



## Research Article

# ECONOMIC ANALYSIS OF MILK PRODUCTION IN KOHIMA DISTRICT OF NAGALAND

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**Abstract:** Dairying is an integral part of farming systems in India and also plays an important role in strengthening the rural economy. The present study attempts to analyse the different cost structures and returns from milk production in Kohima District of Nagaland. The study was based on the data collected from 100 farming households practicing dairy farming either as main or subsidiary occupation during the period 2017-18. The study emphasises the economic costs and returns of milk production by different species of milch animals in different herd-size categories. The results of the study indicate that average daily net maintenance cost was higher for crossbred cows than local cows; however, due to its higher milk productivity the crossbred cows are comparatively more profitable for milk purpose. Since milk productivity was lower for local cows; therefore, the local cows were kept mainly for meat purpose. Most of the labour utilized was hired labour of non-local Nepalese so, there is a need to encourage the local farmers to take up dairy farming by providing trainings on scientific management of dairy farms and providing financial assistance through loans.

**Keywords:** Cost, Milk productivity, Returns

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## Introduction

Dairying is an age-old tradition for millions of rural households across India. The domestication of cattle has been an integral part of the farming systems since time immemorial. In the context of poverty and malnutrition alleviation, milk has a special role to play for its numerous nutritional advantages as well as providing supplementary income to farmers. The Indian dairy industry acquired substantial growth from Eighth Plan onward, with the inception of Operation Flood Programme in 1970-71, milk production in India has shown a rising trend and. India ranks first in milk production, accounting for 18.5 percent of world production, achieving an annual output of 165.5 million tonnes during 2016-2017 as compared to 155.5 million tonnes during 2015-2016 and 146.3 million tonnes during 2014-15. Though dairy has been an integral part of the farming systems and culture for centuries, the dairy production system in the North Eastern part of the country is highly under-developed and it differs widely from the rest of the country as well. Despite impressive developments taking place in the dairy sector throughout the country, the situation and performance of the dairy sector in the North eastern states and particularly Nagaland is in contrast to the national scenario. Though the state has set forth developmental goals to promote smallholder production and marketing in order to meet or partially meet local demands for milk and dairy products, local demands for milk continue to increase, which is being met through imports. This indicates a huge difference between demand and supply of milk in the state. In order to become competitive and self-sufficient in the dairy sector, there is a need for the state of Nagaland to create an efficient policy for the dairy sector, for which a systematic knowledge of the costs and returns of milk production in Nagaland is required. Under this backdrop, the study was conducted with the objective; to examine the general background of dairy households and analyse the cost and returns of milk production across different herd-size farm groups [1-6].

## Materials and Methods

The study was conducted in Kohima district of Nagaland. It is based on primary data from 100 respondents from two blocks of the district, viz., Jakhama block and

Chiephobozou block. A group of eight leading villages was obtained from concerned government departments and four villages from each block were selected at random. For selection of milk producers, a list of milk producers was obtained from village level extension workers of respective villages. From the list, a sample of about 100 respondents was selected using Probability Proportionate to size. The primary data were collected from respondents by personal interview method for which, a special schedule was designed and pre-tested for workability. The selected samples were classified using cumulative square root technique as the basis of classification. The households were thus categorized into three herd size categories viz., small (<5 ACU), medium (5-10 ACU) and large (>10 ACU) and the distribution of sample households across each of the herd size categories was 25, 59 and 16 for small, medium and large categories respectively.

## Analytical tools

A tabular analysis was employed to work out the costs and returns from milk production.

The procedure followed for cost estimation of milk production is given below:

Gross costs = Total fixed costs + Total variable costs

Fixed costs = Depreciation on milch animals + Depreciation on cattle sheds and dairy equipment + Interest on fixed capital investment

Variable cost = Feed and fodder cost + Labour cost + Veterinary cost + Miscellaneous cost

Gross return = (Milk yield \* Market Price) + Value of dung

Net cost = (Total cost – Value of dung)

Net return = Total return – Total cost

Fixed costs: The fixed costs for the dairy enterprise includes the following-

Depreciation on fixed assets like milch animals @ 8 percent assuming productive life of local cows to be 10 years and 12.5 years for crossbreds,

Depreciation on cattle sheds @ 2 percent and 5 percent for "pucca" and "kaccha" assuming their useful life to be 50 and 20 years respectively.

Depreciation on dairy equipment's as per productive life of individual equipment.

Interest on fixed capital @ 10 percent.

Depreciation was calculated using straight line method. The fixed cost for animal was apportioned on the basis of Standard Animal Units (S.A.U.). The conversion coefficients used for calculating the fixed cost of animal have been presented. The cost of green fodder was calculated on the basis of hired labour used for collecting the fodder as in the study area, green fodder was available for collection free of cost and cost was incurred only for labour. The dry fodder was calculated in terms of transportation cost and labour wage as rice straw which was used as dry fodder was available free of cost in the study area. It was calculated as: Dry fodder cost/Kg = Amount of fodder/ (Transportation cost + labour cost). The concentrate cost was calculated on the basis of the prices prevailing in the study area. The hired labour was calculated according to the wages paid to the labourers while for family labour, the value was obtained depending on the hours spent per day in performing dairy activities and prevailing wage rate of casual labour and payment systems in the study area. Veterinary costs include cost of Artificial Insemination (A.I.), vaccination and medicines incurred on an animal during a period of one year while miscellaneous costs such as cost of repairs, electricity, water charges, fuel, etc., were calculated on the basis of per milch animals per day for different types of milch animals kept by the sample dairy farms.

#### Estimation of returns from dairy farm

Income from dung: Monetary value of dung was estimated by multiplying the proportion of manure produced from dung with its market price. Returns from milk production: Milk yield was estimated on the basis of actual amount of milk obtained at the time of milking which was done twice in a day. The price of milk was calculated on the basis of different prices paid by different agencies since the dairy farm households sold milk to more than one agency.

#### Results and discussion

Socio economic profile of the sample households: Majority of the sample dairy farmers (61 numbers) in the study area have medium herd size. The percentage of literate head of sample households was highest in the large herd size category while the illiterate head of households was highest in medium sized category. Majority of head of households had primary education. The percentage of head of households who had higher secondary university and university education was found to be 27.4 and 16 percent respectively while the percentage of farmers having a graduate degree was found to be significantly low [Table-1]. Costs and returns from milk production: The analysis of costs and returns from milk production was done separately for different species of milk animals maintained by different categories of households to have a better insight of species and category wise economics of milk production.

#### Crossbred cow

The daily net maintenance cost and returns per milking crossbred cow from milk production have been presented in [Table-2]. The overall average daily maintenance cost per milking crossbred cow was worked out to be 143.26, while it was 142.63, 144.13 and 143.01 for small, medium and large categories of sample households respectively. The overall net returns per milking crossbred cow was 77.70 while it was worked out to be 83.84, 78.39 and 70.88 for small, medium and large samples households. Overall, the variable cost accounted for 95.76 percent of the gross cost wherein cost of feed constituted the major cost with a total share of 73.31 percent. The overall labour cost accounted for 20.45 percent of the gross cost while it was found to be 22.85, 19.64 and 18.89 percent for small, medium and large household respectively which is much higher than 12.79 percent as reported by Khoveio (2011) in Nagaland. This could be due to the fact that labour cost has increased in the study area. The labour cost per animal was found to be highest for small household category which agrees with the findings of Rajadurai (2002) in Madurai district of Tamil Nadu. The fixed cost accounted for 4.24 percent of the gross cost while it was 3.68, 5.11 and 3.94 percent across small, medium and large categories respectively. The net return was highest for small household and lowest for large household. The overall average milk yield per milking animal was observed to be 5.02 litres while it was 5.08, 5.12 and 4.85 litres for small, medium and large categories of households. The per litre cost of milk production was worked out to be 28.57 while it was 28.08, 28.15 and 29.49

for small, medium and large household categories respectively. The relatively higher per litre cost of milk production observed in the present study could be mainly attributed to the high cost of concentrate which accounted for 34.09 percent of the gross cost. The overall sale price per litre of milk was found to be 44.09 while it was 44.58, 43.46 and 44.1 for small, medium and large categories respectively. The price of milk received was lowest in the case of medium household category as most of them disposed off their milk to cooperative society where they were paid on the basis of fat and SNF in milk. However, the low price of milk was compensated by providing services and feed supplements at subsidized rate.

Table-1 Socio-economic profile of sample households.

Particulars	Herd size categories		
	Small	Medium	Large
Number of sample households	25.00	61.00	14.00
Average family size (number)	5.28	5.13	6.00
Educational status of head of households (%)			
Illiterate	11.54	16.39	14.29
Primary	26.92	22.95	42.86
Secondary	19.23	34.43	28.57
Higher Secondary	34.62	8.20	7.14
Graduate and above	3.85	16.39	7.14

Table-2 Maintenance cost and returns per milking crossbred cow (₹/animal/day)

Cost component	Small	Medium	Large	Overall
Variable cost				
Green fodder	25.95 (18.01)	27.93 (19.18)	27.02 (18.67)	26.97 (18.62)
Dry fodder	27.76 (19.27)	28.57 (19.62)	28.85 (19.93)	28.39 (19.61)
Concentrate	49.22 (34.16)	50.31 (34.54)	52.91 (36.56)	50.81 (35.09)
Medicines and vaccines	2.14 (1.49)	2.12 (1.46)	2.05 (1.42)	2.10 (1.45)
Fuel	0.13 (0.09)	0.09 (0.06)	0.17 (0.12)	0.13 (0.09)
Labour	32.92 (22.85)	28.61 (19.64)	27.34 (18.89)	29.62 (20.45)
Miscellaneous	0.66 (0.46)	0.58 (0.40)	0.70 (0.48)	0.65 (0.45)
Total variable cost (A)	138.78 (96.32)	138.21 (94.89)	139.04 (96.06)	138.68 (95.76)
Fixed cost				
Depreciation on fixed capital	3.41	4.57	3.85	3.94
Interest on fixed capital	1.89	2.87	1.85	2.20
Total fixed cost (B)	5.30 (3.68)	7.44 (5.11)	5.70 (3.94)	6.15 (4.24)
Gross Cost (A+B)	144.08	145.65	144.74	144.82
Value of dung	1.45	1.52	1.73	1.57
Net cost	142.63	144.13	143.01	143.26
Sale price of milk	44.58	43.46	44.10	44.05
Milk production (L/day)	5.08	5.12	4.85	5.02
Gross return (C)	226.47	222.52	213.89	220.96
Net return	83.84	78.39	70.88	77.70
Cost per litre (₹)	28.08	28.15	29.49	28.57

Note: Figures in parenthesis indicate percentage to gross cost

#### Local cow

The daily net maintenance cost and net returns per milking local cow from milk production across different categories of sample households have been presented in [Table-3]. [Table-3] depicts that the overall average daily maintenance cost per milking local cow was worked out to be 53.32 while it was 50.86, 53.86 and 55.24 for small, medium and large categories of sample households respectively. Feed cost accounted for 67.67, 70.56 and 73.75 percent of the gross cost across small, medium and large household categories. Concentrate formed the major feed cost which alone shared an overall 34.77 percent of the gross cost. The cost incurred on concentrate was highest in the large size category *i.e.*, 22.59 followed by the medium size category *i.e.*, 18.98 while it was least in the small size category (15.35). Less supply of concentrate to cattle in the small category may be one of the major reasons responsible for less milk productivity.

Green fodder and dry fodder had an overall share of 16.65 and 19.42 percent of the gross cost. The overall labour cost was worked out to be 19.46 percent of gross cost while it was 21.19, 19.71 and 17.63 percent for small, medium and large household categories respectively. The labour cost per milking animal per day was highest for small household category *i.e.*, 11.02 while it was lowest for large household category *i.e.*, 9.96. This agrees with the findings of Khoveio (2011) reported in Nagaland which may be due to the fact that local cows are still reared in the same traditional manner as was done during that period. The overall share of fixed cost to the gross cost was worked out to be 7.89 percent while it was 9.08, 8.12 and 6.57 percent for small, medium and large household categories respectively. The net return from local cow was found to be very low which may be mainly attributed to its low milk yield. The overall per litre cost of milk production was worked out to be 31.33 while it was 31.79, 30.26 and 31.93 for small, medium and large categories of sample households respectively. The overall average milk yield per animal was found to be 1.70 litres per day whereas it was found to be 1.60, 1.78 and 1.73 litres per day for small, medium and large household categories respectively.

Table-3 Maintenance cost and returns per milk local bred cow (₹/animal/day)

Cost component	Small	Medium	Large	Overall
Variable cost				
Green fodder	9.33 (17.94)	9.19 (16.65)	8.74 (15.47)	9.09 (16.65)
Dry fodder	10.67 (20.52)	10.78 (19.53)	10.34 (18.30)	10.60 (19.42)
Concentrate	15.35 (29.51)	18.98 (34.38)	22.59 (39.98)	18.97 (34.77)
Medicines and vaccines	0.15 (0.29)	0.17 (0.31)	0.23 (0.41)	0.18 (0.34)
Fuel	0.09 (0.17)	0.11 (0.20)	0.15 (0.27)	0.12 (0.21)
Labour	11.02 (21.19)	10.88 (19.71)	9.96 (17.63)	10.62 (19.46)
Miscellaneous	0.68 (1.31)	0.61 (1.11)	0.78 (1.38)	0.69 (1.26)
Total variable cost (A)	47.29 (90.92)	50.72 (91.88)	52.79 (93.43)	50.27 (92.11)
Fixed cost				
Depreciation on fixed capital	3.37	3.25	2.69	3.10
Interest on fixed capital	1.35	1.23	1.02	1.20
Total fixed cost (B)	4.72 (9.08)	4.48 (8.12)	3.71 (6.57)	4.30 (7.89)
Gross Cost (A+B)	52.01	55.20	56.50	54.57
Value of dung	1.15	1.34	1.26	1.25
Net cost	50.86	53.86	55.24	53.32
Sale price of milk	40.00	41.50	42.00	41.17
Milk production (L/day)	1.60	1.78	1.73	1.70
Gross return (C)	64.00	73.87	72.66	70.18
Net return	13.14	20.01	17.42	16.86
Cost per litre (₹)	31.79	30.26	31.93	31.33

Note: Figures in parenthesis indicate percentage to gross cost

## Conclusion

Among various agricultural enterprises, livestock production has more income redistributive effect on households and is very effective in reducing rural income inequality. The findings showed that the feed cost accounted for 73.31 percent of the gross cost in crossbred cows and 70.84 percent in local cows, of which concentrate formed the major constituent. The share of labour was 20.45 and 10.62 percent of gross cost for crossbred and local cows respectively. This indicates a need for supportive technical, institutional and policy initiatives for improvement of breeds, feed availability, disease control, food safety and private investment in order to improve milk productivity and boost the milk production. Although, the daily net maintenance cost was higher for crossbred cows than local cows, however, due to its higher milk productivity the crossbred cows are comparatively more profitable for milk purpose. As milk productivity was lower for local cows than crossbred cows; therefore, the local cows were kept mainly for meat purpose. Most of the labour utilized was hired labour of non-local labourers *i.e.*, Nepalese, indicating a strong need to encourage the local farmers to take up dairy farming by providing trainings on scientific management of dairy farms and

also by providing financial assistance through loans and subsidies. The study also concludes that rearing of dairy animals is a profitable venture which can ensure the livelihood security of producers, provide margin to intermediaries and at the same time ensure the consumer's nutritional security.

**Application of research:** The findings of the research will be applicable in all groups of farms where dairy cattle are reared for milk production and where geo-climatic conditions similar to the study area prevail.

**Research Category:** Dairy Science

## Abbreviations

A.C.U.: Animal Conversion Units

A.I.: Artificial Insemination

Kg: Kilogram

L: Litre

S.A.U : Standard Animal Units

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