

Determinants of farmer's choice of milk marketing outlet in Jaipur District of Rajasthan

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Abstract: This investigation was undertaken in Jaipur district of Rajasthan with a view to identify the factors affecting the farmer's choice of specific dairy outlet to sell their marketable surplus. The data were collected from a sample of 80 sample respondents selected through multistage purposive sampling for the year 2021-22. A tabular analysis was done to list prevalent marketing channels and then a multinomial logit model was fitted to identify the factors affecting farmer's decision of choosing a particular milk-marketing outlet. The farmers used one of the three marketing channels to deliver milk to final consumers. Channel-I was direct marketing channel (Producer – Consumer) and channel II (Producer - Milk vendor- Consumer), channel III (Producer – Collection centre – Co-operative milk plant – Consumer) were indirect marketing channels of milk. The Channel-III was the most preferred channel of milk marketing, as it was opted by 47.50 per cent of the total farmers. Multinomial logit (MNL) regression's results indicated that herd size, marketable surplus, caste categories, access to institutional credit, BPL economic class, income from livestock and breed type of animals were the seven significant factors affecting farmer's decision of choosing a particular milk-marketing outlet out of three. Although direct marketing channels are highly efficient and fetch more prices to producers, still most of the farmer choose channel III for marketing of milk, may be because of easy disposal of marketable surplus. This trend might continue, therefore, farmers should be made

aware about quality parameters like fat percentage in the milk, or even provided with affordable fat testing kits through *Pashu Vigyan Kendras*/ Extension centres like KVKs, so that farmers can test it at their level and be assured about the prices they receive in the collection centres. There is need for the effective and improved spread of modern market outlets and dairy cooperatives, so that all the farmers irrespective of social and economic background may benefit from livestock farming.

Keywords: Milk marketable surplus, Farmer's Choice, Dairy Outlet, Marketing Channel, Multinomial logit regression.

Introduction

India is the world's largest milk producer, contributing about 24 per cent of the global milk production (FAO, 2023). The country has 56.7 per cent of buffalo, 12.5 per cent of cattle, and 20.4 per cent of small ruminant population of the world. During the last few decades, the livestock sector grew at an annual rate of 5.3 per cent during 1980s, 3.9 per cent during 1990s, 3.6 per cent during 2000s and 7.9 per cent during last five years (Economic Survey, 2021). Despite deceleration, livestock sector remained about 1.5 times larger than that of crop sector which implies its critical role in cushioning agricultural growth. 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). Growing human population, increasing urbanization, changing lifestyles, increased health awareness and rising domestic incomes have led to increase in the demand of dairy products from consumer's end (Anita and John, 2001, Kharkwal *et. al* 2021). Dairy products are the most acceptable and affordable nutritious source of animal protein for large vegetarian segment of Indian population (Kundu and Banerjee, 2015). India is also the world's largest consumer of dairy products, consuming almost 100 per cent of its own milk production (Shree and Prabu, 2019).

About 90 per cent of the milk production comes from small farmers located in rural areas. Currently, 80 per cent of the milk produced in the country is marketed by the unorganized sector through local vendors and 20 per cent through organized sector including cooperative societies and private companies (Dept. of Animal

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Husbandry, Dairying & Fisheries, Ministry of Agriculture and Farmers Welfare, GOI). Marketing of the majority of the milk through unorganized sectors is likely to dissuade small dairy farmers from expanding production, which is absolutely necessary to keep up with the strong demand growth (Saran et al. 2022).

Rajasthan is predominantly an agricultural state with an excellent potential for milk production. The state ranks second in milk production and per capita availability of milk in India. In Rajasthan, livestock sector plays major role in improving socio-economic status and fulfilling nutritional needs of rural masses. It is not only a subsidiary occupation to agriculture but also a major economic activity, especially in the arid and semi-arid regions of the Rajasthan. Rajasthan has about only 11.27 per cent of the country's livestock and contributes about 12.6 per cent of the total milk production. Of the total milk produced, 53 per cent is buffalo milk, 36 per cent is cattle milk and 11 per cent is goat milk. Animal husbandry has great potential for rural self-employment and is contributing about 10% in the G.D.P. of the State (Dept. of Animal Husbandry, GOR, 2022).

Milk value chains can range from simple to the complex one's depending upon the scale of its production as well as type of market availability. Farmers may choose to dispose-off the marketable surplus of milk through numerous indirect and direct channels considering marketing cost and profit prospective. Their choice can be an economic indicator for the policy makers in order to set an effective linkage between the milk producers and consumers for fixing the price of milk rationally. Therefore, in this backdrop, this study was undertaken to identify the prevalent dairy marketing channels in Jaipur district of Rajasthan and determine the factors affecting the farmer's choice of a specific dairy outlet in the study area.

Materials and methods

A Multistage purposive sampling was used to select the sample. At first stage, Jaipur district from Rajasthan was chosen purposively as it is the largest milk producing district of Rajasthan. Then Amber and Chomu tehsils of Jaipur district were chosen purposively as these tehsils maintain the highest livestock population, accounting 12.04 per cent and 11.83 per cent of total cattle and buffalo of the district, respectively (Dept. of Animal Husbandry, GOR, 2019). In the next step, two villages, one from peri-urban area and one from rural area were chosen from each

Table 1: Category wise distribution of sample according to herd size

Category	Herd size	Households (No.)
Small	1-3 SAUs	42
Medium	4-6 SAUs	22
Large	≥7 SAUs	16

SAUs = Standard animal units (Lal and Chandel 2016)

selected tehsil. Peri-urban area was the area located within 8-10 Kms from nearest town/ market and rural area was the area located at more than 8-10 Kms away from nearest town/ market. Thus, a total of 4 villages Dhand (rural) and KuKas (peri-urban) from Amber tehsil and Cheta ka bas (rural) and Jetpura (peri-urban) from Chomu tehsil were selected for the study. At final stage, a separate list of all farmers from each selected village along with herd size owned by them was prepared with the help of Patwaris and the concerned personnel of the selected villages. These dairy farmers were then categorized into the three standard size groups viz., small (1-3 SAUs), medium (4-6 SAUs) and large (e"7) as in Table 1. Finally, total 80 farmers were chosen from these village using probability proportion to size (PPS) method from each category of the herd size, which produced and sold milk in the market for detailed investigation. The primary data were collected for 2021-22 from the selected farmers through personal interview method with the help of pre- structured schedule.

A number of econometric models such as probit model by Goetz (1992), structural model based on censoring by Key et al. (2000) and Bayesian double-hurdle model by Holloway et al. (2005) have been employed in identifying factors affecting farmer's choices in marketing their produce. However, if there are finite number of choices and dependent variable is qualitative, multinomial logit estimation is appropriate to analyze the effect of exogenous variables on choices. It is a simple extension of the binary choice model and is the most frequently used model for nominal outcomes that are often used when a dependent variable has more than two choices.

For this study at first a tabular analysis was done to list all direct and indirect milk marketing channels prevalent in the study region, then to study the factors affecting the farmer's choice of a specific dairy outlet, major socio-economic characteristics of the respondents in the study region were listed. The multinomial logistic regression was fitted to identify the factors affecting the producer's choice of selecting particular outlet with the following functional form:

$$M_{ij} = \beta_j X_{ij} + \epsilon_{ij}$$

Where,

M_{ij} = Vector of marketing choice.

β_j = Vector of channel specific characteristics.

ϵ_{ij} = Random error estimation.

X_{ij} = Vector of producer characteristics that together might influence dairy farmer market channel decision,

Table 2 presents the list of explanatory variables which fall under six broad categories: (i) Physical capital (ii) Human capital (iii)

Demographic characteristics (iv) Institutional support (v) Economic factors and (vi) Animal characteristics.

The factors considered under physical capital were herd size and marketable surplus of milk. Human capital was proxied by the educational attainment of a farmer. A higher level of education enhances their capability for better management and, thus, makes them more likely to adopt modern marketing practices and select better-paying marketing channels (Marenya and Barret 2006; Gong et al. 2007). Four variables were included to capture the influence of demographic characteristics, namely; the age of household head, household size, gender of a household head and social group (ST, SC, OBC, GEN). Studies such as Morrison et al. 2007; Barham and Chitemi 2009; Vigneri and Holmes 2009; Aregu et al. 2011; Amani 2014; Eerdewijk and Danielsen 2015 suggest female-headed households are less successful than male-headed households at accessing new market opportunities due to lack of resources. Hence, the variable was taken to test the hypothesis that male headed households are more likely to market milk through modern marketing arrangements, while females headed households resort to the traditional one's. Similarly, hypothesis regarding social group was, the dairy farmers who come from the bottom of the social caste pyramid prefer informal system of milk marketing over the organized ones. To assess the effect of institutional support mechanisms such as access to institutional credit, as well as government sponsored schemes like rural employment guarantee programs (Mahatma Gandhi National Rural Employment Guarantee Act [MGNREGA]), below poverty line (BPL) and village location were taken. On the basis of share of livestock income in the total income, livestock occupation as principal or subsidiary was taken as a proxy of economic variable under the hypothesis that farmers with a higher share of income from livestock, may show specialization in livestock production with higher milk production, and hence may prefer to choose modern milk-marketing outlet. In animal characteristics animal type (local cow, crossbred, buffalo) and livestock age were taken as proxy explanatory variables.

Table 2: Vector of Explanatory variables

S. No.	Explanatory variables	Indicators
1.	Physical Capital	Herd size (No.), Marketable surplus (lt./day/hh)
2.	Human Capital	Literate without formal education, below primary school, Primary school, Middle school, Secondary school, Secondary and above, Training (Yes/no)
3.	Demographic Characteristics	Age of household head (yrs), Gender (Male/Females), Household size (No.), social group (ST, SC, OBC, Others)
4.	Institutional Support	Access to institutional credit (Yes/No), Participation in MGNREGA (Yes/No), BPL cardholder (Yes/No), Village location (Rural/Peri-Urban)
5.	Economic Factors	Principal occupation livestock (Yes/No)
6.	Animal Characteristics	Age, animal type (cow, crossbred, buffalo, combination of any of these)

It is also very important to consider the effect of various species/ breed of milch animals kept by farm households both separately and collectively by converting them into standard equivalent units. For this purpose, Standard Animal Units (SAU) of the bovine stock was derived for each farm household as per the specification given by Kumbhare et al. (1983) given in Table 3.

Results and Discussion

This section is discussed under three subheads; first one is the distribution of farmers in the prevalent milk marketing channels, secondly a highlight of major socio-economic characteristics of the respondents and last subsection deals with the results of multinomial logistic regression.

Distribution of Farmers in the milk marketing channel

Dairy farmers of the study area were observed to sell the milk in one of the three prevalent marketing channels as given in Table 4. A perusal of the table indicates that Channel-I was direct marketing channel (Producer – Consumer) and channel II (Producer - Milk vendor- Consumer), channel III (Producer – Collection centre – Co-operative milk plant – Consumer) were indirect marketing channels for milk disposal in study region. Table further reveals that Channel-III was the most preferred channel of milk marketing, as it was opted by 47.50 per cent of the total farmers. This may be due to organised system and easier disposal of their marketable surplus in this channel as compared to others. Channel-I was adopted by 28.75 per cent sample farmers, while 23.75 per cent farmers sold milk through Channel-II. The farmer’s preference of similar milk marketing channels was also reported by Kashish et al. 2014 and Kumar et al. 2022.

Socio-economic characteristics of the respondents

Socio-economic profile gives an understanding of social status and overall standard of living of people. Table 5 highlights the major socio-economic characteristics of sample farmers in the

study area. It is evident from the table that the average age of the household's head in the study area was 48.21 years. Of whom, 42.50 percent heads had attained average age of 46.88 years. The caste category wise distribution of sample households indicated that OBC formed the largest fraction of total respondents, i.e., around 58.75 per cent, followed by General (25.00%), ST (8.75%) and SC (7.50%) category. The average family size of the respondents was 6.30, of whom 63.75 per cent of the total families had more than 5 members.

The education of the head of the family is an important factor as family head is mainly responsible for making any decision in the household. The Table 5 further suggests that about 23.75 per cent families were headed by illiterate heads. Among the remaining 76.25 per cent literate heads, of whom, 42.50 per cent had

Table 3: Standard animal units (SAU) of milch animal

S. No.	Milch Animal	Standard Equivalent
1	Buffalo	1.30
2	Crossbred cow	1.40
3	Local cow	1.00

education only up to primary level, 13.75 per cent had education up to secondary level, 12.50 per cent had education up to high secondary level and only 7.50 per cent were educated till graduation level.

Furthermore, on an average, one household owned 8.75 animals, out of which approximately half i.e. 4.38 were milch animals. Local cow, crossbred and buffalo accounted for 18.86, 16.28 and 64.86 per cent of these milch animals, respectively. Converting these

Table 4: Distribution of farmers in the milk marketing channel

S. No.	Channels	Small (1-3 SAUs)	Medium (4-6 SAUs)	Large (≥7 SAU)	Total (N=80)
I.	Producer – Consumer	20 (47.62)	2 (9.09)	1 (6.25)	23 (28.75)
II.	Producer - Milk vendor- Consumer	8 (19.05)	5 (22.73)	6 (37.5)	19 (23.75)
III.	Producer – Collection centre – Co-operative milk plant – Consumer	14 (33.33)	15 (68.18)	9 (56.25)	38 (47.50)
	Total	42 (100.00)	22 (100.00)	16 (100.00)	80 (100.00)

Note: Figures in Parentheses indicate per cent to total respondents.

Table 5: Socio-economic characteristics of the respondents

A. Age-wise distribution of household head		
Age(yrs)	No. of respondents	Average Age (Yrs)
20-40	17 (21.25)	37.88
41-50	34 (42.50)	46.88
>50	29 (36.25)	55.83
Total	80 (100)	48.21
B. Caste category wise distribution of sample households		
Caste	No. of respondents	Percentage
GEN	20	25.00
OBC	47	58.75
SC	6	7.50
ST	7	8.75
Total	80	100.00
C. Distribution of sample households according to size of family		
Family size (No. of members)	No. of respondents	Average Size
1 – 4	11 (13.75)	3.72
5 – 7	51 (63.75)	5.56
8 or more	18 (22.50)	9.77
Total	80 (100.00)	6.26

D. Distribution of households depending upon level of educational of the household head

Level of education of the head of the household	Respondents
A. Illiterate	19 (23.75)
B. Literates	61 (76.25)
i. Primary	34 (42.50)
ii. Secondary	11 (13.75)
iii. High Secondary	10 (12.50)
Graduate	6 (7.50)
Total	80 (100.00)

E. Distribution of average number of animals per household

Category	Average
Total milch animal	4.38 (100.00)
a. Local cow	0.83 (18.86)
b. Cross bred	0.71 (16.28)
c. Buffalo	2.84 (64.86)
Total SAUs (milch)	5.51
Calves & heifer	2.90
Dry animal	1.47
Total animal	8.75

Note: Figures in Parentheses indicate percentage figures

animals equivalent to a local cow indicated the presence of average 5.51 SAUs per household in the study area. Further, calves & heifer per family were 2.90, while on an average a family owned 1.47 dry animals.

Factors affecting farmer’s choice of a specific dairy outlet

The choice of a milk-marketing channel can be either supplier or producer-driven (Vandeplas et al. 2013). It depends on a variety of factors and different milk-marketing outlets, as well as a number of social and economic factors. In this study, dairy farmers were observed to make a choice amongst three milk-marketing outlets for the disposal of their milk marketable surplus. These three outlets were: (1) Collection Centre, (2) Direct to Consumers, and (3) Milk vendor. All these milk-marketing outlets can be considered independent from each other and cannot be ordered in any logical way therefore, a multinomial logit (MNL) model was used to identify the factors affecting farmer’s decision of choosing a particular milk-marketing outlet. The maximum likelihood of independent factors to influence farmers’ choice of specific dairy outlet was estimated taking “direct to consumer” as base outlet category. Table6 presents the results of multinomial logistic regression.

An examination of table indicates that the estimated model was significant at 1% level, and demonstrated a good predictive capability as indicated by a pseudo-R² value of 0.57.

Among physical capital, the coefficient of herd size was found negative and significant for both the category of outlets viz., collection center and milk vender, which points that as the herd-size increases, farmers will be more likely to sell the milk directly to the consumer. The marginal effects figure indicates that one per cent increase in herd size will decrease the probability of

selling milk to collection center by 0.19 per cent and to milk vender by 02 per cent. It is in contrast to our expected hypothesis, as it was expected that larger herd size will translate into larger milk marketable surplus, which will be disposed off through organized marketing channel. Some studies suggest that herd size is 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). The reverse situation in the study area may be due to the less productivity of milch animals, connoting milk production might not have been proportionately increased with the herd size. Kuma et al. (2013) also observed that number of milking cows owned by households negatively affected the farmer’s choice of accessing cooperative milk market outlet.

The coefficient of marketable surplus was positive and significant at 1 per cent level of significance. The corresponding marginal effect values indicate that one per cent increase in the marketable surplus increased the probability of selling milk at collection center and to milk vender by 0.72 per cent and 1.89 per cent, respectively. Meena and Tiwari (2015) also endorsed the positive relationship of marketable surplus with farmer’s choice of selling milk to milk and co-operatives.

The table further indicates that the negative and highly significant (at 1%) coefficient of education for the farmers who were educated to senior secondary level. They did not prefer to sell milk to milk vendors, rather favoured selling it direct to the consumers, the results confirm this study’s postulation. The findings are consistent with the fact that education levels considerably affect market information interpretation and hence, market participation levels of farmers by helping them analyze and exploit the best marketing strategies at their disposal (Jari, 2009; Park, 2009; Moturi et al.2015).

The caste coefficient representing demographic characteristics of milk farmers showed that farmers belonging to ST category preferred selling directly to the consumers instead of going to collection center or milk vender. On the other hand, farmers belonging to SC category preferred selling milk to milk venders. Sarkar (2020), who conducted study with total of 35,200 agricultural households all over India using NSSO data observed that SC households lacked access to better marketing facilities for the disposition of milk. Only around 17 per cent of the

agricultural households of the SC community could sell milk to a cooperative and government agency. Even SC households received a lower average price per litre of milk than all other social groups, which was further corroborated by Ahuja and Redmond (2004). Thorat (2009), based on the Action Aid study in 2001 covering 550 villages across 11 states in India observed exclusionary practices in the consumer markets particularly prominent in the case of milk and vegetables. In about 47 per cent of study villages, SCs were not allowed to sell milk to the

Table 6: Factor affecting farmer’s choice of a specific dairy outlet

Variables	Base category – Consumer (2)					
	Collection Centre (1)			Milk Vendor (3)		
	Coefficient	Std. Error	Marginal effects dy/dx	Coefficient	Std. Error	Marginal effects dy/dx
i) Physical capital						
Herd size (log) (no.)	-24.468**	11.111	-0.199	-44.474**	14.261	-2.001
Marketable surplus (log) (lt./day/hh)	37.583*	10.606	0.716	54.622*	12.108	1.895
ii) Human capital						
Education (nominal)						
(1) Primary	1.482	1.914	0.111	.9198	2.222	0.023
(2) Secondary	0.356	2.007	0.211	-3.124	2.940	-0.222
(3) Sen. Secondary	1.845	1.537	0.439	-17.845*	3.355	-0.362
(4) Intermediate	0.666	1.912	0.319	-5.145	3.833	-0.319
iii) Demographic characteristics						
Age of Household (log) (yr.)	3.996	8.343	2.324	-24.293	18.251	-2.390
Gender (1=male, 0=female)	0.951	1.909	0.162	-0.548	2.008	-0.118
Caste (nominal)						
(1) OBC	1.321	1.512	0.145	.227	1.815	-0.080
(2) SC	1.811	2.843	0.156	5.401***	3.122	0.284
(3) ST	-7.313 **	3.635	-0.266	-7.074***	3.820	-0.078
iv) Institutional support						
Institutional credit (1=yes, 0=no)	5.981 **	2.740	0.154	8.152*	3.096	0.255
MGNREGA (1=yes, 0=no)	1.403	1.820	0.381	-2.708	2.513	-0.338
BPL (1=yes, 0=no)	-2.741	1.894	-0.034	-4.225***	2.223	-0.159
Village Location (1=urban, 0= rural)	1.277	1.554	0.119	.587	1.686	-0.044
v) Economic factors						
Principal occupation livestock (1=yes, 0=no)	0.722	1.459	0.215	4.124**	2.108	0.301
vi) Animal Characteristics						
Livestock Age (log) (yr.)	-3.017	7.019	-0.020	-7.846	7.291	-0.450
Animal Type (nominal)						
(1) Buffalo	2.586	2.427	0.325	-0.577	2.997	-0.215
(2) Crossbred & Buffalo	3.029	1.986	0.311	0.403	2.620	-0.166
(3) Cow, CB & Buffalo	16.632 *	3.729	0.356	15.544	4.407	0.007

Pseudo R² = 0.5760
 Prob> chi² = 0.0000

* = Significant at 1% level of significance
 ** = Significant at 5% level of significance
 *** = Significant at 10% level of significance

village cooperative and to private buyers. Singhal *et al.* 2020 also observed that most of the lower caste households sold milk to the informal channel while organized channel was dominated by general caste households in Punjab. Our results are in consonance with the finding of these studies.

Among the factors under institutional support, access to institutional credit was significant at 5 per cent level of significance for the collection center outlet category and at 1 per cent level of significance under milk vender category. The positive sign in each category shows that if the institutional access is available, farmers will prefer to sell milk in these outlets rather than selling it directly to the consumers. The corresponding marginal effect value shows that if access to institutional credit is improved by 1 per cent, the farmer's probability of selling milk in collection center and to milk vender will increase by 0.15 per cent and 0.25 per cent, respectively. This meant that if a farmer had institutional support, then knowledge transmission amongst fellow farmers make them confident in opting suitable marketing channels. This corroborates with findings by Mburu *et al.* (2007), where group membership was taken as a proxy for social capital and had a positive effect toward farmer participation in the cooperative channel. Table also revealed that farmers belonging to BPL category, preferred to dispose-off the marketable surplus of milk directly to the consumers rather than selling it to the milk vendors. The reason of choosing direct channel may be less marketable surplus availability as most of the milk produced might have been utilized for family requirements.

Furthermore, the farmers whose primary occupation was livestock, they favoured selling milk to milk vendors over selling it directly to the consumers. The possible reason may be availability of higher milk surplus due to more focus on livestock enterprise, which in turn would have made it difficult to directly sell milk to consumers. Among the animal characteristics, farmers who owned all the types of animals *viz.*, cows, crossbreds and buffaloes preferred to sell milk in the collection center rather than selling it directly to the consumers. This may be due to unavailability of specific customers for separate kind of milk, which might have prompted producer to mix all kind of milk and dispose it at collection center. The value of marginal effects indicates one per cent increase in such unit, led to 0.36 per cent increase in the probability of selling milk in the collection center.

Conclusion

It can be concluded that, that herd size, marketable surplus, caste categories, access to institutional credit, BPL economic class, income from livestock and breed type of animals were seven significant factors affecting farmer's decision of choosing a particular milk-marketing outlet out of three. Although direct marketing channels highly efficient and fetch more prices to producers, still most of the farmer choose channel III for marketing of milk, may be because of easy disposal of marketable surplus.

This trend might continue; therefore, farmers should be made aware about quality parameters like fat percentage in the milk, or even provided with affordable fat testing kits through *Pashu Vigyan Kendras*/ Extension centres like KVKs, so that farmers can test it at their level and be assured about the prices they receive in the collection centres. There is need for the effective and improved spread of modern market outlets and dairy cooperatives so that all the farmers irrespective of social and economic background may benefit from livestock farming.

References

- Ahuja V, Redmond E (2004) Livestock services and the poor. *Tropical Ani Health Prod* 36: 247-268
- Amani S (2014) Smallholder farmers' marketing choices p4p global learning series. *Management Systems International*
- Anita R, John D (2001) Effects of urbanization on global food demand. *Eco Res Service/USDA*. 23-30
- Aregu L, Puskur R, Bishop-Sambrook C (2011) The role of gender in crop value chain in Ethiopia. Paper presented at the gender and market-oriented agriculture (Agri Gender 2011) Workshop, Addis Ababa, Ethiopia, 31st January-2nd February 2011. Nairobi, Kenya: ILRI.
- Barham J, Chitemi C (2009) Collective action initiatives to improve marketing performance: Lessons from farmer groups in Tanzania. *Food Policy* 34:53-59
- Brar RS, Kaur I, Singh VP, Chopra S (2018) Analysis of factors influencing choice of milk marketing channel among small and medium dairy farmers in Punjab. *Indian J Dairy Sci* 71: 299-305
- Eerdewijk VA, Danielsen C (2015) Gender matters in farm power. *Royal Tropical Institute*
- Ferto I, Szabo G (2002) The choice of supply channels in Hungarian fruit and vegetable sector. In: *Economics of Contracts in Agriculture, Second Annual Workshop, Annapolis, MD, 21-23 July*
- Goetz S (1992) A selectivity model of farmer food marketing behavior in sub-Saharan Africa. *American J Agric Eco* 74:444-452
- Gong W, Parton K, Cox RX, Zhou Z (2007) Transaction costs and cattle farmers choice of marketing channels in China: a tobit analysis. *Management Resource News* 30: 47-56
- Holloway G, Barrett CB, Ehui S (2005) The double-hurdle model in the presence of fixed costs. *J Int Agric Trade Dev* 1:17-28
- Jari B, Fraser GCG (2009) An analysis of institutional and technical factors influencing agricultural marketing amongst smallholder farmers in the Kat River Valley, Eastern Cape Province, South Africa. *African J Agric Res* 4:1129-1137
- Kashish, Kaur M, Sekhon MK, Dhawan V (2014) Marketable surplus, pattern and constraints faced by smallholder dairy farmer in Punjab. *Eco Affairs* 59: 641-647
- Key N, Sadoule E, de Janvry A (2000) Transaction costs and agricultural farmer supply response. *American J Agric Eco* 82:245-245
- Kharkwal S, Malhotra R, Bhinchhar BK, Ratika K (2021) An economic evaluation of crop and livestock enterprises in Uttarakhand hills. *Indian J Eco Dev* 17:591-598
- Kuma B, Baker D, Getnet K, Kassa B (2013) Factors affecting milk market outlet choices in Wolaita zone, Ethiopia. *African J Agric Res* 8:2493-2501
- Kumar A, Mishra A, Parappurathu S, Jha GK (2018) Farmers' choice of milk-marketing channels in India. *Eco Pol Weekly* 53
- Kumar A, Shah J (2016) Dairying as an instrument for ensuring socio-economic and nutritional security in rural India. *Indian J Agric Eco* 71:78-89

- Kumar N, Das TS, Gulati A (2022) Dairy value chain. In: Gulati, A., Ganguly, K., Wardhan, H. (eds) *Agricultural Value Chains in India*. India Studies in Business and Eco. Springer, Singapore 195-226
- Kumbhare SL, Sharma KNS, Patel RK (1983) Standardization of bovine units. *Indian J Ani Sci* 53: 547-550
- Kundu A, Banerjee M (2015) Product quality and brand image development: pillars of brand sustainability in the dairy sector. *Int J Eng Business Ent App* 14:24-29
- Lal P, Chandel BS (2016) Economics of milk production and cost elasticity analysis in Sirsa district of Haryana. *Eco Affairs* 61: 405-411
- Marenya, PP, Barret B (2006) Household level determinants of adoption of improved natural resources management practices among smallholder farmers in Western Kenya. *Food Policy* 32: 515-536
- Meena GL, Tiwari B (2015) Marketed surplus, consumption and disposal pattern of milk in Banswara district of Rajasthan. *Asian J Anim Sci* 10:193-197
- Morrison A, Raju D, Sinha N (2007) Gender equality, poverty, and economic growth. Policy research working paper 4349. World Bank, Washington, DC.
- Mutura JK, Nyairo N, Mwangi M, Wambugu SK (2015) Analysis of determinants of market channel choice among smallholder dairy farmers in Lower Central Kenya. *Int J Innovative Res Dev* 4: 264-270
- Park TA (2009) Assessing the returns from organic marketing channels. *J Agric Resource Econ* 483-497
- Saran D, Sharma M, Sharma H, Pawariya V (2022) Choice of milk marketing channels and factors influencing the marketing channels in rural areas of Bikaner district of Rajasthan. *Pharma Innova J* 11: 770-774
- Sarkar A (2020) Role of livestock farming in meeting livelihood challenges of SC cultivators in India. *Ind J Human Dev* 14: 23-41
- Singhal N, Kaur H, Mukherjee P, Basu S (2020) Choice modelling for participation in milk marketing channels: Evidence from Punjab, India. *Indian J Dairy Sci* 73:260-267
- Shree JS, Prabhu M (2019) An outlook on growth of dairy sector and its contribution to Indian economy. *Int J Livestock Res* 9:240-247
- Thorat S (2009) *Dalits in India: Search for a common destiny*. SAGE Publications.
- Tsourgiannis L, Errington A, Eddison J (2002) Marketing strategies of agricultural producers in objective one Greek regions: The factors affecting the selection of marketing channels of sheep and goat producers. School of Geography, University of Plymouth, Drake Circus, Plymouth, UK.
- USDA, FAS (2021) *India: dairy and products annual report number: IN2021-0122*
- Vandeplas A, MintenB, SwinnenJ (2013) Multinationals vs cooperatives: the income and efficiency effects of supply chain governance in India. *J Agric Eco* 64:217-44
- Vigneri M, Holmes R (2009) When being more productive still doesn't pay: gender inequality and socio-economic constraints in Ghana's cocoa sector. Paper presented at the FAO-IFAD-ILO workshop on gaps, trends, and current research in gender dimensions of agricultural and rural employment, Rome