Indian J Dairy Sci 76(3): 297-303
https://doi.org/10.33785/IJDS.2023.v76i03.013

RESEARCH ARTICLE

Economics of milk production and its constraints: A case study of Himachal Pradesh

Amit, Niyati*, Shilpa and Prakash Singh

Received: 12 June 2022 / Accepted: 17 October 2022 / Published online: 23 June 2023

Abstract: An attempt has been made in this investigation to work out the cost and returns from milk production across different milch species of animals. Tabular analysis was employed to work out the cost and returns while Garrett's Ranking Technique (GRT) was used to identify the major constraints in milk production. The multistage random sampling technique was adopted to select the sample of 60 dairy farmers. Average milk yield per day per animal was found to be significantly higher in the case of crossbred cows (7.06 litres) as compared to local cows (2.88 litres). Similarly, net maintenance cost per milch animal per day was found to be relatively higher in crossbred cows (₹ 200.76) as compared to local cows (₹ 113.76). The per litre cost of milk production was observed to be significantly higher in case of local cows (₹ 35.09) followed by crossbred cows (₹ 26.34). The net income per day was relatively higher in case of crossbred cows (₹ 64.62) as compared to local cows (₹ 4.29), while it was found lowest in the small herd size category for local cows (₹ 0.54). The net return from crossbred cows was more than that of local cows indicating that crossbred milking cow was more economical than the local cow in the study area. High cost of concentrate, unavailability of veterinary services and low milk productivity were the major constraints in milk production in the study area. Therefore, efforts should be made to impart knowledge to dairy farmers regarding advanced animal husbandry techniques through extension services.

Keywords: Average milk yield, Cobb-Douglas, Constraints, Extension services, Garrett's Ranking, Herd size, Milk production, Net maintenance cost

Introduction

India being a major agrarian economy has deep connection with dairy farming since the Vedic era. The dairy and livestock sector contributes 5.2 per cent to the country's GDP and employs more than 8 crore farmers directly including a very high proportion of small and marginal farmers (86.00%) (Economic Survey, 2021-22). Dairy farming in India occupies a prominent place in rural life and provides not only subsidiary occupation and nutritional standards but is also a source of organic manures and draught power (Kumari et al. 2020). It is quite interesting to note that India ranks first among the world's milk-producing nations with 23 percent of global production in the year 2022 (Economic Survey, 2021-22). Dairy is currently the top-ranking commodity in India, with a value of output of Rs. 8.39 lakh crore in 2019-20 which was higher than the combined output value of paddy and wheat during the same period (National Accounts Statistics, 2020-21). In India, the population of crossbred cows was 19.42 million in the year 2012 which increased to 25.67 million in the year 2019. In 2012, the population of indigenous cows was 48.13 million which increased to 48.51 million in the year 2019. The buffalo population was recorded at 51.05 million in the year 2012 which increased to 51.17 million in the year 2019. The population of crossbred cows, indigenous cows and buffaloes increased by 32.18, 0.79 and 0.24 per cent respectively from 2012 to 2019. While in Himachal Pradesh, the population of crossbred cows was 5.21 lakhs which increased to 6.12 lakhs in the year 2019. The population of indigenous cows in the year 2012 was 3.72 lakhs which decreased to 2.66 lakhs in the year 2019. In the year 2012, the buffalo population was 3.96 lakhs which decreased to 3.49 lakhs in the year 2019 (BAH&S, 2019). During 2012- 2019, the population of crossbred cows increased by 18.87 per cent while the population of indigenous cows and buffaloes decreased by 28.45 and 11.74 per cent respectively. Dairy farmers are drastically shifted their choice from indigenous breeds to the crossbred cow (Sharma et

[1]Department of Economics and Sociology, Punjab Agriculture University, Ludhiana, Punjab-141004
[2](thakniyati18ur@gmail.com), Department of Social Sciences, College of Forestry, Dr Yashwant Singh Parmar University of Horticulture and Forestry, Nauni, Solan-173230 (Himachal Pradesh) India.
[3]Department of Social Sciences, College of Forestry, Dr Yashwant Singh Parmar University of Horticulture and Forestry, Nauni, Solan-173230 (Himachal Pradesh) India.
[4] Department of Economics and Sociology, Punjab Agriculture University, Ludhiana, Punjab-141004

Niyati (✉)
Department of Social Sciences, College of Forestry, Dr Yashwant Singh Parmar University of Horticulture and Forestry, Nauni, Solan-173230 (Himachal Pradesh) India
Email: thakniyati18ur@gmail.com

al. 2012 and Kumar et al. 2012) Rearing of livestock is an integral component of the rural economy in Himachal Pradesh which plays a vital role in improving the socio-economic conditions of rural masses (Tulachan and Neupane, 1999). In Himachal Pradesh, there is a dynamic relationship between common property resources (CPRs) such as forests, water, grazing land, livestock and crops (Economic survey of Himachal Pradesh, 2021-22). The region has a high potential for dairying because of its rich natural endowments. The study was conducted in the Shimla district of Himachal Pradesh one of the frontline districts in milk production. It holds the third position in the state in milk production with an annual output of 1.75 Lakh tonnes during 2018-19 (Statistical Abstract of Himachal Pradesh, 2018-19). Despite its increasing importance, very few studies have been carried out in the district so far for analysing dairy farming and studying intricate issues of the economics of milk production (Dogra AK, 2016). Economic analysis of milk production provides useful information with respect to the share of various input components in the maintenance cost of milch animals (Pathania and Sharma, 2016). Whether the per litre cost of milk production is profitable in dairy farming or not. The research can be of great importance to recognize the profitability of milk production in the region, as well as in other regions with similar agro-climatic conditions. It can also assist in the planning and decision-making process in determining the right plan of action for the development and expansion of dairy farming in the region.

Materials And Methods

Selection of Study area

In the present study, a multistage random sampling technique was employed for selecting the ultimate milk-producing households. Shimla district has been selected purposively for the study because it has a relatively large bovine population (2.85 lakhs) as compared to other districts of the state (Livestock Census, 2019). In terms of milk production, it is the third largest milk-producing district in the state with an annual output of 1.75 lakh tonnes which shared 12 % of the state's milk production during the year 2018-19 (Statistical Abstract of Himachal Pradesh, 2018-19). In the first stage, out of twelve blocks in Shimla, the three blocks namely; Mashobra, Rohru and Rampur were selected randomly. In the second stage, 2 gram-panchayats were selected randomly from each selected block and thereafter in the third stage, 2 villages were selected randomly from each selected gram-panchayat. Thereafter, 5 dairy farmers were drawn randomly from each selected village thus making a total sample of 60 dairy farmers.

Data Collection

The primary data were collected from the 60 sample households by conventional survey method using a well-structured schedule through personal interviews on various aspects of dairy enterprises from selected households for the year 2020-21. The collected data covered socio-economic characteristics, management practice, land-use patterns, labour use and availability, capital, output and the problems encountered by dairy farmers.

Analytical Procedures

Dairy farms based on herd size were categorized into three different categories namely; small (0-3.64 SAUs), medium (3.64-7.66 SAUs) and large (7.66 SAUs) using the cumulative square root frequency method of stratification (Singh and Mangat, 1996). Tabular analysis was applied to work out the costs and returns from milk production and the Garrett ranking approach was followed for identifying the major constraints faced by the farmers during milk production.

Standard Animal Units (SAUs)

Considering the differences in regional endowments of animal wealth and species, the dairy animals have been converted into SAUs using factors suggested by Sirohi et al. (2019) for the hilly region. In this study apart from labour utilization, the body weight of the animal was also taken into consideration for the estimation of the SAUs. Based on expert opinion, 60 % of the weight was given to labour utilization and 40 % to the body weights of animals for the final estimation. As the study area falls in the hilly region so Standard Animal Units for this region were used as given below in table 1.

Resource Productivities in Dairy Farming

To analyse the resource productivities of different farms for improving the economic conditions of the farmers and to measure the contribution of a specific factor in combination with other factors which are responsible for the change in the level of output, multiple regression analysis was used. The Cobb-Douglas type production function was used because the coefficient of determination (R^2) was recorded highest with significant t-ratios thus the model was well fitted to the data. The Cobb- Douglas production function was fitted to the data as follows:

$$Y = AX_1^{b_1} X_2^{b_2} X_3^{b3} X_4^{b_4} X_5^{b_5} \ldots\ldots X_6^{b_6} u_i$$

In logarithms, the function is of the following form:

$$\log Y = \log A + b_1 \log X_1 + b_2 \log X_2 + b_3 \log X_3 + b_4 \log X_4 + b_5 \log X_5$$

Where,

Y_i = Income from milk per animal per day (Rs.)

X_1 = Expenditure on green fodder per animal per day (Rs.)

X_2 = Expenditure on dry fodder per animal per day (Rs.)

X_3= Expenditure on concentrates per animal per day (Rs.)

X_4= Value of Human labour used per animal per day (Rs.)

X_5 = Miscellaneous expenses per animal per day (Rs.)

A = Intercept

u_i = Error term

Constraints in Dairy Farming

Garrett ranking approach was adopted for identifying the various constraints experienced by the farmers in existing dairy farming in the study area given by Garrett and Woodworth (1969). The prime advantage of this technique over simple frequency distribution is that the constraints are arranged based on their severity from the point of view of farmers (Zalkuwi et al. 2015). Further, in order to test the significant difference for the problem among selected farm categories, the Chi-Square test was used.

Results and Discussion

Costs and returns from milk production for local cows

It can be seen in Table 2 that the overall average daily net maintenance cost per milch local cow was worked out to be ₹ 113.76, while it was highest in the case of the large category (₹ 125.05) followed by medium (₹116.16) and small category (₹ 106.85). On average, feed cost accounted for 68.48 per cent of the gross cost in the overall category which was lower than 81.36 % as reported by Pathania and Sharma (2012) in Kangra and higher than 62.45 % of the gross cost as reported by Patil et al. (2019) in Karnataka, 55.01 per cent by Meena et al. (2010) in Rajasthan. The expenditure on dry fodder constituted the major feed cost across all the household categories which constituted 32.47 per cent of the gross cost. At overall level, labour cost accounted for 20.66 percent of the gross cost. The category-wise analysis has shown that the contribution of labour was 20.96, 21.14 and 19.13 per cent of the gross cost for small, medium and large farms, respectively. This finding is much higher than the previous studies of 12.79 per cent of labour cost as reported by Khoveio et al. (2012) in Nagaland and 8.26 per cent in Meghalaya (Singh and Chauhan 2015). The component-wise break-up of the cost of milk production indicated that for the overall category, the contribution of variable cost to the gross cost (91.47%) was much higher than the contribution of fixed costs (8.53%) which was worked out to be 91.31, 91.54 and 91.66 % for small, medium and large farms, respectively. The overall gross return per milch local cow was worked out to be ₹ 105.24 while it was ₹ 108.44, 118.32 and 127.46 for small, medium and large categories of sample farms, respectively. The gross return per milch cow was highest for the large farm category. The results revealed that milk productivity increased with the increase in herd size and it was found highest for large farms (3.23 litres) followed by medium (2.97 litres) and small farms (2.65 litres). The reason behind this could be large category farmers were feeding a higher quantity of concentrate as compared to medium and small dairy farmers. The per litre cost of milk production was found highest in the case of small (₹ 35.59) followed by medium (₹ 34.78) and large farm categories (₹ 34.58), respectively. The net returns per local cow were recorded as lowest in the case of the small (₹ 0.54) farm category followed by medium (₹ 1.89) and large (₹ 2.57) categories of sample farms, respectively. Small herd category dairy farmers were feeding less concentrate to cows which results in lower milk productivity that ultimately lower the net return from the milk. These findings are in accordance with the findings of Meena et al. (2010), Khoveio et al. (2012), Jaiswal et al. (2015) and Patil et al. (2019).

Cost and returns from milk production for crossbred cows

The overall gross maintenance cost for crossbreds was worked out to be ₹ 200.76 per day which varies from ₹ 189.53 per day for the small category to ₹ 218.73 per day for the large farm category (Table 3). Feed cost for the large herd size category (₹ 161.84) was higher as compared to medium (₹ 150.87) and small herd size category (₹ 139.93). These findings are in accordance with earlier studies carried out by Tanwar et al. (2012). The reason behind this could be increased awareness among large category farmers regarding the importance of proper feed for animals. The overall fixed cost was found to be ₹ 16.29 which varies from ₹ 16.06 for the small herd size category to ₹ 16.63 for the large herd size category. The overall fixed cost accounted for 8.11 per cent of the total gross costs. The percentage of the fixed cost was highest for the small herd size category (8.47 %) and lowest for the large herd size category (7.60%). The overall total variable cost was found to be ₹ 184.48 which varies from ₹ 173.47 for the small herd size category to for ₹ 202.10 the large herd size category. Thus, fixed cost accounted for about 8.11 per cent and variable cost accounted for about 91.89 per cent of the gross cost. Feed and fodder costs accounted for about 73.79 per cent of the total gross cost followed by labour costs of 15.95 per cent of the total gross cost. On the appraisal of per litre cost of milk production, it was found that the per litre cost of milk production was found to be 26.37 which varies from ₹ 25.96 per day for small to ₹ 26.69 per day for the small category. Therefore, it can be concluded that the cost of milk production was highest in the case of medium

Table 1: Standard animal units for Hill regions of India

Category of animals	Local Cow	Crossbred cow	Buffalo
Adult Male (≥ 3 years)	1.11	1.48	1.43
Adult female (≥3 years)	1.00	1.71	1.70
Young stock male (<1)	0.29	0.41	0.35
Young stock female (<1)	0.63	0.72	0.63
Young Stock male (>1)	0.55	0.71	0.73
Young Stock female (>1)	0.82	1.08	0.94
Heifer	0.98	1.24	1.09

Sirohi et al. (2019)

herd size categories. Though the total cost was highest for the large herd size category the cost per litre was highest for the medium herd size category. The overall gross return per milch crossbred cow was estimated to be ₹ 250.57 while it was ₹ 234.82, 256.11 and 276.23 for the small, medium and large categories in sampled farms, respectively. The gross return per milch cow was highest for the large farm category. The average daily milk yield was found to be 6.74, 7.12 and 7.68 litres for small, medium and large farms. The net returns per milch were recorded highest in the case of the large (₹ 72.85) farm category followed by medium (₹ 66.10) and small (₹59.83) categories of sample farms, respectively.

Resource productivities

The milk production function describes the input-output relationship in milk production. The cobb-Douglas production function for cattle milk was fitted and the results of regression analysis are presented in Table 4. The results revealed that the adjusted coefficient of determination value (R^2) was 0.78 indicating thereby that 78 per cent of the variation in the gross income was explained by the independent variables included in the production function model. The coefficients of green fodder and concentrate were positive and significant ($p<0.01$) with the coefficient values of 0.56 and 0.67, respectively, which shows that a one per cent increase in expenditure on green fodder and concentrate cause 0.56 and 0.67 per cent increase in gross returns keeping other factors constant. These results indicated greater bearing of green fodder and concentrate returns from milk production. This conforms with earlier studies carried out (Meena et al. 2012) in the Alwar district of Rajasthan. The labour was also positive and significant ($p<0.05$) with a coefficient value of 0.21, which showed that a one percent increase in expenditure on labour would increase gross income by 0.21 per cent respectively. The returns to scale were increasing (1.49) implying that doubling of input will result in enhancing the output by more than double. These findings are in accordance with the findings of Prusty et al. (2015) in Odisha and Pundir et al. (2018) in Gujarat.

Constraints encountered by the dairy farmers

At the overall level, the high cost of concentrate was the most severe problem and it was more prevalent in the small category with a mean Garrett score of 63.18 (Table 5). The findings of the

Table 2: Costs and Returns from Milk Production for Local Cows

(₹/animal/day)

Particular	Farm Category			
	Small	Medium	Large	Overall
Total Fixed Cost (TFC)	9.29	9.83	10.43	9.71
	(8.69)	(8.46)	(8.34)	(8.53)
Cost of green fodder (F_1)	20.55	23.33	26.06	22.63
	(19.23)	(20.08)	(20.84)	(19.89)
Cost of dry fodder (F_2)	35.78	36.99	39.56	36.94
	(33.49)	(31.84)	(31.64)	(32.47)
Cost of concentrates (F_3)	16.28	18.70	22.44	18.34
	(15.24)	(16.10)	(17.94)	(16.12)
Feed and Fodder Cost	72.61	79.02	88.06	77.90
($V_1=F_1+F_2+F_3$)	(67.96)	(68.03)	(70.42)	(68.48)
Imputed Cost of family labour (V_2)	22.40	24.56	23.92	23.51
	(20.96)	(21.14)	(19.13)	(20.66)
Miscellaneous cost (V_3)	2.55	2.75	2.64	2.64
	(2.39)	(2.37)	(2.11)	(2.32)
Total Variable Cost	97.56	106.33	114.62	104.05
($TVC=V_1+V_2+V_3$)	(91.31)	(91.54)	(91.66)	(91.47)
Gross Cost (A=TFC+TVC)	106.85	116.16	125.05	113.76
	(100.00)	(100.00)	(100.00)	(100.00)
Returns from Manure (B)	12.54	12.86	13.35	12.81
Net Cost (C=A-B)	94.31	103.30	111.70	100.94
Sale price of milk (¹ per litre)	36.13	36.67	37.15	36.52
Average milk production (litre/animal/day)	2.65	2.97	3.23	2.88
Gross Return (D)	95.74	108.91	119.99	105.24
Net Return (D-C)	1.43	5.61	8.29	4.29
Cost of milk production (₹ per litre)	35.59	34.78	34.58	35.09
Return (₹ per litre)	0.54	1.89	2.57	1.43

Figures in parentheses are percentage to total

Table 3: Cost and returns from milk production for crossbred cows (₹ /animal/day)

Particular	Farm Category			
	Small	Medium	Large	Overall
Total Fixed Cost (TFC)	16.06	16.38	16.63	16.29
	(8.47)	(8.00)	(7.60)	(8.11)
Cost of green fodder (F_1)	38.1	38.83	40.22	38.77
	(20.10)	(18.95)	(18.39)	(19.31)
Cost of dry fodder (F_2)	44.85	46.7	49.9	46.49
	(23.66)	(22.79)	(22.81)	(23.15)
Cost of concentrates (F_3)	56.98	65.34	71.72	62.89
	(30.06)	(31.89)	(32.79)	(31.32)
Feed and Fodder Cost	139.93	150.87	161.84	148.14
($V_1=F_1+F_2+F_3$)	(73.83)	(73.64)	(73.99)	(73.79)
Imputed Cost of family labour (V_2)	29.98	32.95	34.92	32.02
	(15.82)	(16.08)	(15.96)	(15.95)
Miscellaneous cost (V_3)	3.56	4.67	5.34	4.31
	(1.88)	(2.28)	(2.44)	(2.15)
Total Variable Cost (TVC=$V_1+V_2+V_3$)	173.47	188.49	202.10	184.48
	(91.53)	(92.00)	(92.40)	(91.89)
Gross Cost (A=TFC+TVC)	189.53	204.87	218.73	200.76
	(100.00)	(100.00)	(100.00)	(100.00)
Returns from Manure (B)	14.54	14.86	15.35	14.81
Net Cost (C=A-B)	174.99	190.01	203.38	185.95
Sale price of milk (₹ per litre)	34.84	35.97	36.25	35.53
Average milk production (litre/animal/day)	6.74	7.12	7.68	7.06
Gross Return (D)	234.82	256.11	276.23	250.57
Net Return (D-C)	59.83	66.10	72.85	64.62
Cost of milk production (₹ per litre)	25.96	26.69	26.48	26.34
Return (₹ per litre)	8.88	9.28	9.56	9.16

Figures in parentheses are percentage to total

Table 4: Resource productivities of dairy farms in Shimla

Particulars	Coefficients	Standard error	t stat
Intercept	1.062**	0.104	10.162
Value of green fodder) (X_1)	0.565**	0.206	2.746
Value of dry fodder (X_2)	0.011	0.064	0.172
Value of concentrate (X_3)	0.673**	0.103	6.534
Value of labour (X_4)	0.216*	0.090	2.400
Miscellaneous Expenses (X_5)	0.026	0.096	0.275
R^2	0.78		
Adjusted R^2	0.76		
Return to scale (Σbi)	1.49		
Sample size (n)	60		

Note: ** Significant at 1% level of significance and * Significant at 5% level of significance.

present study are in line with the findings of (Khoveio et al. 2012 and Lalrinsangpuii et al. 2016). The second most severe problem was the unavailability of veterinary services on time with a mean Garrett score of 57.28. It was observed that this problem was more prevalent in medium category farmers (71.04) followed by small and large category farmers with mean Garret scores of 59.31 and 23.73, respectively. These results are in agreement with the findings of Patil et al. (2009) and Dubey et al. (2013). Low milk productivity of milch animals was the third most severe problem faced by the dairy farmers on an overall basis with a mean Garret score of 51.89. This problem was found more frequently in the small category (59.74) followed by the medium (53.08) and small category (32.64) respectively. Dogra A (2016) and Kumar A (2020) also reported that the low milk productivity of milch animals was one of the major constraints in Himachal Pradesh. Next to this, lack of awareness about advanced animal husbandry techniques

Table 5: Constraints encountered by the dairy farmers

Particulars	Small		Medium		Large		Overall		Chi-Square (S«2)
	Score	Rank	Score	Rank	Score	Rank	Score	Rank	
Low Milk Productivity of milch animals	59.74	IV	53.08	III	32.64	V	52.22	III	8.23
Unavailability of veterinary services on time	59.31	II	71.04	II	23.73	IV	57.28	II	23.64**
Problem of heat detection	26.92	X	22.43	X	54.45	II	30.25	X	17.37*
High cost of concentrate feed	63.18	I	71.23	I	72.09	I	67.89	I	0.70
Lack of awareness about advanced animal husbandry techniques	56.27	III	58.39	IV	34.82	IV	53.15	IV	6.82
No sufficient water availability all the time	32.46	IX	30.61	IX	29.91	VI	31.28	IX	0.11
Lack of transport facilities	47.46	V	48.65	V	25.18	VIII	43.83	V	8.65
Low price offered for the milk	44.42	VIII	41.22	VI	42.27	III	42.80	VI	0.12
Lack of credit support	44.77	VII	35.78	VIII	27.18	VII	38.10	VIII	4.31
Inadequate knowledge about balanced feeding	47.00	VI	40.87	VII	14.09	X	38.62	VII	18.02*

Note: Figure is parentheses indicate standard error of the estimate. ** Significant at 1% level of significance and * Significant at 5% level of significance

among the dairy farmers (53.15), lack of transport facilities (43.83), low price of milk (42.80), inadequate knowledge about balanced feeding (38.62), lack of credit support (38.10), no sufficient water availability all the time (31.28) and the problem of heat detection with mean Garrett score 30.25 were the major problems encountered by the dairy farmers in the study area. These findings are in conformity with the findings of (Prusty and Tripathy, 2015). To test the significant difference for the problem among selected farm categories, the Chi-Square test was used. The chi-square value was found significant for the constraints like lower conception rate through AI (21.64), the problem of heat detection (17.37) and inadequate knowledge about balanced feeding (18.02) indicating that these constraints differed significantly among three farm categories.

In the present study on economic analysis of milk production, it was observed that the feed cost accounted for 73.79 per cent of the gross cost in crossbred cows and 68.48 per cent in local cows where concentrate formed the major constituent of the feed cost. These results are in agreement with the findings of Khoveio et al. (2012) and Mohapatra et al. (2021). The overall net returns per litre of milk were recorded highest for crossbred cows (¹ 9.16) followed by indigenous cows (₹ 1.43). These findings are in accordance with earlier studies carried out by Athare et al. (2019) and Kumari et al. (2020). The average milk production per day of milch crossbred and local cows was found to be 7.06 and 2.88 litres, respectively. The per litre cost of milk production was observed to be significantly higher in the case of local cows (¹ 35.09) followed by crossbred cows (₹ 26.34). The high per litre cost of milk may be a result of the high feed cost associated with low milk yield in the case of local cows. Therefore, there is a need to adopt scientific dairy farming practices and efforts should be made to upgrade the germplasm of indigenous cows to improve its productivity thus reducing the cost of milk production (Athare et al. 2019).

Conclusion

The study further observed that the high price of concentrate followed by, unavailability of veterinary services on time, low milk productivity of milch animals, and lack of awareness about advanced animal husbandry techniques were the major constraints faced by the dairy farmers in the study area. It can be concluded from the study that there is a knowledge gap among dairy farmers. Therefore, efforts should be made to bridge this knowledge gap and empowers the farmers with adequate information for effective and sustainable dairy farming through extension services.

References

20th Livestock Census (2019). Department of Animal Husbandry & Dairying, Ministry of Fisheries, Animal Husbandry and Dairying, Government of India. pp 119

Athare PG, Verma A, Malhotra R, Sendhil R (2019) Economics of milk production in Pune district of Maharashtra: A comparative analysis. Indian J Dairy Sci 72: 652-658

Basic Animal Husbandry& Statistics (2019). Department of Animal Husbandry, Dairying and Fisheries. Ministry of Fisheries, Animal Husbandry and Dairying, Government of India. 132p.

Dogra AK (2016) Dairy Development in Himachal Pradesh. J Advances and Scholarly Researches in Allied Education 12:366-368.

Dubey YK, Sharma ML, Yadav KN (2012) Problems faced in adoption of improved dairy farming practices by the dairy farmers of Raipur city. Res J Anim Husbandry Dairy Sci 3:30-33

Economic Survey (2022), Economic Division, Department of Economic Affairs, Ministry of Finance, New Delhi. pp 685

Garrett EH, Woodworth RS (1969) Statistics in psychology and education. 6th ed. Vakils, Feffer and Simons Pvt. Ltd., Bombay. 329p.

Jaiswal P, Singh RK (2015) Economics of milk production and determinants of market participation for smallholder dairy farmers in Raipur district of Chhattisgarh. Indian J Dairy Sci 68:619-627.

Khoveio LLM, Jain DK, Chauhan AK (2012) Economics of milk production and its constraints in Nagaland. Indian J Dairy Sci 65:520-526.

Kumar A (2020) Constraints of Dairy Farming in Himachal. J Advances and Scholarly Researches in Allied Edu 17:52-55

Kumari B, Chandel BS, Priyanka (2020) Economic analysis of milk production in eastern region of India. Indian J Dairy Sci 73:449-456.

Lalrinsangpuii, Malhotra R, Priscilla L (2016) Economics of milk production and its constraints in Mizoram. Indian Journal of Dairy Science 69:588-594.

Meena GL, Burark SS, Pant DC, Sharma H, Yogi RK (2012) Milk production function and resource use efficiency in Alwar district of Rajasthan. International Journal of Scientific & Technology Research 1:115-119

Meena GL, Jain DK, Chandel BS (2010) Economic analysis of milk production in Alwar district of Rajasthan. Asian Journal of Dairy and Food Research 29:1-7.

Mohapatra S, Sendhil R,Singh A, Dixit A K, Malhotra R, Ponnusamy K (2021) An economic analysis of milk production in Haryana. Indian J Dairy Sci 74: 159-166

National Accounts Statistics (2021). Central Statistical Organisation. Ministry of Statistics and Programme Implementation, Government of India. pp 408.

Pathania MS, Sharma A (2016) Economic analysis of milch animals in Jaisinghpur tehsil of district Kangra. Himachal J Agric Res 42:37-46.

Patil AP, Gawande SH, Nande MP, Gobade MR (2009) Constraints Faced by the Dairy Farmers in Nagpur District while Adopting Animal Management Practices. Vet World 2:111-112

Patil V, Reddy BS, Patil SS and Hiremath GM (2019) Comparative economics of rural and peri-urban dairy farming in Kalaburagi district of Karnataka. J Applied Natural Sci 11:762-767

Prusty SR, Tripathy S (2015) Economics of milk production in the organized and un-organized sector in Cuttack district of Odisha- a comparative analysis. Indian J Dairy Sci 69:360-367

Pundir RS, Mishra S, Mahera AB, Trivedi MM, Zala YC (2018) Economics of milk production and its disposal pattern in central Gujarat. Indian J Dairy Sci 71: 611-619.

Sharma KD, Chauhan SK, Sharma A (2012) Role of improved breeds and management practices in enhancing dairy animal productivity in Himachal Pradesh. Indian J Agric Econ 67:436-437

Kumar V, Lal H, Priyanka (2012) Livestock economy of Himachal Pradesh: Need to strengthen animal health and veterinary services. Agricultural Economics Research Review 25:501-506

Singh KR, Chauhan AK (2015) Impact of dairy co-operatives on income and employment in rural Meghalaya. Indian J Dairy Sci 68:173-179

Singh R, Mangat NS (1996) Elements of survey sampling. Kluwer Academic Publication, Netherlands. 362p

Sirohi S, Chand P, Sharma D, Saxena R (2019) Estimation of bovine equalizing units in India: A regional perspective. Indian J Anim Sci 89:1009-1013.

Statistical Abstract of Himachal Pradesh (2019) Department of Economics and Statistics Government of Himachal Pradesh, Shimla. pp 147

Tanwar PS, Kumar Y, Sankhala G (2012) Economics of milk production among member and non- member families of dairy co-operatives in Jaipur, Rajasthan. Indian J Dairy Sci 65:405-409

Tulachan PM, Neupane A (2022) Livestock in Mixed Farming Systems of the Hindu Kush- Himalayas: Trends and Sustainability. Food and Agriculture Organization of the United Nations International Centre for Integrated Mountain Development.https://www.fao.org/3/x5862e/x5862e00.htm#TopOfPage (10.00 AM, 20th Feb 2022)

Zalkuwi J, Rao B, Singh R, Bhattarai M, Singh O (2015) Analysis of constraints influencing sorghum farmers using Garrett's ranking technique: a comparative study of India and Nigeria. Int J Sci Res Manag 3:2435-2440