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Choice of milk marketing channels and factors influencing the marketing channels in rural areas of Bikaner district of Rajasthan

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Abstract
The present study was undertaken in Bikaner district of Rajasthan. The specific objective of this study has look into the choice of milk marketing channels and factors influencing the choice of milk marketing channels. A total of 180 sample farmers were randomly selected from list of farmers rearing at least two adult milch animals. Majority of the milk producers were selling the milk through Informal channel i.e., to private middlemen (62.77per cent) followed by cooperatives channel (18.90 per cent) and direct to consumer (18.33per cent). High price of milk, less herd size, more experience in dairy farming and less milk production per day per household increased the likelihood of selecting channel directly to consumer. On the other hand more price of milk, less duration in payment, type of milch animals and higher milk production per household increased the likelihood of selecting channel through private traders. The study shows per liter price of milk is positive and significant in the case of direct sales to consumers and informal marketing channels because informal channel give higher price compare to formal marketing channel. This showed that if herd size increases, milk sold directly to consumers decreases as then farmers want to sell more quantity of milk to cooperatives. Milk households who own high potential exotic breeds have better likelihood of selling to informal channel through private traders.

Keywords: dairy, milk, marketing channel, consumer, private traders

Introduction
Animal husbandry in India is closely interwoven with agriculture. It plays an important role in millions of rural households for their socio-economic development .It also significantly contributing importantly in the national economy (Vaidyanathan, 1989; Mishra, 1995; Chawla, *et al*, 2004; Sharma, 2004; Birthal, 2016) [24, 14, 3, 19, 1]. Demand for, and production of, livestock and livestock products in less developed countries are expected to double in 2020 from that of 1999 (Delgado *et al*., 1999). Dairying has become an important secondary source of income for millions of poor and rural families and has assumed the most important role in providing employment and income generating opportunities particularly for marginal and women farmers (Patel, 2003) [16]. Most of the milk is produced by animals reared by small, marginal farmers and landless labourers. It has been witnessed over the years that the stability in dairy income is far stronger than the income realized from agricultural activities (Kumar and Shah, 2016) [11]. Milk has always played a critical role in addressing hunger and malnutrition (Kumar, 2016) [11]. Dairy farming is a source of supplementary income for millions of small/marginal farmers and landless labourers in India. Market oriented smallholder dairying offers significant scope for diversification and thus helps in augmenting income and employment generation for the farmers. Despite of impressive growth in milk production during the past three decades, productivity of dairy animals continues to remain very low and milk marketing system is primitive (Rajendran and Mohanty, 2004; Sarkar and Ghosh, 2010) [17, 18]. Currently, more than 80 per cent of the milk produced in the country is marketed by the unorganized sector (private organizations) and less than 20 per cent is marketed by the organized sector (government or cooperative societies). Marketing of the majority of the milk through unorganized sectors is likely to dissuade small dairy farmers from expending production, which is absolutely necessary to keep up with the strong demand growth. Rajasthan is the largest state having about 10.41 percent of the total geographical area of the country. It supports 5.5 percent of human population and about 11 percent of the country's livestock population. Agriculture and allied activities, however, remain the primary and major economic activity in the state providing livelihood to 66 percent of the state's population.

Because of the limited water resources, most of the agriculture production is rain-fed and thus, the livestock sector assumes more importance. Animal husbandry is not only a subsidiary occupation to agriculture but it is a major economic activity, especially in the arid and semi-arid regions of the Rajasthan. Livestock sector development has a significant positive impact in generating employment and reducing poverty in rural areas. In Rajasthan, livestock sector plays major role in improving socio-economic status of rural households and fulfilling nutritional needs of rural masses. The total bovine population in Rajasthan was 27.60 million numbers in 2019. It has increased by 13 per cent over the previous census previous (2012). Bovine population has increased substantially in Bharatpur (67 per cent), Bikaner (37 per cent) and Churu (36 per cent). The number of milch animals (in-milk and dry) in cows and buffaloes has increased at higher rate of 17 per cent from 10.4 million in previous census (20012) to 12.2 million (GOI (2019), www.dahd.nic.in). However, facilitating market participation of households as well as developing chain competitiveness and efficiency are valuable pre-conditions to improve livelihoods. Unless farm households adjust to rapidly changing markets which are characterized by quality and food safety, vertical integration, standards and product traceability, reliability of supply, there will be a risk of competitiveness and inefficiency for the entire value chain. To see household choices among milk market outlets, a systematic identification of factors faced by households in choice of market outlets should be identified for reaching the millennium development goals.

Data and Methodology

The Bikaner district of Rajasthan is selected for the study purposively. There are three distinct types of agricultural situations in the region *viz*., canal irrigated (Lunkaransar Tahsil), tubewell (Kolayat Tahsil) irrigated and unirrigated (Nokha) were selected. The primary data were collected from 180 milk producer households of selected three region of Bikaner district. The data collected have been analyzed using different statistical measures and interpreted across herd-size categories of milk producers as well as overall. In order to have an appropriate comparison, herd size maintained by different categories of households were converted into standard animal units using the conversion factors suggested by Sirohi *et al.*, (2015) [21]. Thus, the sample was comprised of 88 small herd size milk producers category (2-7 SAUs), 61 medium herd size (more than 7-12 SAUs) and 31 large herd size milk producers category (more than 12 SAUs). The primary data were collected from the sample farmers for the year 2019-20.

Analysis tools

Various type of methodologies have been used in factors influencing the choice of market channel Staal *et al*., (2006) [22], Mburu *et al.* (2007) [13], Tsourgiannis and Eddison (2008) [23], Bardhan *et al.* (2012), Kuma *et al*. (2013) [10], Mutura *et al*. (2015), Moturi *et al*. (2015) [15], Brar *et al*. (2018) [2] used Multinomial Logit model, mostly taking three milk marketing channels as dependent variable.

Multinomial logit regression modal

To determine factors that influence choice of milk marketing channel, multinomial logit (MNL) regression model was used. The model was used to determine the empirical relationship between choice of marketing channel and factors hypothesized to influence decision as used by Tsourgiannis *et al*. (2008) [23]. The model is aimed at how changes in the predictors translate into the probability of observing a particular categorical outcome. The MNL regression model is specified, where market choice is given as:

MKTCHij=βjXij+€ij

Where,

MKTCHij is a vector of the various marketing channel choices namely: (j= 1, 2 and 3) for direct to consumer, Informal (private middlemen) and formal (cooperatives) etc. channels of i^{th} farmer, βj is a vector of channel-specific parameters. €ij is the error term assumed to have a distribution with mean 0 and variance 2, is a vector of the producer's characteristics that together reflect the incentive, risks, and capacity variables and other shifters influencing the producer's indirect utility. If the smallholder farmer chooses market j, then is the maximum among the j=1, 2, 3 utilities. It follows that if market *j* will be chosen by a farmer then:

*PROB (*U ij >U ik*)* for all j≠ k

Following Greene (2000), the probability for the choice of market *j* given *xi* covariates is given as:

$$\text{PROB (Yi=j)} = \frac{e^{\beta j \times i}}{1+\sum e^{\beta j \times i}} \forall j = 1,2,3 \ldots\ldots\ldots..$$

Where,

Yibeing the market choice *j* made among a total of different channels by respondent *i*, *xi* are the household level and area specific factors of choice of household *i*, and *βi*'s are parameters to be estimated.

Factors influencing choice of milk marketing channels from review of literature are listed

Sr. No.	Variable description	Measurement
1.	Dependent variable indication the various marketing channels 1=Direct to consumer 2=Informal through middle men and private 3=Cooperative	Discrete multiple choice dependent variable
2.	Education of the household head in years	Number of years spent level of education (years)
3.	Per liter price of milk	Scale
4.	Herd size	Scale
5.	Dairy farming experience in years	Scale
6.	Sale payment duration	Ordinal
7.	Proportion of female labour in total work in rearing milch animals	Nominal
8.	Type of milch animal	It is breed types of cows owned by the household. It takes a value of ordinal.
9.	Total milk production per household per day	Nominal

Results and Discussion

Choice of sample household by marketing channel

Thedistribution of sample households by marketing channel is given Table 1. At the household level it is necessary to understand the benefits selecting a particular milk marketing channel. In Lunkaransar, 60 per cent of the households sold milk to informal channels (private middlemen), and 35 per cent households old milk through cooperatives channel, leaving only a small quantity to be sold directly to consumer i.e., 5 per cent. In contrast, in Nokha 100 per cent of the milk produced was sold to Informal private middlemen as there was no cooperative existing in area and no respondent was selling milk directly to consumer also. In Kolayat *tehsil* 50 per cent milk producers sold milk directly to consumers, and the rest is sold to informal marketing channels as well as formal marketing channel (cooperatives) nearer to the production points .Majority of the milk producers were selling the milk through Informal channel i.e., to private middlemen (62.77per cent) followed by cooperatives channel (18.90per cent) and direct to consumer (18.33per cent).

Table 1: Distributions of sample households according to marketing channel adopted for selling milk

Point of sale of milk	Canal Irrigated	Tubewell irrigated	Unirrigated	Total Number of HH using channel
Consumer	3.00 (5.00)	0.00 (0.00)	30 (50.00)	33 (18.33)
Informal (Private middlemen)	36 (60.00)	60 (100)	17 (28.33)	113 (62.77)
Formal (cooperatives)	21 (35.00)	0.00 (0.00)	13 (21.66)	34 (18.90)
Total	60 (100)	60 (100)	60 (100)	180 (100)

Factors influencing choice of milk marketing channels

The factors influencing choice of milk marketing channels Multinomial logit regression analysis was used to estimate the maximum likelihood of independent factors to influence farmers' choice of milk marketing channel(taking cooperative channel as base category) is given Table 2.The coefficient of per liter price of milk is positive and significant in the case of direct sales to consumers and informal marketing channels both, indicating that price of milk effect the choice of channel over the cooperative channel. Milk producer are price sensitive and prefer selling milk directly to consumers and informal channel of milk, because of the higher prices from them. Results indicate that the average marginal effects associated with choice of market channels. The probability of choosing direct to consumer increases by 1.37unit with one unit increase in the price per litre of milk. Similarly the probability of choosing informal marketing channel increase by 1.23 unitwith one unit increase in the price of per litre milk, respectively. Other study found similar result have identified factor related to price and nearness the milk production centres to farmers prefer selling to milk directly consumers (Singh 2018 and Kumar *et al*., 2011) [20]. Also similar study found with Moturi *et al.,* (2015) [15] which revealed that coefficient significant positive in case of private channel influenced the per liter price of milk. The results found a negative relationship between herd size of milch animal and choice of direct to consumer channel at 1 per cent significance level in channel direct to consumers as compared to cooperatives. A unit increase in the number of mich animals by a household reduced the probability of using direct to consumer channel as compared to using cooperative marketing channel for its milk by -0.271 units but it had no significant difference over cooperatives in selling to private channels. This showed that if herd size increases, milk sold directly to consumers decreases as then farmers want to sell more quantity of milk to cooperatives. Other studies have reported herd size being a significant determinant in market channel participation for modern market channels (Tsougiannis *et al*., 2008 and Mutura *et al*., 2015 and Brar *et al*., 2018) [2]. The result was dissimilar with Kuma *et al*., (2013) that indicate that number of milking cows owned by households negatively and significantly affected accessing cooperative milk market outlet. As the herd size increases, milk producers shift to more organized milk marketing channels hence the negative relationship with direct to consumer channel which could be argued to be less organized. Large milk producers are likely to get price incentives or higher price for their milk because of high bargaining power. As the experience of dairy household likelihood of selling milk through direct sales to consumers channel increases over cooperative marketing channel by 22.67 units. But the household's experience in dairy farming did not have significant difference with cooperatives. These findings have dissimilarity with the result of kuma *et al*., (2013) [10] that revealed that number of years a household has been in dairy farming positively and significantly affected accessing cooperative milk market outlet as compared with accessing individual consumer milk market outlet.

The variables time duration of receiving payments is negative and significant in making difference in selecting channel through private traders as compared to cooperatives. As the sale payment duration increases the likelihood to select channel through private traders decreases. The time duration of receiving payments selling of milk increases by one unit the probability of selling milk decrease by 0.027 unit through private middle men and private marketing channel. The variables related to type of milch animal and its milk productivity and quality difference resulted in more likelihood to choose channel through private players1.385 units. Milk households who own high potential exotic breeds have better likelihood of selling to informal channel through private traders than direct to consumer and cooperative. These factors are expected to exert a greater influence on dairy farmers' participation in ainformal channel by private middlemen for fetching relatively better price owing to their proximity to market.

Table 2: Factors influencing choice of milk marketing channels (Multinomial logistic regression taking Cooperative channel as base category)

Market channel choice variables	Channel-Direct to consumer			Channel-Informal through middle men and private		
	dy/dx	Std err	P - value	dy/dx	Std err	P- value
Level of education	1.219	.298	.507	1.234	.210	.256
Per liter price of milk	1.371***	.118	.008	1.233***	.080	.009
Herd size	-.271***	.396	.001	.843	.108	.112
Dairy farming experience in years	22.665***	.951	.001	1.499	.359	.259
Sale payment duration	1.506	1.047	.696	-.027***	.732	.000
Proportion of female labour in total work in rearing milch animals	1.030	.030	.312	.998	.016	.913
Type of milch animal	.606	.352	.154	1.385**	.145	.025
Total milk production per household per day	- 0.741***	.113	0.008	1.070**	.035	0.051
Model fit Log likelihood = 191.453 Number of observations = 180 Prob>chi^2 = 0.000 Pseudo R^2 =.655						

Source: Base category is the cooperative The level of significance ** = 5per cent, ***=1per cent The log likelihood function testing the hypothesis that all

The results of this study show a negative relationship of total milk production per day with a household with the choice of channel likely to be direct to consumer compared to cooperative channel. An increase in total milk production per household per day decreases probability of selling its milk direct to consumers as compared to through a cooperative marketing channel by 0.741 units. On the other hand increased per day milk production increased the probability to sell to private traders increases as compared to cooperatives by 1.07 units. Total milk production per household was found a significant determinant in both the other channels over cooperative channel. There was likelihood to select channel through cooperatives as compared to direct to consumer by 0.741 units if total milk production increased by 1 unit. It was found that farmers were more likely to sell through Informal channel by private middlemen as opposed to cooperative marketing channel by 1.07 units if total milk production increased by 1 unit. It can be seen that factors responsible for selecting channel direct to consumers as compared to cooperatives were found different from the factors affecting probability to select channels through private traders in place of cooperative channel. High price of milk, less herd size, more experience in dairy farming and less milk production per day per household increased the likelihood of selecting channel directly to consumer. On the other hand more price of milk, less duration in payment, type of milch animals and higher milk production per household increased the likelihood of selecting channel through private traders by the households. Psuedo R^2 value of the model is 0.655. Mburu *et al*. (2007) [13] found in their study that milk price and total number of cows milked negatively influenced farmers' adoption of milk marketing through the dairy cooperative channel while in this study herd size was negatively affecting the choice for cooperatives.

Conclusion

Studying the choice of milk marketing channels by households and factors influencing the choices was the study. The distribution of sample households by marketing channel revealed that at the household level, it is necessary to understand the benefits selecting a particular milk marketing channel. Majority of the milk producers were selling the milk through Informal channel i.e., to private middlemen followed by cooperatives channel and direct to consumer. It can be seen that factors responsible for selecting channel direct to consumers as compared to cooperatives were found different from the factors affecting probability to select channels through private traders in place of cooperative channel. High price of milk, less herd size, more experience in dairy farming and less milk production per day per household increased the likelihood of selecting channel directly to consumer. On the other hand more price of milk, less duration in payment, type of milch animals and higher milk production per household increased the likelihood of selecting channel through private traders by the households. Psuedo R^2 value of the model is 0.655.

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