterate. Overall, 23 percent of households are under debt and per household debt was estimated around Rs.97884. These households mainly borrow from land owning households and 92 percent of the surveyed households own no farm land. No doubt the living conditions of these households in terms of pucca house and in house piped drinking water etc. has improved over the years (Shergill, 2017) and despite a significant population of scheduled castes in this state they have insignificant land holdings (Gail, 1981).

The total number of milch animals owned by sample households is 478 and out of these 54.60 percent were buffaloes, 26.99 percent are cows and remaining 18.41 percent goats. The average number of milch animals per household was 1.59.

**Table 1. Profile of the Milch Animal owning Sampled Households**

Sr. No.	Description of Household Characteristics	Number/Percentage
1.	Family Size (Average)	5.6
2.	Number of Adult Male Members (Average)	1.57
3.	Number of Adult Female Members (Average)	1.91
4.	Caste:	
	Mazhabi	43
	Ramdasia	34
	Other	23
5.	Religion:	
	Sikh	77
	Hindu	23
6.	Age of Head of Household (Years):	51
7.	Gender of Head of Household:	
	Male	93
	Female	07
8.	Education of Head of Household:	
	Literate	34
	Illiterate	66
9.	Financial Status:	
	Under Debt (Percent of Sample Households)	23
	Amount of Debt per Indebted Household (Rs.)	97,884
10.	Land Ownership with Households:	
	Not Owing Land	92
	Owning Land	08
11.	Total Milch Animals owned by Households:	478
	Number of Cows	129 (26.99)
	Number of Buffaloes	261 (54.60)
	Number of Goats	88 (18.41)
12.	Number of Milch Animals owned Per Household:	1.59

Source: Field Survey, 2019-20.

### **Occupational Pattern of Adult Members of the Sampled Households**

A majority of the male members of sample households were working in number of tasks. A high proportion of sampled households were landless and due to this and high prevalence of illiteracy, the head of households and adult male members were working as casual labourers either in agriculture or in non-agriculture work (Table-2).

Less than ten percent of household members are involved in farming. Contrary to this 99 percent of the adult female workers are not working anywhere and are a source of supply of labour in farming and non-farming activities. As we already discussed, this female labour force may be involved in dairy farming because they have in born skill to

keep milch animals. In the next section, we have explained the factors affecting the ownership of different herd size of milch animals with the sample households by using multinomial model.

### **Factors Affecting Ownership of Milch Animals:**

In table-3, we explained the factors affecting the different herd size of milch animals with the households. In all three equations, it seems the selling price of milk in a village is the important factor in raising the probability of ownership of milch animals especially where herd size is more than two milch animals. The study of Dhawan and Johl (1969) also found that increase in price of milk increases the herd size.

**Table 2. Occupational Pattern of Adult Members of the Sampled Households**

Sr. No.	Family Size Description	Working Profile	Number	Percentage
1.	Head of Household Number: 300	Not working	30	10.00
		Working	270	90.00
		Casual Labourer	207	76.67
		Farmers	21	7.78
		Non-farming activities	42	15.56
2.	Adult Male Members Number: 378	Not working	59	15.61
		Working	319	84.39
		Casual Labourer	240	75.23
		Farmers	17	5.32
		Non farming activities	62	19.45
3.	Adult Female Members Number: 572	Not working	568	99.30
		Working	4	0.70
		Casual Labourer	2	50.00
		Farmers	-	-
		Non Farming Activities	2	50.00

Source: Field Survey, 2019-20.

**Table 3. Factors Affecting Ownership of Milch Animals with Scheduled Caste Households  
(Multinomial Logit Model)  
Dependent Variable (y)= Number of Total Milch Animals**

Variables	Households with Two Milch Animals (Eq. 1)	Households with Three Milch Animals (Eq. 2)	Households with Four Milch Animals (Eq. 3)
Age (Years)	0.003 (0.20)	0.03 (0.79)	(-)0.09 (1.35)
Occupation of Head of Household: Labour=1; Other=0	(-)0.72 (1.99)*	(-)1.80 (2.54)*	(-)1.76 (1.30)
Number of Adult Male Members in Family	0.18 (0.88)	0.77 (1.77)*	1.15 (1.68)*
Number of Adult Female Members in Family	0.08 (0.40)	0.11 (0.26)	0.14 (0.20)
Number of Non-Farm Workers in Family	0.32 (1.57)	(-)0.66 (1.16)	(-)25.28 (0.00)
Own Land (Kanals)	0.02 (1.08)	(-)6.44 (0.00)	(-)5.99 (0.00)
Price of Milk in a Village (Rs./Kgs.)	0.03 (3.34)*	0.04 (2.49)*	0.06 (1.85)*
Intercept	(-)1.50	(-)4.73	(-)1.01
Likelihood Ratio Test	95.04		
Log Likelihood	(-)200.61		
Akaike Criterion (AIC)	497.22		

Note: 1. Figures in brackets are t-values.

2. '\*' Shows significant t values.

**Table 4. Milk Production of Sampled Households**

Sr. No.	Indicator Description	Number/Kgs.
1.	Number of milch animals with households	478
2.	Number of milk animal yielding milk on the day of survey	277
3.	Milk produced by milk producing households during a month (Kgs.)	26070
4.	Per household milk production on the day of survey (Kgs.)	3.91

Source: Field Survey, 2019-20.

**Table 5. Gross Return from Milk Production Per Kg.**

Sr. No.	Indicator Description	Value
1.	Quantity of milk sold during a month (Kgs.)	8069
2.	Price per Kg. (Rs.)	35.30
3.	Cost of material input per Kg. (Rs.)	18.95
4.	Value of milk produced by milk producing households during a month (Rs.)	920271
5.	Gross return per Kgs. (Rs.)	16.35

Source: Field Survey, 2019-20.

The rising price of milch animals fodder, feed and medicines raise the cost of production of milk and these all inputs raise the expectations of milk producers in terms of higher prices. Next in Eqts. 1 and 2, the landless labourers have less probability of owning milch animals because these labourers can't spare time to take care of milch animals. Moreover, they have not sufficient space to keep milch animals, lack in capital to purchase milch animals and can't afford loss in case of death of animals. Lastly in eqts. 2 and 3, the numbers of milch animals increase with the number of adult male members in a family. The adult male members not only take care of milch animals but also bring green fodder from fields and can easily arrange other inputs.

#### **Milk Production of Sampled Households:**

Previously we discussed the ownership of milch animals with households. Here in table 4, we illustrated the milk production of sampled households.

It is interesting to note just 57 percent of milch animals were in lactation on the day of survey. The scheduled caste households mostly owned milch animals which were either

old or released by big farmers in villages and rarely purchase high yielding milch animals. The total milk production of these milch animals during a month was around 26070 kilograms. The total value of milk production is about Rs.9.20 lakh per month. The price of milk obtained by milk selling households (Rs.35.30) given in table 5 is used for this purpose.

#### **Gross Return from Milk Production:**

Out of total milk production 31 percent i.e. 8069 kgs. was sold by households through different marketing channels (Table-5).

The average prevailing selling price of milk was Rs.35.30 per kgs. The cost of production includes only operational cost and was estimated on the basis of information supplied by sampled households of different inputs used was Rs.18.95 and gross return per kg. was around Rs.16.35. The total value of milk production is around Rs.9.20 lakh during a month.

Next we discuss the different market channels adopted by milk producers to sell milk.

**Table 6. Marketing channels used by milk producing households**

Sr. No.	Indicator Description	Number/ Percentage
1.	Number of milk producing households on the day of survey	222
2.	Number of milk selling households on the day of survey	90
3.	Marketing Channels (Percent):	
3.1	Village Dairy	54.44
3.2	Milk Venders	8.89
3.3	Retail Sale within Village	36.67

Source: Field Survey, 2019-20.

### Marketing Channels used by Households to Sell Milk:

In majority the households producing milk is consumed at home. Out of 222 milk producing households at day of survey just 90 were selling milk (Table-6).

Out of milk selling households 54.44 percent were selling milk at dairies located in their villages, either cooperative or private. Further, 36.67 percent were selling milk to households within the village and 8.89 percent milk producers were selling milk to itinerant milk vendors. In the next section, we have given the relevant policy measures came out of study and field survey to enhance the ownership of milch animals and milk production by scheduled caste households.

### Conclusions and Policy Implications

The mechanisation of farm operations shredded the male and female scheduled caste agriculture labourers. Gradually, the male labourers shifted towards non-farming activities and female labourers stuck into the domestic work. The high illiteracy and lack of technical skills made the situation of these households more vulnerable. The participation of females in work, except domestic work, is almost negligible. During a day the females have sufficient spare time during which they can take care of milch animals. Presently, the proportion of scheduled caste households owning milch animals is very low and the herd size and milk production per animal/household of those who own milch animals is too small. To provide high yielding milch animals, provide space to keep milch animals, subsidised fodder and medicines may help and encourage these households to increase herd size and milk production. The cooperative milk societies expansion in villages may provide various inputs and competitive price of milk to the milk selling households. The participation of females in managing cooperative societies will further encourage them to keep milch animals. The dairy farming may be a suitable employment avenue for the Scheduled Caste landless households if they are enabled to create infrastructure. The households may be provided space to keep milch animals outside their residential premises. To increase the milk yield better breed of animals is most needed, along with the subsidized veterinary care services. The easy availability of green fodder/wheat chaff in villages at stalls on the subsidized rates may be promoted. A portion of village common land may be allocated to Scheduled Caste households to grow green fodder. They may be provided small pits on the outer sides of *phirni* (ring roads) to dispose off the dung of animals. The milk cooperative societies managed by females may be encouraged.

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### References

- Dhawan, K C and Johl, S S 1967. Comparative profitability of dairy enterprises into crop cultivation on suburban farms in Punjab. *Indian Journal of Agricultural Economics* **22**: 81-97. <http://dx.doi.org/10.22004/ag.econ.270264>
- Dhawan, K C and Johl, S S 1969. An economic analysis of dairy enterprise vis-a-vis crop cultivation in Punjab: A case study. *Indian Journal of Agricultural Economics* **24**: 53-72. <http://dx.doi.org/10.22004/ag.econ.233687>
- Grewal, S S and Ranghi, P S 1980. Economics and employment of dairying in Punjab. *Indian Journal of Agricultural Economics* **35**: 120-125. <http://dx.doi.org/10.22004/ag.econ.269443>
- Maddala, G S 1986. *Limited dependent and qualitative variables in Econometrics*. Cambridge University Press, London.
- Omvedt, Gail 1981. Capitalist agriculture and rural classes in India. *Economic and Political Weekly Review* **16**: 140-159. <https://www.jstor.org/stable/4370527>
- Sankhayan, P L and Joshi, A S 1975. Resource productivity in milk production of crossbreed and indigenous cows in rural areas of Ludhiana district, Punjab. *Indian Journal of Agricultural Economics* **30**: 105-110.
- Schmidt, P And Strauss, R P 1975. The predictions of occupations using multiple logit models. *International Economic Review* **16**: 471-486. <https://doi.org/10.2307/2525826>
- Sharma, P S 1965. Scale of livestock enterprise. *Indian Journal of Agricultural Economics* **20**: 77-82. [10.22004/ag.econ.252480](https://doi.org/10.22004/ag.econ.252480)
- Shergill, H S 2006. *Commercial Dairy Farming in Punjab: Problems and Strategy for Further Development (Monograph)*. Institute for Development and Communication (IDC), Chandigarh.
- Shergill, H S 2017. Living conditions and consumption standard of rural dalits: A comparison across the states. *Indian Journal of Human Development* **II**: 1-13. <https://doi.org/10.1177/0973703017713036>
- Singh, R, Patel, R K and Ahlawat, S S 1977. Impact of integrated crop and milk production on small farms in Punjab. *Indian Journal of Agricultural Economics* **32**: 130-135. <http://dx.doi.org/10.22004/ag.econ.268532>
- Srivastava, S K, Chand, Ramesh, Singh, Jaspal, Kumar Anjani and Singh, N P 2020. What drives transitions in milk productivity? Household level evidence from Punjab. *Economic and Political Weekly* **4**: 72-78. <https://www.epw.in/journal/2020/13/notes/what-drives-transitions-milk-productivity.html>
- Theil, H 1969. A multinomial extension of the linear logit model. *International Economic Review* **10**: 251-259. [doi:10.2307/2525642](https://doi.org/10.2307/2525642)
- Vandeplas, Anneleen, Minten Bart and Swinnen Johan 2013. Multinationals v/s cooperatives: The income and efficiency effects of supply chain governance in India. *Journal of Agricultural Economics* **64**: 217-244. <https://doi.org/10.1111/1477-9552.12004>