

Factors Influencing Choice Probability in Milk Marketing: Evidence from Punjab's Dairy Sector

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ABSTRACT

This study examined the determinants of dairy farmers' participation in organised and unorganised milk marketing channels in Punjab, using primary data collected from 180 dairy farmers and 100 market intermediaries during 2024-25. The results of the study show that participation in organized milk marketing channels is strongly influenced by factors such as education level, geographic location, timely payment, availability of inputs at reasonable costs, and provision of veterinary services. While unorganised markets continue to attract farmers due to higher spot pricing and more flexible payment options, organised channels provide greater transparency, price stability, and access to support services. The findings suggest that organised channels compete primarily through service-based incentives rather than price advantages. The study emphasizes the need for targeted policy interventions to strengthen organized milk marketing channels; expansion of cooperative outreach and payment reliability could enhance farmer's participation in the organized channels and contribute to a more efficient and inclusive dairy marketing system in Punjab.

Keywords: Milk Marketing Channels, Cooperatives, Organised, Unorganised Markets, Channel Choice, Determinants

JEL Code: Q13, L14, Q12, O13, R11

I

INTRODUCTION

The livestock sector is an integral component of the Indian agrarian economy, marked by rapid expansion and a profound impact on rural livelihoods. Over the past five years, the sector recorded a Compound Annual Growth Rate (CAGR) of 7.38 percent, significantly outperforming other agricultural sub-sectors (Government of India, 2023). In this context, dairying has become an essential tool for reducing poverty and creating employment. With an expected 239.31 million tonnes produced in 2023–2024, India continues to lead the world in milk production, accounting for about 24.64 percent of global production. Despite India's status as a "Milk Surplus" nation, the marketing sector remains highly fragmented, divided into organised and unorganised sectors. About 39 percent of marketed milk is supplied by the organised sector, which includes corporate processors like Nestle and dairy cooperatives like MILKFED and Amul. On the other hand, the remaining 61 percent is still handled by the unorganised sector, which includes direct consumer sales, halwais and local vendors (Mitsui, 2017). Despite the "White Revolution" and the growth of cooperative networks, informal channels continue to dominate the market. Choosing a marketing channel is a strategic decision for smallholder farmers, who account for more than 70 percent of India's total milk production (Brar et al., 2017; Sharma, 2015), and is influenced by transaction costs, price volatility and infrastructure limitations.

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Punjab holds a special place in India's dairy map, ranking sixth in production and recording per capita milk availability of 1245 grams, nearly three times the national average (Government of India, 2023). Dairy farming offers a profitable and sustainable option in a state grappling with the ecological effects of the extensive wheat-paddy monoculture, such as soil erosion and declining water levels (Kaur, 2021). While institutions like the Punjab State Cooperative Milk Producer's Federation Limited (MILKFED) and its brand Verka have established a robust presence, the organised sector in Punjab captures only 18 percent of total milk production, indicating heavy reliance on conventional, often exploitative informal channels (Brar et al., 2017). Small and medium-sized farmers sometimes find themselves at a crossroads; the informal sector frequently offers quick cash payments and lower entry barriers, while the organised sector offers quality-based pricing and stability (Kumar et al., 2011).

The marketing efficiency of the dairy sector depends heavily on how producers navigate available channels. While previous research has focused on marketing margins and costs (Thakur et al., 2020), there remains a critical need to understand the behavioural and socio-economic determinants that drive a farmer's choice among cooperatives, private processors and local vendors. This selection process is strongly influenced by variables such as the amount of marketable surplus, distance to collection locations, credit availability and education level (Birthal et al., 2017). In Punjab, where the supply chain is evolving from traditional to organised systems, identifying these determinants is crucial for policymakers seeking to integrate smallholders into modern supply chains. Understanding why farmers opt for one channel over another can inform strategies that reduce marketing costs and maximise the producer's share in the consumer's rupee. In light of this, the primary objective of the present study is to examine the determinants of dairy farmers' choice of milk marketing channel and provide empirical evidence on the socio-economic factors that shape these decisions.

II

MATERIALS AND METHODS

2.1 Selection of Study Area

This study was conducted during 2024-25 across three agroclimatic zones of Punjab; Sub-mountainous zone I, Central Plain zone II, and South-western zone III. One district was purposively selected from each zone based on high milk production within the respective zone. Accordingly, Hoshiarpur, Ludhiana, and Mansa were selected to represent the Sub-mountainous, Central Plain, and South-western zones, respectively. Selecting districts from different agroclimatic zones ensured adequate representation of the diverse dairy production and marketing conditions prevailing across the state. Two blocks were randomly selected from each district to capture diverse milk supply chain strategies, including both formal and informal systems. Subsequently, two villages from each block were randomly selected, yielding a total of twelve villages. Fifteen dairy producers were randomly sampled, resulting in a total of 180 respondents.

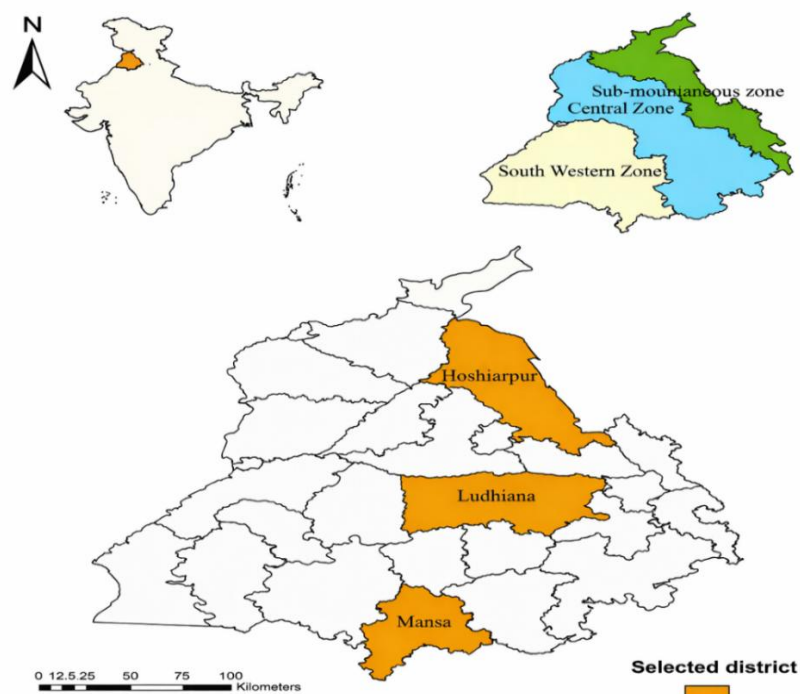


FIGURE 1. LOCATION OF THE STUDY AREA

2.2 Sampling Procedure

A multi-stage sampling approach was used to identify dairy farmers actively engaged in milk production and marketing. Farmers were ranked in ascending order by the number of milch animals they owned. The sample was divided into three categories using the cumulative cube root frequency method: small (up to 7 milch animals), medium (8 to 21 milch animals) and large (more than 21 milch animals). Among the total respondents, 54.44 percent were classified as small, 29.45 percent as medium and 16.11 percent as large dairy farmers. Across agroclimatic zones, small-scale farmers predominated in every region, with the south-western zone having the largest share (66.67%). Medium and large herd sizes varied by zone, highlighting regional differences in dairy farming practices.

The distribution of milk from farmers to ultimate consumers involves a number of intermediaries. Milk vendors, regional processors, private dairies, distributors, retailers, cooperative milk societies, and milk processing facilities are some of these middlemen. A random sample of 100 intermediaries was selected from the study area to examine the current milk marketing pattern and assess the roles played by these stakeholders. Accordingly, from the study region, thirty vendors, thirty private dairies, ten dairy cooperatives, two milk processing plants, and thirty milk distributors/retailers

engaged in milk marketing were selected. The sampling strategy ensured that every type of supply chain intermediary was adequately represented.

2.3 Statistical Techniques

The decision to participate in organised or unorganised markets reflects an individual farmer's choice to maximise utility. Binary logistic regression was used to analyse this decision and the factors influencing the farmer's choice. The dependent variable is binary, with a farmer opting for the organised milk marketing channel coded as 1 and a farmer opting for the unorganised milk marketing channel coded as 0. The independent variables include both qualitative and quantitative factors. The logistic regression model is commonly expressed in the general form:

$$\ln\left(\frac{P}{1-P}\right) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_n X_n$$

Where,

$\frac{P}{1-P}$ represents the odds ratio, showing the likelihood of a farmer choosing the organized market channel.

β_0 is the intercept (constant).

$\beta_1, \beta_2, \dots, \beta_n$ are the coefficients for the independent variables $X_1, X_2, \dots, X_n$, representing the factors that influence the farmer's decision.

The independent variables in the model included age, education level, family size, experience in dairy farming, marketed surplus of milk, milk price, distance to the selling point, doorstep collection facility, price stability, timely payment, provision of veterinary services, provision of advance, input availability at affordable prices, and transparency in measurement. For binary variables such as doorstep collection, price stability, timely payment, and access to services (e.g., veterinary care, input provision, transparency), the exponent of the respective coefficients represents the change in odds associated with a shift in the variable's status (e.g., from 'no' to 'yes'). The exponent of the coefficient shows how a one-unit change in a continuous variable, such as age, family size, experience, marketable surplus, milk price, and distance to the selling point, affects the odds ratio. In both cases, the coefficient's sign indicates whether the effect on the likelihood of the outcome is positive or negative. The ratio of the likelihood that an event will occur to the likelihood that it won't, or probability / (1 - probability), is known as the odds. As a result, the odds ratio provides information on the direction and association between each independent variable and the dependent outcome in the model.

The goodness of fit of the binary logistic regression model was assessed using the Hosmer–Lemeshow test, which is commonly used to evaluate how well the observed outcomes align with the predicted probabilities. The test's null hypothesis states that there is no significant difference between the observed and predicted

outcomes. Thus, a non-significant Hosmer–Lemeshow result ($p > 0.05$) indicates that the model fits the data well (Hosmer et al., 2013).

III

RESULTS AND DISCUSSION

This section presents empirical findings from primary survey data. The analysis begins with a concise overview of the socio-economic characteristics of the sampled dairy households and then presents binary logistic regression results on farmers' participation in organised (dairy cooperatives and private dairies) and unorganised (local vendors and direct sales to consumers) milk marketing channels.

3.1 Socio-economic Characteristics of Dairy Farmers

The demographic analysis of the sampled dairy farmers indicates that the majority (47.78%) were between 45 and 60 years, followed by the 30-45 years age

TABLE 1. SOCIO -DEMOGRAPHIC PROFILE OF SAMPLED DAIRY HOUSEHOLDS ACROSS HERD SIZE CATEGORIES IN PUNJAB, 2024-25

Socio-demographic	Herd size category (Number)			
	Small (n=98)	Medium (n=53)	Large (n=29)	Overall (n=180)
Age classification of respondents				
<30	9 (9.18)	3 (5.66)	3 (10.34)	15 (8.33)
30-45	31 (31.63)	22 (41.51)	17 (58.62)	70 (38.89)
45-60	55 (56.12)	24 (45.28)	7 (24.14)	86 (47.78)
>60	3 (3.06)	4 (7.55)	2 (6.90)	9 (5.00)
Educational classification of respondents (Number)				
Upto Primary	5 (5.10)	3 (5.66)	1 (3.45)	9 (5.00)
Middle	16 (16.33)	4 (7.55)	7 (24.14)	27 (15.00)
Matriculation	39 (39.80)	21 (39.62)	7 (24.14)	67 (37.22)
Senior secondary	32 (32.65)	17 (32.08)	10 (34.48)	59 (32.78)
Graduation and above	6 (6.12)	8 (15.09)	4 (13.79)	18 (10.00)
Main Occupation				
Dairy	17 (17.35)	29 (54.72)	27 (93.10)	73 (40.56)
Farming	65 (66.33)	21 (39.62)	2 (6.90)	88 (48.89)
Service	11 (11.22)	2 (3.77)	0 (0.00)	13 (7.22)
Others	5 (5.10)	1 (1.89)	0 (0.00)	6 (3.30)
Family Size				
≤ 4	37 (37.76)	16 (30.19)	9 (31.03)	62 (34.44)
5-8	57 (58.16)	33 (62.26)	11 (37.93)	101 (56.11)
> 8	4 (4.08)	4 (7.55)	9 (31.03)	17 (9.44)
Experience classification of respondents				
≤10	22 (22.45)	13 (24.53)	6 (20.69)	41 (22.78)
11-20	28 (28.57)	21 (39.62)	13 (44.83)	62 (34.44)
21-30	36 (36.73)	9 (16.98)	8 (27.59)	53 (29.44)
>30	12 (12.24)	10 (18.87)	2 (6.90)	24 (13.33)

Note: Figures in parentheses are the respective percentages of their total

group, which comprised 38.89 percent of the sample. Those below 30 and above 60 years accounted for 8.33 percent and 5.00 percent, respectively. In terms of education, 37.22 percent of respondents had completed matriculation and 32.78 percent had senior secondary education, whereas about 10 percent were graduates or higher; a smaller proportion had middle (15%) and primary (5%) education. Family size analysis indicated that the majority of small (58.16%) and medium (62.26%) herd households had 5 to 8 members, providing adequate labour for dairy operations; large herd households varied considerably, with 37.93 percent having five to eight people and 31.03 percent having more than eight people.

3.2 Distribution of Milk Disposal across Organised and Unorganised Supply Chains

Out of the five identified milk supply chains in Punjab during 2024–25, two were categorised under the organised sector, while the remaining three belonged to the unorganised sector. The analysis of quantities handled showed that the unorganized sector accounted for 52.90 percent of the total milk disposed, whereas the organized sector handled 47.10 percent. Among the identified unorganized supply chains, Chain I is Producer–Consumer, Chain II is Producer–Milk Vendor–Consumer, and Chain III comprises Producer–Milk Vendor–Private Dairies–Consumer. The organized supply chains included Chain IV (Producer–Private Dairies–Consumer) and Chain V (Producer–Co-operative Milk Societies–Milk Plant–Distributors–Retailers–Consumer).

TABLE 2. EXISTING MILK SUPPLY CHAINS IN PUNJAB, 2024-25

Supply chains	Description of the supply chain	Quantity handled (%)
	Unorganized supply chains	52.90
Chain I	Producer-Consumer	17.79
Chain II	Producer -Milk Vendor- Consumers	19.30
Chain III	Produce-Milk Vendors-Private Dairies-Consumers	15.81
	Organized supply chain	47.10
Chain IV	Producer-Private Dairies-Consumer	23.93
Chain V	Producer-Co-operative milk societies-Milk Plant-Distributors-Retailers-Consumer	23.17

Note: per cent of total marketed surplus

3.2 Determinants of Dairy Farmer's Milk Supply Chain Preference

Several demographic and market-related aspects were compared between dairy producers who preferred organised and unorganised supply chains to understand the factors influencing their choice of milk marketing channels. As shown in Table 3, the average age of farmers choosing the unorganised channel was 45.52 years, slightly higher than 43.95 years recorded for those using the organised channel. However, this difference was statistically insignificant. Similarly, no significant difference was noted

in family size and dairying experience between the two groups. On the other hand, farmers who preferred organised channels had slightly greater educational attainment (11. 17 years) compared to those in the unorganised channel (10. 52 years), indicating

TABLE 3. DESCRIPTIVE STATISTICS OF DETERMINANTS OF DAIRY FARMERS' MILK SUPPLY CHAIN PREFERENCE

Particulars	Unit	Unorganized channel	Organized channel	t-value
Demographic factors				
Age	Years	45.52	43.95	0.97
Education level	Years	10.52	11.17	-1.72*
Family size	Number	5.59	5.63	-0.11
Experience	Years	22.09	19.95	1.31
Marketed factors				
Marketed surplus	Litres	64.98	54.96	0.82
Milk Price	Rs. Per litre	56.22	54.55	1.43**
Distance to selling point	Kilometres	1.47	2.07	-1.53
Doorstep collection	Yes=1, 0 otherwise	0.81	0.63	2.83***
Price stability	Yes=1, 0 otherwise	0.53	0.90	-5.92***
Timely payment	Yes=1, 0 otherwise	0.36	0.80	-6.58***
Provision of veterinary service	Yes=1, 0 otherwise	0.13	0.63	-8.05***
Provision of advance	Yes=1, 0 otherwise	0.48	0.25	0.92
Provision of input at affordable prices	Yes=1, 0 otherwise	0.10	0.73	-11.02***
Transparency in measurement and pricing	Yes=1, 0 otherwise	0.69	0.89	-3.39***

Note: *** indicates a one per cent, ** a five per cent and * a ten per cent level of significance

a marginally significant difference in education level at the 10 percent level. With respect to marketed factors, the marketed surplus had mean values of 54. 96 litres for organised channels and 64. 98 litres for unorganised channels, and did not substantially differ between the two groups, suggesting that channel choice cannot be explained at the descriptive level only by sales scale. Milk prices received were marginally higher in unorganised channels, with a mean of ₹ 56.22 per litre, compared with ₹ 54.55 per litre in organised channels, which may partly explain farmers' continued reliance on informal buyers despite the institutional advantages of formal markets. Organised channels provide substantially greater non- price benefits, including higher price stability (0. 90 compared with 0. 53), on- time payments (0. 80 compared with 0. 36), veterinary services (0. 63 versus 0. 13), input supply at reasonable prices (0. 73 versus 0. 10), and transparency in pricing and measurement (0. 89 versus 0. 69). Conversely, doorstep milk collection was more common among unorganised channels, with mean values of 0. 81 and 0. 63, highlighting the significance of reduced transaction costs and convenience. These descriptive patterns offer initial insights into variations among channels.

TABLE 4. BINARY LOGISTIC RESULTS FOR ORGANIZED MARKET CHANNEL CHOICE COMPARED TO UNORGANIZED MARKET CHANNEL FOR MILK, 2024-25

Particulars	Coefficient	Odds ratio	VIF
Demographic factors			
Age	-0.013 (0.023)	0.987	1.28
Education	0.226* (0.132)	1.254	1.27
Family size	0.014 (0.141)	1.014	1.25
Dummy variable 1 (if Zone=Central plain zone=1,0 otherwise)	1.107** (0.567)	3.025	1.61
Dummy variable 2 (if Zone=South western zone=1,0 otherwise)	-0.65 (0.568)	0.522	1.45
Market factors			
Milk Price	-0.061* (0.034)	0.941	1.15
Marketed surplus	-0.015 (0.004)	0.985	1.45
Distance to selling point	-0.095 (0.085)	0.880	1.38
Provide inputs at cheaper rate	2.600* (0.577)	13.464	1.75
Provision of veterinary services	1.219*** (0.699)	3.384	1.70
Timely Payment	1.508** (0.566)	4.518	1.37
Transparency in measurement and pricing	-0.067 (0.638)	0.935	1.16
Provide advance	0.221 (0.483)	1.247	1.16
Doorstep collection	-0.072 (0.655)	0.931	1.38
Constant	-2.027 (2.732)	0.132	
Wald $\chi^2 = 66.43$			
Prob > $\chi^2 = 0.0000$			
Pseudo R ² = 0.51			
Log likelihood = -61.02			
Hosmer–Lemeshow $\chi^2 (8) = 8.16$			
Prob > $\chi^2 = 0.4184$			
Mean VIF = 1.38			

Note: *** indicates a one per cent, ** a five per cent and * a ten per cent level of significance

The binary logistic regression analysis builds on descriptive evidence by estimating the independent effects of each variable on the likelihood of participation in organised milk marketing channels. Compared with descriptive analysis, this approach yields more robust and reliable findings by accounting for the simultaneous influence of multiple variables and enabling a clearer assessment of the roles of price incentives, service-related factors, market distance and institutional support in farmers' choice of marketing channel. The coefficients and marginal effects are interpreted below, variable-wise.

The binary logistic regression estimates for dairy farmers' participation in organised versus unorganised milk marketing channels are presented in Table 4. The

model has notable explanatory power (Pseudo $R^2 = 0.51$) and is statistically significant overall (Wald $\chi^2 = 66.43$; $p < 0.001$), indicating that the included factors collectively explain a substantial share of the variation in farmers' channel choice. Furthermore, the Hosmer–Lemeshow goodness-of-fit test was not statistically significant ($\chi^2 = 8.16$, $p = 0.42$), indicating that the predicted probabilities are consistent with the observed outcomes and confirming the adequacy of the model fit. The low mean VIF value (1.38) further indicates the absence of multicollinearity among the explanatory variables. Among socioeconomic factors, dependence on organised channels is positively and significantly influenced by education. The odds ratio shows that the probability of selling milk to organised buyers increases by about 25 percent for every additional year of education, underscoring the importance of education in promoting interaction with official market institutions and in maintaining quality and standard procedures. This result is consistent with previous research from Punjab and other states, which indicates that farmers with higher levels of education are more likely to use organised or modern milk marketing channels (Kaur & Toor, 2024; Jaiswal et al., 2016). In contrast, age and family size do not significantly influence channel choice, which aligns with findings from Kumar et al. (2018) and Rather et al. (2016), who also identified limited demographic effects once market-related factors are taken into account.

The zonal dummy for the central plain zone is positive and significant, with an odds ratio of 3.03, indicating that farmers in this zone are about three times more likely to participate in organised channels than those in the reference zone. This underscores how market access varies geographically and that commercially developed areas have comparatively better access to organised procurement infrastructure. Kumar et al. (2011) and Singhal et al. (2020) have reported similar spatial patterns, with higher participation in organised milk markets in more commercially advanced and well-connected areas. In contrast, the dummy for the south-western zone is negative but not statistically significant, indicating no systematic difference in organised market participation compared to the reference category. The findings are consistent with evidence that disadvantages persist primarily due to infrastructure gaps rather than farmer-level attributes.

Regarding market-related factors, the price of milk has a negative and significant coefficient, indicating that farmers are more likely to sell through informal channels. This suggests that higher prices offered in unorganised channels increase the likelihood of farmers supplying milk to informal buyers. This result aligns with findings by Saran et al. (2021), who noted that despite less institutional backing, informal channels frequently offer better spot prices, making them appealing to farmers. In contrast, Kumar et al. (2016) showed that price premiums in organised channels vary across regions and periods.

Marketed surplus and distance to the selling point do not have significant effects, which differs from the results reported by Moutri et al. (2015) and Rather et al.

(2016), who found these factors significant in other contexts. Taken together, this variation suggests that, in Punjab, institutional support and service qualities may be more important than quantity and distance effects.

Service-related attributes are identified as the most influential determinants of organised channel participation. With an odds ratio of 13.46, the provision of affordable inputs has a considerable positive impact and is statistically significant. This means that farmers who receive cheaper inputs from organised buyers are significantly more likely to deliver milk through formal channels. This result confirms previous findings that farmers are connected to formal value chains through bundled input services (Kumar et al., 2011; BIRTHAL et al., 2017). Similarly, the provision of veterinary services significantly increases the likelihood of participation in organised channels, consistent with findings by Sharma (2015) and Kumar et al. (2018), who emphasised the importance of service delivery in encouraging formal market participation. Timely payment also has a strong positive and statistically significant effect, consistent with results presented by Jitmun & Kuwornu (2019) and Cheelo & Merwe (2021), which emphasise payment reliability as a critical determinant of farmers' market choice. While price stability showed significance in descriptive analysis, it was excluded from the regression model due to high correlation with timely payment and milk price variables to maintain model stability. Omitting price stability was necessary to prevent variance inflation and preserve model identification. Other service attributes, including transparency in pricing and measurement, and the provision of advance and doorstep collection, do not show statistically significant effects in the variable framework. Although doorstep collection has been noted in descriptive studies as a key factor favouring informal channels (Staal et al., 2006; Singh et al., 2013), its lack of independent significance here indicates that, when taken together, stronger institutional services such as input provision, veterinary support, and timely payments outweigh its influence.

Prior to model estimation, multicollinearity among the explanatory variables was assessed using the Variance Inflation Factor (VIF). The VIF values ranged from 1.15 to 1.75, with a mean of 1.38. Since all VIF values were well below the commonly accepted threshold of 10, the results indicate the absence of serious multicollinearity among the explanatory variables. Therefore, all selected variables were retained in the regression analysis.

Overall, the regression findings indicate that the availability of institutional services and the accessibility of alternative outlets have a greater influence on Punjabi farmers' participation in organised milk-selling channels than fundamental demographic characteristics. The strong effects of input provision, veterinary services and timely payments suggest that organised buyers compete with informal markets primarily through non-price mechanisms. The negative effect of milk price reinforces the continued relevance of informal channels, which often offer higher spot prices, and

suggests that organised markets must complement service provision with competitive and transparent pricing strategies to attract and retain smallholder suppliers.

3.3 Marginal effects

In addition to the odds ratio estimates, marginal effects are presented to quantify how changes in explanatory factors affect the predicted probability of participation in organised milk marketing channels. Education shows a positive but weakly significant effect: an additional year of schooling increases participation by about 5.4 per cent, while age and family size show no significant effects. Location plays a role, as farmers in the central plain zone have a significantly higher probability

TABLE 5. MARGINAL EFFECTS ESTIMATE FOR ORGANIZED MARKET CHANNEL CHOICE COMPARED TO UNORGANIZED MARKET CHANNEL FOR MILK

Particulars	Marginal effects	p-value
Demographic Factors		
Age	-0.0031	0.558
Education	0.0536*	0.094
Family size	0.003	0.92
Dummy variable 1 (if Zone=Central plain zone=1,0 otherwise)	0.245**	0.036
Dummy variable 2 (if Zone=South western zone=1,0 otherwise)	-0.156	0.253
Market Factors		
Milk Price	-0.014*	0.074
Marketed surplus	-0.0003	0.720
Distance to selling point	-0.022	0.265
Provide inputs at cheaper rate	0.274*	0.054
Provision of veterinary services	0.538***	0.000
Timely Payment	0.353**	0.005
Transparency in pricing and measurement	-0.0159	0.915
Provide advance	0.052	0.646
Constant	-2.027	0.458

Note: *** indicates a one per cent, ** a five per cent and * a ten per cent level of significance

of participation by about 24.5 percentage points, whereas the effect for the south-western zone remains statistically insignificant. Milk price has a negative marginal effect, with a one-unit increase reducing the probability of participation in organised channels by about 1.4 per cent, reflecting the continued price competitiveness of unorganised buyers. Marketed surplus and distance to the selling point do not show significant effects once service-related factors are considered. Service-related attributes exert the strongest influence, with veterinary services increasing participation by about 53.8 per cent, timely payments by about 35.3 percentage points, and affordable input provision by about 27.4 per cent.

IV

SUMMARY AND CONCLUSIONS

The findings show that farmers' choice of marketing channel depends on multiple socio-economic and institutional factors, with many still relying on informal systems due to accessibility, price and trust-related issues. Participation in organised channels depends more on the availability of reliable services and transactions than on basic demographic characteristics. While higher spot prices in informal markets continue to draw farmers towards unorganised channels, access to veterinary support, timely payments and affordable inputs strongly encourages engagement with organised buyers. This explains the continued coexistence of formal and informal milk markets in Punjab and underscores the limits of price-based strategies in promoting formal market participation. A more sustainable and equitable milk marketing system can be built with a well-rounded strategy that includes digital solutions, private processors and cooperatives. The study emphasises the need to strengthen formal milk marketing channels by enhancing market information systems, ensuring timely payments to farmers and improving infrastructure. The following policies may be suggested based on the study's findings.

- The strong positive influence of affordable input provision and veterinary services on organised channel participation suggests that cooperatives and private dairies could benefit from strengthening the delivery of farmer support services. Improving access to production inputs and animal health services is expected to make organised milk marketing channels more attractive than informal buyers.
- Organised milk marketing agencies are advised to explore farmer-oriented financial support services, such as short-term credit and emergency liquidity assistance, to address producers' working capital needs and improve the competitiveness of formal marketing channels.
- Education and awareness play an important role in farmers' choice of organised channels. State agencies and extension services should aim to gradually optimise and improve training and awareness programmes. This can help more farmers join dairy cooperatives, understand fair pricing and transparent measurement, and trust organised buying processes. These steps can lead to increased milk production, fairer prices, and better rural livelihoods.

Limitation of study: The present study is based on cross-sectional primary data collected during the 2024–25. As the data represent observations at a single point in time, the study is unable to capture temporal variations in milk marketing behaviour, seasonal fluctuations or changes in farmers' participation across marketing channels over time. Therefore, the findings should be interpreted as statistical associations rather than permanent longitudinal trends. Despite this limitation, the study provides valuable evidence on the determinants of milk marketing channel choice in Punjab and

highlights the importance of institutional support services in encouraging farmers' participation in organised channels.

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