# Socioeconomic Characteristics of Small and Medium Sized Dairy Farmers in Punjab : Milk Production, Marketing, & Consumption

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## Abstract

**Livestock is emerging as a driving force in the growth of the agricultural sector of India as it is a major instrument of production for small and medium-sized farmers. Among the livestock, milk constitutes about 68% of the total value of products. Currently, Punjab produces about 7% of the country's total milk production. The present study attempted to document the important socioeconomic characteristics like education, main occupation, social status, experience in dairying, land ownership status, milk yield, milk production pattern, milk consumption, marketed surplus, and price of milk received by small and medium sized dairy farmers in Punjab. A multistage sampling technique was used to select the sample households. The results of the study revealed that about 52% of the small farmers and 38% medium farmers were educated under the matriculation level. About 70% farmers in the small category and 57% farmers in the medium category had an average experience of more than 15 years in dairying. The daily milk production and marketed surplus were found to be 16.52/L/day and 10.68L/day by small category farmers and 32.69/L/day and 25.74 L/day by medium size category farmers, respectively. The price of milk received by small and medium sized dairy farmers was found to be ₹ 31.92/L and ₹ 33.42/L, respectively for buffalo milk and ₹ 24.36/L and ₹ 25.82/L, respectively for cow milk. About 52% small category farmers and 55% medium category farmers had adopted organized milk marketing channels to sell their produce in the state. The study revealed that there is a huge need of awareness regarding marketing of milk and improvement in pricing policy so that farmers of all categories receive the same price of milk they sell.**

***Keywords :*** **education, milk production, milk yield, occupation, price of milk**

**JEL Classification : Q12, Q13, Q 18**

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Livestock plays an important role in the Indian economy. About 80% of the total agricultural work force is involved in livestock rearing (Jha, Kumar, & Singh, 2014). Livestock contributes 26.90% of the agricultural gross domestic product (GDP), which is around 4.40% of the national GDP at current prices (Department of Animal Husbandry, Dairying and Fisheries, Ministry of Agriculture, 2016). With adoption of

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better management practices at the dairy farms and use of better quality feed and fodder, the milk production has increased from 17 million tonnes in 1950-51 to 155.50 million tonnes in 2015-16 (Department of Animal Husbandry, Dairying and Fisheries, Ministry of Agriculture, 2016). The combined share of landless, marginal, and small dairy households in the country's milk production was 77.34% (Singh, Mahajan, & Datta, 2013). Dairying provides not only full time, but also regular income to the rural people. The contribution of livestock in income generation in the rural areas is quite substantial as it contributes about 85%, 50%, and 34% to the total family income in case of landless, marginal, and smallholders, respectively (Jha et al., 2014).

Punjab contributes about 7% of the country's total milk production and is the sixth highest milk producing state. Milk production in Punjab increased from 2.2 million tonnes in 1970-71 to 10.77 million tonens in 2015-16 (Ministry of Finance, Economic Division, 2016). The state has the highest per capita availability of milk, that is, 1032 gram/day and also has the highest milk yield per animal in the country (Ministry of Finance, Economic Division, 2016). With only 1.1% of the country's total cattle population, Punjab's share in total cow milk production of the country was 5.2%. In case of buffaloes, as per the 2012 statistics, the state owned 4.8% of the country's total buffaloes and produced 9.7% of the country's total buffalo milk (Department of Animal Husbandry, Dairying and Fisheries, Ministry of Agriculture, 2012). More than 75% of the milk production and marketed milk were contributed by the households keeping three or more milch animals (Kumar, Staal, & Singh, 2011).

The present study attempts to document the important socioeconomic characteristics of the respondent households which include education, main occupation, social status, experience in dairying, land ownership status, milk yield, milk production pattern, milk consumption, marketed surplus, and price of milk received by small and medium sized dairy farmers in Punjab. The state of Punjab provides an ideal environment for the study of socioeconomic reforms and pattern of milk production, consumption, and marketable surplus of milk by small and medium-sized dairy farmers. As no recent detailed study has been undertaken in this direction in Punjab, thus the present study will act as the source of information to future researchers and stakeholders in the dairy industry.

## Methodology

The study was conducted in three agro-climatic zones of Punjab state, that is, Sub Mountainous Zone, Central Zone, and South-Western zone in the year 2015. A multistage sampling technique was used to select the sample households. In the first stage, the district having highest milk production from each zone was selected. Ludhiana, having the highest milk production in the Central zone was selected. Similarly, Hoshiarpur and Firozpur were selected from the Sub Mountainous zone and South Western zone, respectively. Further two blocks were selected randomly from each selected district based on different situations of marketing of milk. In the next stage, two villages were selected randomly from each selected block. Overall, 12 villages were selected from three districts for detailed study. A comprehensive list of all the households from all the 12 villages having at least two milch animals and who marketed the milk throughout the year was prepared to identify the size ranges of small, medium, and large dairy farmers using the cumulative cube root frequency method of stratification. Two farm size categories were identified, that is, small (2-5 milch animals) and medium (6-11 milch animals). A sample of 15 dairy farmers (small and medium category) from each village was selected using probability proportional to size method. Consequently, 133 small and 47 medium size dairy farmers rearing buffalo, crossbred cow, and indigenous cow were selected randomly, making a total sample of 180 dairy farmers.

Data regarding the socioeconomic parameters like education, main occupation, social status, experience in dairying, family-size, etc., were collected from the selected dairy farmers through personal interviews with the aid of specially designed and pre-tested questionnaire. The tabular analysis was used for interpretation and comparison of milk yield, milk production, consumption, marketed surplus of milk, and price received from sale

of milk for different categories of households. The analysis was carried out on per farm basis. Other statistical tools such as simple averages, percentages, etc. were also used wherever required.

## Analysis, Results, and Discussion

**(1) Current Status of Punjab Dairying :** Buffalo and cattle population over time in Punjab is presented in the Table 1. A perusal of the table represents that there has not been much increase in the buffalo population of the state. Buffalo population increased up to 1997, but after that, it started declining in the state. Cattle population decreased from 33.12 lakhs in 1977 to 17.62 lakhs in 2007 and increased to 24.28 lakhs in 2012. According to Livestock Census 2012 (Department of Animal Husbandry, Dairying and Fisheries, Ministry of Agriculture, 2012), Punjab had 39.24 lakhs milch animals, out of which 68.52% were buffaloes, 28.87 % were crossbred cows, and 2.61% were indigenous cows.

**Table 1. Buffalo and Cattle Population Overtime in Punjab**

| Year | Buffalo (in lakhs) | Crossbred cows (in lakhs) | Indigenous cows (in lakhs) | Total Cattle (in lakhs) |
|---|---|---|---|---|
| 1977 | 41.10 | - | 33.12 | 33.12 |
| 1990 | 55.78 | 15.79 | 12.53 | 28.32 |
| 1997 | 61.71 | 18.29 | 8.10 | 26.39 |
| 2003 | 59.95 | 15.31 | 5.09 | 20.40 |
| 2007 | 50.02 | 12.58 | 5.03 | 17.61 |
| 2012 | 51.60 | 3.63 | 20.65 | 24.28 |

Source: Department of Animal Husbandry, Dairying and Fisheries, Ministry of Agriculture (2012).

According to Livestock Census 2012 (Department of Animal Husbandry, Dairying and Fisheries, Ministry of Agriculture, 2012), the female-male ratio in Punjab was 46.68:53.32 for indigenous cows, 88.33:11.67 for crossbred cows, and 89.65:10.35 for buffaloes. The ratio of crossbred females has increased overtime, while that of indigenous females has decreased in the state. The female-male ratio in case of buffalos has stabilized overtime.

Milk production of Punjab has been represented in the Table 2. It has been observed that milk population has grown tremendously from 3.22 million tonnes in 1980 to 10.77 million tonnes in 2015 with a compound growth rate of 3.47%. The overtime growth rate of milk production in Punjab has declined as the compound growth rate during 1980 and 1990 was 4.45%, which decreased to 3.08% during 2011 to 2015. The overall compound growth rate of milk production between 1980 and 2015 was observed to be 3.47% . It can be inferred from the Table 1 and Table 2 that the animal population in the state has decreased overtime, but the milk production has increased. It is due to the improved milk yield of the animals by up-gradation of local breeds to crossbred animals.

**Table 2. Milk Production and Growth Rates in Punjab**

| Year | Milk production (million tonnes) | Period | Compound Growth Rate (%) |
|---|---|---|---|
| 1980-81 | 3.22 | 1980s | 4.45 |
| 1990-91 | 5.14 | 1990s | 4.42 |
| 2000-01 | 7.77 | 2000s | 2.18 |
| 2010-11 | 9.42 | 2011-2015 | 3.08 |
| 2015-16 | 10.77 | 1981-2015 | 3.47 |

Source: Economic and Statistical Organisation (2015)

**Table 3. Socioeconomic Profile of the Sample Households (2015-16)**

| Socio-economic Characteristics / Category | | Central | | South Western | | Sub Mountainous | | Punjab | |
|---|---|---|---|---|---|---|---|---|---|
| | | **Small** | **Medium** | **Small** | **Medium** | **Small** | **Medium** | **Small** | **Medium** |
| **Education** | Illiterate | 5 | 2 | 5 | 4 | 5 | 0 | 15 | 6 |
| | | (10.42) | (16.67) | (11.63) | (23.53) | (11.90) | (0.00) | (11.28) | (12.77) |
| | Under matriculation | 21 | 2 | 16 | 3 | 18 | 7 | 55 | 12 |
| | | (43.75) | (16.67) | (37.21) | (17.65) | (42.86) | (38.89) | (41.35) | (25.53) |
| | Matriculation & 10+2 | 20 | 8 | 18 | 8 | 17 | 10 | 55 | 26 |
| | | (41.67) | (66.67) | (41.86) | (47.06) | (40.48) | (55.56) | (41.35) | (55.32) |
| | Graduate and above | 2 | 0 | 4 | 2 | 2 | 1 | 8 | 3 |
| | | (4.17) | (0.00) | (9.30) | (11.76) | (4.76) | (5.56) | (6.02) | (6.38) |
| | **Total** | **48** | **12** | **43** | **17** | **42** | **18** | **133** | **47** |
| | | **(100.00)** | **(100.00)** | **(100.00)** | **(100.00)** | **(100.00)** | **(100.00)** | **(100.00)** | **(100.00)** |
| **Main Occupation** | Dairy | 6 | 7 | 2 | 5 | 6 | 9 | 14 | 21 |
| | | (12.50) | (58.33) | (4.65) | (29.41) | (14.29) | (50.00) | (10.53) | (44.68) |
| | Farming | 31 | 5 | 32 | 12 | 27 | 9 | 90 | 26 |
| | | (64.58) | (41.67) | (74.42) | (70.59) | (64.29) | (50.00) | (67.67) | (55.32) |
| | Labor | 4 | 0 | 4 | 0 | 7 | 0 | 15 | 0 |
| | | (8.33) | 0 | (9.30) | 0 | (16.67) | 0 | (11.28) | (0.00) |
| | Others | 7 | 0 | 5 | 0 | 2 | 0 | 14 | 0 |
| | | (14.58) | (0.00) | (11.63) | (0.00) | (4.76) | (0.00) | (10.53) | (0.00) |
| | **Total** | **48** | **12** | **43** | **17** | **42** | **18** | **133** | **47** |
| | | **(100.00)** | **(100.00)** | **(100.00)** | **(100.00)** | **(100.00)** | **(100.00)** | **(100.00)** | **(100.00)** |
| **Social status** | General | 36 | 10 | 29 | 13 | 24 | 15 | 89 | 38 |
| | | (75.00) | (83.33) | (67.44) | (76.47) | (57.14) | (83.33) | (66.92) | (80.85) |
| | SC | 9 | 0 | 11 | 0 | 14 | 1 | 34 | 1 |
| | | (18.75) | (0.00) | (25.58) | (0.00) | (33.33) | (5.56) | (25.56) | (2.13) |
| | Others | 3 | 2 | 3 | 4 | 4 | 2 | 10 | 8 |
| | | (6.25) | (16.67) | (6.98) | (23.53) | (9.52) | (11.11) | (7.52) | (17.02) |
| | **Total** | **48** | **12** | **43** | **17** | **42** | **18** | **133** | **47** |
| | | **(100.00)** | **(100.00)** | **(100.00)** | **(100.00)** | **(100.00)** | **(100.00)** | **(100.00)** | **(100.00)** |
| **Experience in dairying** | < 5 years | 5 | 2 | 3 | 3 | 2 | 1 | 10 | 6 |
| | | (10.42) | (16.67) | (6.98) | (17.65) | (4.76) | (5.56) | (7.52) | (12.77) |
| | 5- 15 years | 12 | 4 | 10 | 6 | 8 | 4 | 30 | 14 |
| | | (25.00) | (33.33) | (23.26) | (35.29) | (19.05) | (22.22) | (22.56) | (29.79) |
| | 15-30 years | 10 | 3 | 14 | 3 | 15 | 7 | 39 | 13 |
| | | (20.83) | (25.00) | (32.56) | (17.65) | (35.71) | (38.89) | (29.32) | (27.66) |
| | >30 years | 21 | 3 | 16 | 5 | 17 | 6 | 54 | 14 |
| | | (43.75) | (25.00) | (37.21) | (29.41) | (40.48) | (33.33) | (40.60) | (29.79) |
| | **Total** | **48** | **12** | **43** | **17** | **42** | **18** | **133** | **47** |
| | | **(100.00)** | **(100.00)** | **(100.00)** | **(100.00)** | **(100.00)** | **(100.00)** | **(100.00)** | **(100.00)** |

Table contd. on next page

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Land ownership status** | Landless | 4 | 0 | 3 | 0 | 4 | 0 | 11 | 0 |
| | | (8.33) | (0.00) | (6.98) | (0.00) | (9.52) | (0.00) | (8.27) | (0.00) |
| | 1 - 2.5 acres | 18 | 3 | 8 | 0 | 15 | 7 | 41 | 10 |
| | | (37.50) | (25.00) | (18.60) | (0.00) | (35.71) | (38.89) | (30.83) | (21.28) |
| | 2.5 - 5 acres | 12 | 4 | 9 | 4 | 11 | 3 | 32 | 11 |
| | | (25.00) | (33.33) | (20.93) | (23.53) | (26.19) | (16.67) | (24.06) | (23.40) |
| | 5 - 10 acres | 11 | 4 | 18 | 10 | 10 | 6 | 39 | 20 |
| | | (22.92) | (33.33) | (41.86) | (58.82) | (23.81) | (33.33) | (29.32) | (42.55) |
| | > 10 acres | 3 | 1 | 5 | 3 | 2 | 2 | 10 | 6 |
| | | (6.25) | (8.33) | (11.63) | (17.65) | (4.76) | (11.11) | (7.52) | (12.77) |
| | **Total** | **48** | **12** | **43** | **17** | **42** | **18** | **133** | **47** |
| | | **(100.00)** | **(100.00)** | **(100.00)** | **(100.00)** | **(100.00)** | **(100.00)** | **(100.00)** | **(100.00)** |
| **Family size** | Up to 4 | 17 | 3 | 9 | 0 | 9 | 5 | 35 | 8 |
| | | (35.42) | (25.00) | (20.93) | (0.00) | (21.43) | (27.78) | (26.32) | (17.02) |
| | 5-8 | 31 | 6 | 27 | 12 | 28 | 8 | 86 | 26 |
| | | (64.58) | (50.00) | (62.79) | (70.59) | (66.67) | (44.44) | (64.66) | (55.32) |
| | >8 | 0 | 3 | 7 | 5 | 5 | 5 | 12 | 13 |
| | | (0.00) | (25.00) | (16.28) | (29.41) | (11.90) | (27.78) | (9.02) | (27.66) |
| | **Total** | **48** | **12** | **43** | **17** | **42** | **18** | **133** | **47** |
| | | **(100.00)** | **(100.00)** | **(100.00)** | **(100.00)** | **(100.00)** | **(100.00)** | **(100.00)** | **(100.00)** |

**(2) Socioeconomic Profile of the Selected Dairy Farmers :** The rural households in a typical village community in India exhibit a great heterogeneity in socioeconomic characteristics, and Punjab is no exception to this. An attempt has been made to document the important socioeconomic characteristics of the respondent households which include education, main occupation, social status, experience in dairying, land ownership status, and total family size. The information pertaining to the socioeconomic details of the sample households of Central, South Western, and Sub Mountainous zones are presented in the Table 3.

**(i) Education :** Education status of rural households is considered to have a strong bearing on the production of milk. The distribution of sampled households according to the education of the household head is presented in the Table 3. It is evident from the table that in Punjab, only 11.28% heads of households in small size farm category were illiterate and the remaining 88.72% were literate. Amongst the literate farmers, 82.70% had studied up to matriculation and higher secondary level. Only 6.02% small farmers were graduates or post graduates. In the medium size farm category, 12.77% farmers were illiterate, 80.85% had studied up to matriculation and higher secondary level, and 6.38% were graduates or post graduates. As per the zone wise analysis, the highest proportion of literate farmers in the small size farm category were found in the Central zone (89.58%) , but in the medium category, all the farmers in the Sub Mountainous zone were literate.

**(ii) Main Occupation :** The information regarding the main occupation of the households is useful to analyze the adoption status of dairy farming as a main or subsidiary occupation. A perusal of the Table 3 reveals that in small size farm category, 67.67% of the households had crop farming as their main occupation, while dairy farming was adopted as the main occupation only by 10.53% of the households. In the medium size farm category, 44.68% farmers had dairy as their main occupation, while 55.32% of the households adopted crop farming as their main occupation.

**(iii) Social Status :** A perusal of the Table 3 also summarizes the social status of the sample dairy farmers. Maximum proportion of the farmers from both small and medium size farm categories belonged to the general category in Punjab as about 67% small and 81% medium size category farmers belonged to the general category. In the small size farm category, about 25% of the farmers belonged to scheduled caste and remaining 7.52% of the farmers belonged to other castes (BC, OBC, ST, etc.). In the medium size farm category, only 2.13% of the farmers belonged to scheduled caste and 17.02% belonged to other caste groups.

**(iv) Experience in Dairying :** The information regarding experience in dairying is presented in the Table 3. A perusal of the Table 3 reveals that in the small size farm category, 51.88% farmers were having up to 30 years of experience and the remaining 40.60% were having more than 30 years of experience in dairying. In the medium size farm category, 57.45% farmers had up to 30 years of experience, and the remaining 29.79% had more than 30 years of experience in dairying. The results of the study of Geetha and Lavanya (2013) in Coimbatore district showed that about one-third of the farmers in the small farm group had more than 20 years of experience in dairying, but in the medium farm group, this proportion was nearly about 60%.

**(v) Land Ownership Status :** The Table 3 shows the land ownership status of the sample dairy farmers. About 8% of the small farmers were landless, while no farmer in the medium size farm category was landless. In the small size farm category, 54.89% farmers owned land up to 5 acres and the remaining 36.84% had more than 5 acres of land. In the medium size farm category, the proportion of farmers having land up to 5 acres was 44.68% and 55.32% of the farmers had more than 5 acres.

**(vi) Family Size :** The information regarding the family size of the sample respondents is presented in the Table 3. Family size and its composition is an important contributory factor in bovine rearing. It is basically a labour intensive activity and much of the labour requirements are met from the family itself. The family size varied among different categories of households. In case of small size farm category, the average family size was between 5 to 8 members as 64.66% of the households fell into this category and the same trend was followed by medium size farm category (55.32%). Zone wise analysis clearly shows that both the small and medium size category farmers had average family size between five to eight members ; whereas, in Tamil Nadu, the maximum number of dairy farmers had an average family size between three to six members (Selvaraj & Balajikumar, 2015).

**(3) Category Wise Herd Composition and Size :** It is important to understand the herd composition and size of animal holding on different size categories of dairy farmers.

The information regarding the number of bovines on small and medium sized dairy farms and their herd composition has been presented in the Table 4. A perusal of the Table 4 reveals that the proportion of in-milk buffaloes in small size dairy farms was the highest in Central zone with 31.47 % followed by South Western zone and Sub Mountainous zone with 28.96 % and 27.64%, respectively with an overall value of 29.38% in the state.

In the medium size farm category, there was not much difference among the zones. It was highest in South Western zone with 34.52 % followed by Sub Mountainous zone and Central zone with 34.33 % and 33.33 %, respectively and the overall value in the state was found to be 33.69%. Furthermore, in case of cows, the proportion of in-milk cows in small size dairy farms, it was highest in Central zone with 16.24% followed by Sub Mountainous zone and South Western zone with 13.07% and 13.04%, respectively with an overall value of 14.10 % in the state. In the medium size farm category, this proportion was highest in Sub Mountainous zone with 18.67 % followed by Central zone and South Western zone with 18.52 % and 17.86 %, respectively and the overall value in the state was found to be 18.34 %. The proportion of in-milk buffaloes and cows is directly related to the farm size category. It was highest in medium sized dairy farms and lowest in small sized dairy farms in all the three zones.

**Table 4. Zone Wise Herd Composition in Punjab, 2015-16**

| Category/Type of animal | Buffalo | | Cow | | Calves | Heifers | Bullocks | Total |
|---|---|---|---|---|---|---|---|---|
| | In milk | Dry | In milk | Dry | | | | |
| | | | **CENTRAL** | | | | | |
| **Small** | 62 | 33 | 32 | 15 | 34 | 11 | 10 | **197** |
| | (31.47) | (16.75) | (16.24) | (7.61) | (17.26) | (5.58) | (5.08) | **(100.00)** |
| | [65.26] | [34.74] | [68.08] | [31.92] | | | | |
| **Medium** | 45 | 15 | 25 | 6 | 22 | 15 | 7 | **135** |
| | (33.33) | (11.11) | (18.52) | (4.44) | (16.30) | (11.11) | (5.19) | **(100.00)** |
| | [75.00] | [25.00] | [80.65] | [19.35] | | | | |
| | | | **SOUTH WESTERN** | | | | | |
| **Small** | 60 | 28 | 27 | 19 | 36 | 22 | 15 | **207** |
| | (28.96) | (13.53) | (13.04) | (9.18) | (17.39) | (10.63) | (7.25) | **(100.00)** |
| | [68.18] | [31.82] | [58.70] | [41.30] | | | | |
| **Medium** | 58 | 24 | 30 | 8 | 27 | 12 | 9 | **168** |
| | (34.52) | (14.29) | (17.86) | (4.76) | (16.07) | (7.14) | (5.36) | **(100.00)** |
| | [70.73] | [29.27] | [78.95] | [21.05] | | | | |
| | | | **SUB MOUNTAINOUS** | | | | | |
| **Small** | 55 | 23 | 26 | 20 | 45 | 18 | 12 | **199** |
| | (27.64) | (11.56) | (13.07) | (10.05) | (22.61) | (9.05) | (6.03) | **(100.00)** |
| | [70.51] | [29.49] | [56.52] | [43.48] | | | | |
| **Medium** | 57 | 15 | 31 | 5 | 32 | 15 | 11 | **166** |
| | (34.33) | (9.04) | (18.67) | (3.01) | (19.28) | (9.04) | (6.63) | **(100.00)** |
| | [79.17] | [20.83] | [86.11] | [13.89] | | | | |
| | | | **PUNJAB** | | | | | |
| **Small** | 177 | 84 | 85 | 54 | 115 | 51 | 37 | **603** |
| | (29.35) | (13.93) | (14.10) | (8.96) | (19.07) | (8.46) | (6.14) | **(100.00)** |
| | [67.82] | [32.18] | [61.15] | [38.85] | | | | |
| **Medium** | 160 | 54 | 86 | 19 | 81 | 42 | 27 | **469** |
| | (33.69) | (11.94) | (18.34) | (4.05) | (17.27) | (8.96) | (5.76) | **(100.00)** |
| | [74.77] | [25.23] | [81.90] | [18.10] | | | | |

Note: Figures in parenthesis indicate the percentage to total animals.

Figures in square parenthesis indicate the percentage of in-milk to milch animals.

**(4) Milk Yield of In-Milk and Milch Animals :** The profitability of dairy farming depends mainly on milk production and milk yield of milch animals. The milk yield and production varies across farm size categories and zones. Milk yield and herd size relationship has also been depicted in the Table 5. A perusal of the Table 5 shows that the average milk yield/in-milk animal among buffaloes in small size farm category was found to be the highest in Central zone (6.41 L/day) followed by Sub Mountainous zone (6.11 L/day) and South Western zone (5.27 L/day) with an overall figure of 5.93 L/day in Punjab, while the milk yield/milch animal in case of buffaloes in small size farm category was the highest in Central zone (4.30 L/day) followed by South Western zone (4.16 L/day) and Sub Mountainous zone (3.99 L/day) with an overall figure of 4.15 L/day in Punjab. The average milk yield/in-milk animal among buffaloes in medium size farm category was found to be the highest in Central

**Table 5. Zone Wise Milk Yield of In-Milk and Milch Animals in Punjab, 2015-16**

| Category | Milk yield per In milk animal (L/day) | | Milk yield per milch animal (L/day) | |
|---|---|---|---|---|
| | Buffalo | Cow | Buffalo | Cow |
| | | **CENTRAL** | | |
| **Small** | 6.41 | 11.13 | 4.30 | 7.85 |
| **Medium** | 7.86 | 12.90 | 4.88 | 9.22 |
| | | **SOUTH WESTERN** | | |
| **Small** | 5.27 | 6.41 | 4.16 | 5.28 |
| **Medium** | 6.79 | 9.28 | 4.42 | 5.63 |
| | | **SUB MOUNTAINOUS** | | |
| **Small** | 6.11 | 8.40 | 3.99 | 6.28 |
| **Medium** | 7.42 | 9.80 | 4.19 | 6.83 |
| | | **PUNJAB** | | |
| **Small** | 5.93 | 8.65 | 4.15 | 6.47 |
| **Medium** | 7.36 | 10.66 | 4.50 | 7.23 |

zone (7.86 L/day) followed by Sub Mountainous zone (7.42 L/day) and South Western zone (6.79 L/day) with an overall figure of 7.36 L/day in Punjab, and the average milk yield/milch animal in medium size farm category was found to be the highest in Central zone (4.88 L/day) followed by South Western zone (4.42 L/day) and Sub Mountainous zone (4.19 L/day) with an overall figure of 4.50 L/day in Punjab.

In case of cows, the milk yield/in-milk animals in small category was found to be highest in Central zone (11.13 L/day) followed by Sub Mountainous zone (8.40 L/day) and South Western zone (6.41 L/day) with an overall figure of 8.65 L/day, and the milk yield/milch animal in small category was also highest in Central zone (7.85 L/day) followed by Sub Mountainous zone (6.28 L/day) and South Western zone (5.28 L/day) with an overall figure of 6.47 L/day in Punjab. The milk yield/in-milk cows in medium category was highest in Central zone (12.90 L/day) followed by Sub Mountainous zone (9.80 L/day) and South Western zone (9.28 L/day), with an overall figure of 10.66 L/day and similar pattern was observed for milk yield/milch animals. It was found to be highest in Central zone (9.22 L/day) followed by Sub Mountainous zone (6.83 L/day) and South Western zone (5.63 L/day) with an overall figure of 7.23 L/day. The study by Singh, Kaur, Kaur, and Singh (2013) in Punjab state revealed that the milk yield/in-milk animal was found to be 7.77 L/day and 10.57 L/day for buffaloes and cows, respectively and the milk yield/milch animal was found to be 5.70 L/day and 7.59 L/day for buffaloes and cows, respectively. The existing milk yield of Punjab was found to be 8.73L/day for buffaloes and 11.21L/day for cows (Department of Animal Husbandry, Dairying and Fisheries, Ministry of Agriculture, 2016).

In a category wise analysis, a direct relationship between milk yield and herd size was observed in all three zones in both cows and buffaloes. This was due to the prevalence of economies of scale, better management, and better quality of animals on medium-sized dairy farms. The zone wise difference in milk yield was due to the difference in quality and quantity of green fodder and concentrates fed to the animals across three zones was found to be another reason of difference in milk yield.

**(5) Milk Production, Consumption, and Marketed Surplus of Milk :** Marketed surplus depends on many factors like total milk production, consumption, family size, income etc. of the household. Keeping this in view, average milk production, consumption, and marketed surplus of milk per household among different categories of dairy farms were worked out and are presented in the Table 6. It is revealed from the Table that the average daily milk production per household in small size farm category was 15.56 lts in summer and 17.48 lts in winter season. The

**Table 6. Zone Wise Average Production, Consumption, and Marketed Surplus of Milk in Punjab, 2015-16**

| Category | Average milk yield per milch animal (L/day/farm) | Summer | | | | Winter | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Average per farm (L/day/farm) | | | | Average per farm (L/day/farm) | | | |
| | | Milk production | Home consumption | Suckled by calves | Marketed surplus | Milk production | Home Consumption | Suckled by calves | Marketed surplus |
| | | | | | CENTRAL | | | | |
| **Small** | 5.48 | 16.24 | 4.63 | 0.94 | 10.67 | 18.54 | 4.54 | 1.09 | 12.91 |
| | | (100.00) | (30.38) | (6.16) | (63.46) | (100.00) | (24.48) | (5.88) | (69.64) |
| **Medium** | 6.36 | 32.45 | 5.03 | 1.63 | 25.79 | 37.45 | 4.92 | 1.83 | 30.70 |
| | | (100.00) | (15.74) | (5.10) | (79.15) | (100.00) | (13.14) | (4.89) | (81.97) |
| | | | | | SOUTH WESTERN | | | | |
| **Small** | 4.54 | 15.35 | 4.93 | 0.70 | 9.72 | 17.19 | 4.17 | 0.93 | 12.09 |
| | | (100.00) | (34.35) | (4.88) | (60.78) | (100.00) | (24.26) | (5.41) | (70.33) |
| **Medium** | 4.80 | 28.34 | 5.65 | 1.62 | 21.07 | 32.56 | 5.53 | 2.08 | 24.95 |
| | | (100.00) | (19.94) | (5.72) | (74.82) | (100.00) | (16.98) | (6.39) | (76.63) |
| | | | | | SUB MOUNTAINOUS | | | | |
| **Small** | 4.84 | 15.08 | 4.40 | 0.62 | 10.06 | 16.72 | 4.05 | 0.88 | 11.79 |
| | | (100.00) | (31.25) | (4.40) | (64.35) | (100.00) | (24.22) | (5.26) | (70.51) |
| **Medium** | 5.07 | 30.57 | 5.41 | 1.36 | 23.80 | 35.26 | 4.69 | 1.98 | 28.59 |
| | | (100.00) | (17.70) | (4.45) | (77.85) | (100.00) | (13.30) | (5.62) | (81.08) |
| | | | | | PUNJAB | | | | |
| **Small** | 4.95 | 15.56 | 4.65 | 0.75 | 9.09 | 17.48 | 4.25 | 0.97 | 12.26 |
| | | (100.00) | (32.09) | (5.18) | (62.73) | (100.00) | (24.31) | (5.55) | (70.14) |
| **Medium** | 5.41 | 30.29 | 5.36 | 1.54 | 23.39 | 35.09 | 5.05 | 1.96 | 28.08 |
| | | (100.00) | (17.69) | (5.08) | (77.22) | (100.00) | (14.39) | (5.59) | (80.02) |

Note: Figures in parenthesis indicate the percentage.

marketed surplus accounted for 62.73% of the total milk production in summer season and 70.14 % in winter season in the state. In the medium size farm category, the average daily milk production per household was 30.29 lts in summer and 35.09 lts in winter season. The marketed surplus in case of medium size farm category accounted for 77.22 % of the total milk production in summer season and 80.02 % in the winter season in the state. It is clear from the table that marketed surplus was higher in winter season as compared to summer season. The study by Meena and Jain (2012) in Alwar district of Rajasthan also reported similar observations. The average milk production across different seasons indicates that the highest milk production was recorded in the winter season (15.06 L) as compared to the summer season (10.52 L).

In small size farm category, the proportion of marketed surplus of milk was highest in Sub Mountainous zone (64.35 %) in summer season followed by Central zone (63.46 %) and South Western zone (60.78%). On the other hand, in the winter season, the proportion of marketed surplus of milk was highest in Sub Mountainous zone (70.51%) followed by South Western zone (70.33 % ) and Central zone (69.64%). In medium size farm category, the proportion of marketed surplus of milk was highest in Central zone (79.15%) in summer season followed by Sub Mountainous zone (77.85%) and South Western zone (74.82%). The pattern followed in winter season was the same as in summer season as the proportion of marketed surplus of milk was highest in Central zone (81.97%) in summer season followed by Sub Mountainous zone (81.08%) and South Western zone (76.63 %). The season wise difference in the marketed surplus of milk was due to the decreased milk production in summer season as

compared to winter season. Another reason for reduced marketed surplus in summer season was increase in quantity of milk retained at home. The results of the table reveal that in small size farm category, 32.09% and 24.31% of the total milk produced was retained at home in summer and winter season, respectively. On the other hand, in medium size farm category, the proportion of milk retained at home was found to be 17.69 % in summer and 14.39% in winter season. In category wise analysis, the proportion of marketed surplus of milk was observed to be higher in medium sized category as the quantity of total milk produced was very high as compared to small size category farmers.

**(6) Adoption of Various Milk Marketing Channels by the Farmers :** The major marketing channels involved in the marketing of milk are presented in the Table 7. The results of the table reveal that mainly there are five milk marketing channels existing in the state. Out of these five, two channels are categorized under organized sector and remaining three come under thee unorganized sector of marketing. Market outlets under organized and unorganized sector handled different volumes of milk. Channel-II and Channel-III were categorized under organized sector and Channel-I, Channel-IV, and Channel-V were categorized under unorganized sector. Different farmers adopt different marketing channels to sell their produce.

The Figures 1 and 2 represent the proportion of households choosing different marketing channels for selling their produce. The results of the Figures 1 and 2 reveal that in the small size farm category, 52.59 % of the households preferred to adopt organized channels, while 47.41% of the households preferred unorganized channels to sell their produce, but in the medium size farm category, 55.50% of the households preferred organized channels while 44.50% of the households preferred unorganized channels. Kaur and Kaur (2016) reported that about 62% of the small farmers preferred organized or modern sector to sell their produce. It is further observed that the maximum number of households in the small category preferred to adopt Channel-III as the proportion of households selling milk through this channel was found to be 26.99% followed by Channel-IV (26.58 %), Channel-II (25.60%), Channel-V (16.19%), and Channel-I (4.64%) in the state. However, in the medium size farm category, about 33% of the households preferred to adopt Channel-II followed by Channel-III (21.84%), Channel-IV (21.73%), Channel-V (12.37%), and Channel-I (10.40 %) in the state. It is clear from both the figures that the proportion of medium category households adopting organized marketing channels was higher than the small category households.

**Table 7. Existing Milk Marketing Channels in Punjab, 2015-16**

| Channel Name | Description of Channel |
|---|---|
| **Organized Marketing Channels** | |
| Channel II | Producer → Co-operative Milk Plant → Consumers |
| Channel III | Producer → Private Milk Plant → Consumers |
| **Unorganized Marketing Channels** | |
| Channel I | Producer → Consumer |
| Channel IV | Producer → Milk Vendor → Consumers |
| Channel V | Producer → Milk Vendors → Sweet Shops/Creameries → Consumers |

**(7) Average Milk Price Received by Farmers in Summer and Winter Season :** The price per unit of milk sold plays an important role in determining the profitability and net cash returns from milk production. The price of milk sold varies across different zones and size categories. The information related to milk prices received by selected dairy farmers for buffalo and cow's milk in three zones of Punjab is presented in the Table 8. The average buffalo milk price was the highest in both categories in Central zone (₹ 35.42/lt in summer and ₹ 32.86/lt in winter for

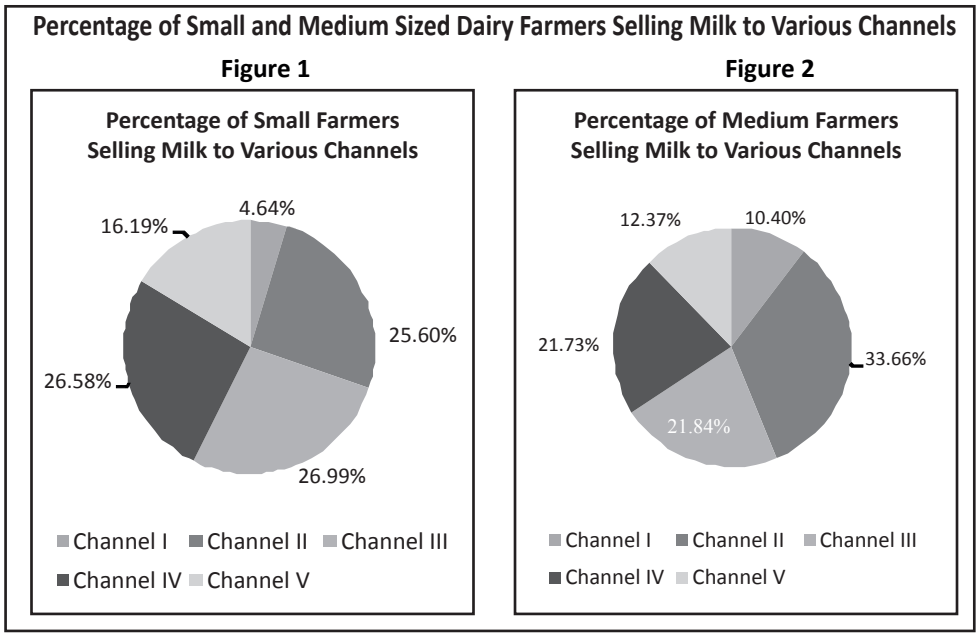


**Table 8. Zone Wise Seasonal Average Milk Prices Received by Farmers in Punjab, 2015-16 (₹/L)**

| Category | Buffalo | | Cow | |
|---|---|---|---|---|
| | Summer | Winter | Summer | Winter |
| | | **CENTRAL** | | |
| **Small** | 35.42 | 32.86 | 26.32 | 24.61 |
| **Medium** | 37.41 | 35.21 | 27.40 | 25.80 |
| | | **SOUTH WESTERN** | | |
| **Small** | 30.58 | 28.93 | 24.47 | 22.09 |
| **Medium** | 31.71 | 29.74 | 26.13 | 24.60 |
| | | **SUB MOUNTAINOUS** | | |
| **Small** | 33.17 | 29.56 | 25.05 | 23.63 |
| **Medium** | 34.01 | 32.44 | 26.23 | 24.74 |
| | | **PUNJAB** | | |
| **Small** | 33.06 | 30.78 | 25.28 | 23.44 |
| **Medium** | 34.38 | 32.46 | 26.58 | 25.05 |

**Summer** ***t* - value: - 2.276; *df* : 178; Sig (2-tailed) : 0.024**

**Winter** ***t* - value: - 2.207; *df* : 178; Sig (2-tailed) : 0.029**

small size farm category and ₹ 37.41/lt in summer and ₹ 35.21/lt in winter for medium size farm category) and lowest in South Western zone (₹ 30.58/lt in summer and ₹ 28.93/lt in winter for small size farm category and ₹ 31.71/lt in summer and ₹ 29.74/lt in winter for medium size farm category). The average price for buffalo milk received by small size category farmers in summer was ₹ 33.06/lt and ₹ 30.78/lt in winter in the state. In case of medium-size farm category, the average price received for buffalo milk was ₹ 34.38/lt in summer and ₹ 32.46/lt in winter. The zone wise pattern followed for cow milk prices was same as that in case of price received for buffalo

milk. The average price for cow milk received by small size category farmers in summer was ₹ 25.28/lt and ₹ 23.44/lt in winter in the state. For medium-size farm category, the average price received for cow milk was ₹ 26.58/lt in summer and ₹ 25.05/lt in winter.

The relatively higher price of milk in Central zone was on account of higher demand of milk and relatively more sale through organized sector as compared to other zones. In the summer season, the milk production decreased due to which the price of milk increased. The medium size category farmers received more prices as compared to small category farmers due to large quantity of their produce, which increased their bargaining power regarding the price of milk. There is a significant difference between the price received by small and medium-size category farmers in both summer and winter season.

## Conclusion

From the foregoing discussion, it is evident that the about 88% of the farmers were literate in both small and medium sized category. It is observed that more medium sized farmers adopted dairy as their main occupation as compared to small sized dairy farmers. From the study, it has been learned that there is a gap between existing milk yield (buffaloes : 8.72 L/day and cows: 11.21 L/day) in Punjab state and milk yield of small (buffaloes: 5.93 L/day and cows: 8.65 L/day) and medium farmers (buffaloes: 7.36 L/day and cows: 10.66 L/day). Further, it is stated that the price of milk for small size category farmers was found to be ₹ 28.17/lt in winter and ₹ 29.86/lt in summer and in medium size category, price of milk was found to be ₹ 30.35/lt in winter and ₹ 32.06/lt in summer. Therefore, there exists an inconsistency and non-uniformity in pricing of milk.

## Policy Implications

There is a need to improve the quality of animals to increase the profits of small and medium-sized farmers, for which genetic improvement of cattle should be done on a priority basis. As the share of the organized sector consisting of cooperative societies (Verka, Amul), private players (Nestle, Reliance) etc. in total marketed milk as compared to the unorganized sector (milk vendors, halwais etc.) is less, thus it is suggested that there is a huge realm for growth and improvement in the organized sector. Plus, the fact that elasticity of marketed surplus with respect to milk, which is positive in general, implies that there is enough scope for raising the price of milk in order to induce farmers to increase milk production and hence stimulate more milk for marketing. Higher and stable prices for milk must be given to the farmers. Cheaper inputs like cattle feed, veterinary care, etc. must be provided to the farmers by the milk buyers in order to increase their profit. The government must follow a conducive integrated policy for the improvement of the dairy enterprise in Punjab.

## Limitations of the Study and Scope for Further Research

Since no current study covering all the points regarding socioeconomic reforms and milk production, marketing, and consumption has been done in the state, the present study will act as the source of information to future researchers and stakeholders in the dairy industry. Due to time constraints, only one time data was collected for the study purpose. To generate more elaborative results, the future researchers may collect the overtime data.

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