

ECONOMIC EMPOWERMENT OF DAIRY FARMERS THROUGH DAIRY COOPERATIVE SOCIETIES IN NAGALAND

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ABSTRACT

This study examines the role of Dairy Cooperative Societies (DCS) in empowering dairy farmers economically in the Dimapur district of Nagaland, India. Primary data were collected from 75 DCS members and 25 non-members, while secondary data were sourced from the DIMUL office and relevant public records for the agricultural year 2020-21. Analytical methods included tabular analysis, index construction, and cost-return analysis. Economic empowerment was assessed by examining the creation of human, physical, and financial assets among the farmers. Results indicated that DCS members exhibited significantly higher mean scores in human (58.44 vs. 51.33), financial (42.00 vs. 30.17), and overall asset creation (55.11 vs. 44.50) compared to non-members. However, physical asset creation was slightly higher for non-members (52.00 vs. 51.11). Additionally, DCS members reported significantly higher average annual savings (Rs. 42,845.96 vs. Rs. 21,508.69). In terms of milk production, the net return per day from crossbred cows was Rs. 53.19, Rs. 78.09, and Rs. 71.30 for small, medium, and large-scale farmers, respectively, compared to Rs. 17.95, Rs. 20.40, and Rs. 22.47 for local cows. The average milk yield was 5.08 liters per day for crossbred cows and 1.89 liters for local cows. These findings highlight the positive economic impact of DCS membership, particularly in asset creation and milk production efficiency.

Keywords: Assets creation, Income generation, Milk production, Savings

Livestock has long been integral to the agricultural system and rural economy of India. Approximately 65% of the Indian population resides in rural areas, with 58% relying on agriculture and allied activities for their livelihoods. Traditionally, Indian farmers have depended on two key income-generating assets: land and livestock (Bindu *et al.*, 2014). Among these, dairying has emerged as a vital secondary source of income for millions of rural households, playing a particularly crucial role in providing employment and economic opportunities for marginalized groups, including small and women farmers. A significant portion of milk production is attributed to animals reared by smallholder, marginal farmers, and landless labourers (Biradar *et al.*, 2011). By March 2015, over 15.46 million farmers were linked to 165,835 village-level Dairy Cooperative Societies, facilitating widespread participation in dairy production. India remains the world's largest milk producer, a position bolstered by several government initiatives aimed at enhancing livestock productivity. These efforts have led to substantial growth in milk production, which rose from 80.90 million tonnes in 2001-02 to 221.0 million tonnes in 2021-22, reflecting an annual growth rate of 5.40% (Economic Survey, GoI, 2022).

The demand for milk and dairy products in India is projected to grow at an annual rate of 7% in the

coming decades. This increase is driven by several factors, including urbanization, rising incomes, changing dietary preferences, and greater awareness of the health benefits associated with milk consumption. Dairy products are particularly popular among India's large vegetarian population, offering a nutritious and affordable source of animal protein. For many, especially among marginalized, smallholder, landless farmers, and women, dairy products represent the primary or sole source of animal-derived nutrition (Aggarwal, 2016).

Dairy farming plays a crucial role in the agricultural landscape of Northeast India, supported by the region's abundant greenery and temperate climate. However, recent developments have significantly transformed the state of dairy farming in the area. Traditionally, smallholder farmers and rural communities in Northeast India have relied on livestock for milk production, with dairy farming holding deep cultural significance. In Nagaland, located in the northeastern part of India, dairy farming has evolved considerably over time. Nagaland spans an area of 16,579 square kilometers and has a population of 1.9 million, according to the 2011 Census (Economic Survey, GoI, 2022). The state shares borders with Assam to the west and north, Myanmar (Burma) to the east, Arunachal Pradesh to the north, and Manipur to the south. The region is predominantly mountainous, with the exception of the areas bordering the Assam Valley, which constitute about 9% of the

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state's total area. Nagaland is also home to a diverse range of indigenous tribes, each with its own unique traditions and practices. Historically, before World War II, the Naga people primarily sustained themselves on a non-vegetarian diet, with limited consumption of milk. Dairy farming was not initially considered a viable occupation, particularly when Christian missionaries first arrived in Nagaland, and milk was largely used for its nutritional value rather than as a commercial product. However, over time, particularly after World War II, the region's attitude toward dairy farming shifted. As the local economy began to grow and diversify, livestock, including dairy cattle, became an essential component of agriculture and a cornerstone of the rural economy in Nagaland. The demand for milk and dairy products has steadily increased, driven by urbanization and rising incomes. This growth highlights the expanding role of dairy production in Nagaland's economy. The dairy industry not only provides a stable source of income but also generates employment, contributing to rural development and playing a key role in poverty reduction (Khoveio, 2012).

In the northeastern region of India, the Operation Flood project was eventually withdrawn due to its commercial unprofitability. However, in many parts of Nagaland, dairy farming continued to hold potential, and milk production activities were revitalized with the launch of the Integrated Dairy Development Project (IDDP) between 1993 and 1997. This initiative marked a turning point for the dairy industry in the region, and by 2020, Nagaland's dairy sector had emerged among the top ten in the country. Recognizing the potential for growth in the dairy sector, the Department of Veterinary and Animal Husbandry (Government of Nagaland) has undertaken various measures to support and expand dairy production across the state. A key milestone in this effort was the establishment of the Kohima District Milk Producers Union (KOMUL) in 1985-86. KOMUL was founded with the primary objective of protecting local dairy farmers in rural areas from exploitation by intermediaries, while also enhancing the socioeconomic conditions of the local population. During the Eighth Five-Year Plan (1992-1997), the Indian government launched a central sector plan specifically targeting the development of mountainous and backward regions, under the IDDP framework. This initiative provided crucial financial support for the expansion and modernization of the dairy industry in Nagaland, helping to improve both the quality and quantity of dairy production in the state (Chakraborty, 2007).

The Nagaland State Dairy Co-operative Federation Ltd (NSDCF) is the apex body overseeing the dairy industry in Nagaland. Established in 2001-2002, its primary objective is to expand the dairy sector across the state by promoting the formation of dairy cooperative

societies. Registered under the Assam Co-operative Societies Act, 1949, and following the "Anand Pattern," the NSDCF is based in Kohima and is responsible for coordinating and supervising dairy activities throughout Nagaland. The federation also supervises a network of affiliated unions and dairy companies, both directly and indirectly. In line with Indian government guidelines, the NSDCF Ltd. was designated as the State Implementing Agency (SIA) for dairy development in Nagaland. While the federation manages the dairy industry at the state level, district-level milk unions retain functional autonomy as per their statutes. Key district-level unions under the NSDCF include (a) the Kohima District Co-Operative Milk Producers' Union Ltd (KOMUL), (b) the Dimapur District Cooperative Milk Producers Union Ltd (DIMUL), and (c) the Mokokchung District Cooperative Milk Producers' Union Ltd (MOMUL). In 1997-98, the Kohima district was split into two new districts-Dimapur and Kohima. This reorganization resulted in the establishment of DIMUL, a new dairy union in Dimapur to serve the dairy needs of the region (Chakraborty, 2007).

Dairy operations in Nagaland are still in their early stages, with only a few individuals engaging in large-scale dairying. The lack of established dairy cooperatives has significantly impacted the livelihoods of dairy farmers in the region. This study aims to explore how the Dairy Cooperative Societies under the Dimapur District Cooperative Milk Producers Union Ltd (DIMUL) are contributing to the economic empowerment of dairy farmers. Additionally, the study examines the economics of milk production in Nagaland, highlighting the financial dynamics and challenges faced by local producers.

METHODOLOGY

The present study was conducted in the state of Nagaland, located in the northeastern region of India, with a geographical area of 16,579 km². Agriculture is the primary occupation of the people, contributing 20.00% to the state's economic production in 2020-21, with approximately 72% of the population engaged in agricultural activities. Traditionally, the Naga people have raised animals primarily for meat, which forms a central part of their diet. Nagaland is divided into 12 districts, with Kohima and Dimapur serving as the state's commercial hubs. The Dimapur District Milk Producers Union Ltd. (DIMUL), based in Dimapur, is a cooperative union comprising 52 dairy cooperative societies. Among these, 29 are registered, and 21 are actively functional. From the 21 operational dairy cooperatives, 15 societies that have been in existence for at least five years and were involved in milk production and collection at the time of the survey were selected for data collection. A total of 75 respondents (5 members

per dairy cooperative society) were randomly chosen for the study. Additionally, to assess the impact of dairy cooperative societies (DCS) on income, employment, and milk production, 25 non-members from the same area were selected, resulting in a total sample size of 100. The study was conducted during the agricultural year 2020-21. Primary data were collected on various socio-economic factors, including herd size, the type and value of animals, dairy equipment, cattle sheds (along with their current value and expected lifespan), the quantity and monetary value of feeds and fodder, family and hired labour (along with prevailing wage rates), as well as veterinary and miscellaneous expenses. Information was also gathered on milk production, selling prices, and disposal patterns of milk. To analyze the data, households were categorized based on herd size into three Animal Conversion Unit (ACU) categories: small (<5 ACU), medium (5-10 ACU), and large (>10 ACU), following the methodology of Feroze *et al.* (2016). This categorization helped assess the influence of dairy cooperative societies across different categories of farmers, particularly in understanding the economics of dairy farming in the study area. For age categorization, the study followed Jaganathan and Nagaraja (2015), dividing respondents into three groups: young (≤ 35 years), medium (36-60 years), and old (≥ 61 years).

I. Economic empowerment of dairy farmers through dairy cooperative societies

The economic empowerment of dairy farmers through dairy cooperative societies was studied using an index developed by Dolli (2006) and Biradar *et al.* (2011), which focuses on three key economic asset dimensions: human assets, physical assets, and financial assets. This approach provides a comprehensive evaluation of how dairy cooperatives contribute to the economic well-being of farmers by assessing improvements in education, employment, household infrastructure, and financial stability.

a. Human asset: Human assets were assessed based on two key aspects: education and employment generation. In terms of education, the study focused on the respondent's ability to provide quality education to their family members. This included their ability to educate their children according to their desired educational levels, as well as their capacity to send children to district or state headquarters for further studies. The study also considered the encouragement of women in the family to pursue education and looked at cases of school dropouts as a measure of challenges in sustaining education within the family. Employment generation was evaluated by examining the increase in man-days of employment within the

respondent's family due to their involvement in dairy farming activities. This included the total number of man-days of employment per annum for both the respondent and other family members. It also measured the development of new skills, with an emphasis on how dairy farming contributed to skill enhancement for both the respondent and their family. Furthermore, the study assessed the extent to which improved farming technologies and income-generating activities were understood and adopted by the family, which helped increase their overall economic activity and productivity. These two dimensions, education and employment generation, provided insight into how dairy cooperative societies contributed to the human capital of the households, enhancing both educational opportunities and employment outcomes.

- b. Physical asset:** House, farm equipment and household articles were considered in the study
- i) Renovation of house
 - ii) Construction of new building
 - iii) Purchase of household article like TV, Refrigerator, washing machine and sewing machine etc.
 - iv) Purchase of farm equipment such as power tiller, sprayer etc.
- c. Financial asset:** Financial assets were assessed based on the collection of financial information related to savings and debts. For savings, the study considered various types, including savings in cash, in banks, in Self-Help Groups (SHGs), and in the form of durable assets. Regarding debts, the study examined the sources of financial liabilities, which included loans from local SHGs, banks or cooperative societies, money lenders, and other sources of debt. Equal weight was assigned to all the items included in the financial asset index, ensuring that each factor contributed equally to the overall assessment. A composite index was then calculated by averaging the scores of the three key asset dimensions: economic, physical, and financial, providing a comprehensive measure of the respondents' overall economic empowerment.

II. Economics of dairy farming:

The tabular analysis was used to work out the costs and returns from milk production. Cost of milk production was studied with the two concepts of cost viz. variable cost and fixed cost.

A) Variable cost

Costs which vary based on the level of production and which can be altered in the short run such as feed and fodder cost, veterinary cost, labour cost, and miscellaneous costs are included as variable cost.

i) Cost of Feed and fodder: Green fodder cost was estimated based on 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 = Based on Prevailing price including transportation and manual labour cost for loading and unloading. Cost of concentrate was calculated based on the prices prevailing in the study region. ii) Labour Cost: This cost was based on both family as well as paid labour (hired labour). The family labour cost has been accounted same as hired labour cost. The hired labour was estimated by taking care of the type of work allotted and wages paid. In case of family labour, cost estimation was done considering the time spent in performing dairy activities and wage rate of labour and payment systems prevailing in the study region. iii) Veterinary Cost: It included the cost of Artificial Insemination (A.I.), vaccination and medicines incurred on an animal during a period of one year. iv) Miscellaneous Cost: Miscellaneous costs such as repairs, electricity, water charges, fuel, etc. were estimated on per milch cow per day for various types of milch cattle. v) Gross Cost: This cost was estimated by adding all the cost components which includes fixed and variable costs, i.e. Gross Cost = Total Variable Cost + Total Fixed Cost. The fixed cost have accounted by calculating depreciation of assets and animals, interest on fixed capital, land revenue etc. vi) Net Cost: The net cost was estimated by subtracting the income from dung, from the gross cost, i. e. Net Cost = Gross Cost - Value of Dung.

The quantity of dung was estimated by enquiring the number of gunny bags of dung produced on the farm per year. The bags of dung produced were multiplied with rate of the bags of dung prevailing in the study area. Accordingly, the value of dung was apportioned to milch animals on the farms by using Standard Animal Units (S.A.U.).

B. Fixed cost

Fixed costs are those expenditures incurred whether or not the production is carried out. It includes

- Depreciation on Milch Animals
- Depreciation on cattle shed and dairy equipments
- Interest on fixed capital.

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 in table 1.

The components of fixed cost are: i) Interest on Fixed Capital Investment: The interest on fixed capital was estimated at the rate of 10 per cent. ii) Depreciation on Building and Machinery/ Equipments: It is the loss in the value of an asset as a result of its continuous use, wear and tear, accidental damage and time obsolete. It was worked out separately for milch animals, cattle shed, mangers, machinery and equipments keeping in view the present value and lifetime of the asset. a. Depreciation on Milch Animals: The depreciation for crossbred cow was taken as 8 per cent assuming its productive life to be 12.5 years while for local cows it was taken as 10 per cent assuming its productive life to be 10 years. b. Depreciation on cattle shed and dairy equipments: Depreciation on cattle shed, mangers, machinery and dairy equipments were estimated using straight line method. The annual depreciation on cattle shed and store was calculated at the rate of two percent for "pucca" shed and five percent for "kachha" shed assuming the useful life of building as 50 and 20 years, respectively (Rao and Singh, 1980). The depreciation on equipment like manger, milking cans, utensils and other instruments were also estimated as per productive life of the individual equipment.

$$\text{Annual Depreciation} = \frac{\text{Original Value} - \text{Junk Value}}{\text{Productive life}}$$

Returns from milk production

Gross returns were calculated by multiplying milk yield of a single in-milk cow with the prevailing milk prices in the study area, i.e. Gross Returns = Quantity of milk x Market price of milk. ii) Net Returns: Net return was calculated by subtracting net cost from gross returns, i.e. Net Returns = Gross Returns - Net Cost.

RESULTS AND DISCUSSION

Socio economic characteristics of the sample households

General information regarding the family size, composition, and educational background of

Table 1. Standard Animal Units for Eastern and North Eastern Region

Type of animal	Adult Male	Adult Female	Young stock male (<1 yr)	Young stock female (<1yr)	Young stock male (>1yr)	Young stock female (>1yr)	Heifer
Cross breed	1.48	1.71	0.41	0.72	0.71	1.08	1.24
Local breed	1.11	1.0	0.29	0.63	0.55	0.82	0.98

(Feroze et al., 2016)

respondents is presented in Table 2. Among the Dairy Cooperative Society (DCS) members, 77.33% were male, and 22.67% were female, while for the non-DCS members, 80.00% were male, and 20.00% were female. The highest proportion of respondents in the DCS group fell within the medium herd size category, accounting for 46.67% of the total, whereas for non-DCS members, the highest proportion (52.00%) was in the small herd size category. In terms of age distribution, 16.00% of the DCS members were in the young age group (≤ 35 years), 56.00% in the medium age group (36-60 years), and 28.00% in the old age group (≥ 60 years). For non-DCS members, 16.00% were young, 70.00% were in the medium age group, and 24.00% were in the old age group. The average family size varied by herd size category. Among DCS members, the average family size was 4.82 for small herd size, 4.69 for medium herd size, and 5.08 for large herd size. For non-DCS members, the average family size was 5.15 for small herd size, 6.11 for medium herd size, and 5.00 for large herd size. Regarding literacy, 90.67% of the DCS members were literate, while 9.33% were illiterate. Among non-DCS members, 88.00% were literate, and 12.00% were illiterate. Specifically, the literacy rate for DCS members in the medium herd

size category was 91.43%, significantly higher than the 88.88% literacy rate among non-DCS members in the same category. Among DCS members, the highest number of respondents had achieved matriculation, while in the non-DCS group, the highest proportion of respondents had attained only primary education.

Distribution of milch animals among DCS and non-DCS members

From Table 3, it was observed that among the 75 DCS members, there were 264 in-milk crossbred cows and 88 dry crossbred cows, accounting for 75.00% and 25.00% of the total, respectively. In contrast, there were 25 in-milk local cows and 12 dry local cows among the same group of DCS members, making up 67.57% and 32.43%, respectively. Among the 25 non-DCS members, 60 in-milk crossbred cows and 22 dry crossbred cows were recorded, comprising 73.17% and 26.83% of the total, respectively. Additionally, 67.74% of the local cows in this group were in-milk, while 32.26% were dry. These findings suggest that, in both the crossbred and local categories, the number of in-milk cows outnumbered the dry cows, indicating a higher proportion of productive animals in both DCS and non-DCS households.

Table 2. Socio-economic characteristics of Dairy Cooperative Society (DCS) and non-DCS members

Categories		Members				Non Members			
		Small	Medium	Large	Total	Small	Medium	Large	Total
Gender	Male	19 (67.86)	29 (82.86)	10 (83.33)	58 (77.33)	10 (76.92)	7 (77.78)	3 (100.00)	20 (80.00)
	Female	9 (32.14)	6 (17.14)	2 (16.67)	17 (22.67)	3 (23.08)	2 (22.22)	0 (0)	5 (20.00)
Age	≤ 35 years	7 (25.00)	5 (14.29)	0 (0)	12 (16.00)	3 (23.08)	1 (11.11)	0 (0)	4 (16.00)
	36-60 years	16 (57.14)	21 (60.00)	5 (41.67)	42 (56.00)	8 (61.54)	6 (66.67)	1 (33.33)	15 (70.00)
	≥ 60 years	5 (17.86)	9 (25.71)	7 (58.33)	21 (28.00)	2 (15.38)	2 (22.22)	2 (66.67)	6 (24.00)
Family size (nos)		4.82	4.69	5.08	4.87	5.15	6.11	5.00	5.42
Education	Illiterate	4 (14.29)	3 (8.57)	0 (0)	7 (9.33)	2 (15.38)	1 (11.11)	0 (0)	3 (12.00)
	Primary	10 (35.71)	9 (25.71)	3 (25.00)	22 (29.33)	5 (38.66)	4 (44.44)	1 (33.33)	10 (40.00)
	Matriculation	9 (32.14)	12 (34.29)	6 (50.00)	27 (36.00)	4 (30.77)	3 (33.33)	2 (66.67)	9 (36.00)
	Higher Secondary	4 (14.29)	8 (22.86)	2 (16.67)	14 (18.67)	2 (15.38)	1 (11.11)	0 (0)	3 (12)
	Degree	1 (3.57)	3 (8.57)	1 (8.33)	5 (6.67)	0 (0)	0 (0)	0 (0)	0 (0)
Total Respondents		28 (37.37)	35 (46.67)	12 (16.00)	75 (100.0)	13 (52.00)	9 (36.00)	3 (12.00)	25 (100.0)

Table 3. Distribution of milch animals among the Dairy Cooperative Society (DCS) and non-DCS members

Categories		DCS Members				DCS non-Members			
		Small	Medium	Large	Total	Small	Medium	Large	Total
Crossbreed cows	In-milk	42 (77.78)	116 (74.84)	106 (74.13)	264 (75.00)	11 (73.33)	18 (78.26)	31 (70.45)	60 (73.17)
	Dry	12 (22.22)	39 (25.16)	37 (25.87)	88 (25.00)	4 (26.67)	5 (21.74)	13 (29.55)	22 (26.83)
	Total	54 (15.34)	155 (44.03)	143 (40.63)	352 (100)	15 (18.29)	23 (28.05)	44 (53.66)	82 (100)
Local cows	In-milk	6 (75.00)	8 (66.67)	11 (64.71)	25 (67.57)	5 (62.50)	10 (71.43)	6 (66.67)	21 (67.74)
	Dry	2 (25.00)	4 (33.33)	6 (35.29)	12 (32.43)	3 (37.50)	4 (28.57)	3 (33.33)	10 (32.26)
	Total	8 (21.62)	12 (32.43)	17 (45.95)	37 (100)	8 (25.81)	14 (45.16)	9 (29.03)	31 (100)

Economic empowerment of dairy farmers through dairy cooperative societies

The economic empowerment status of dairy farmers through dairy cooperative societies was assessed based on three different asset dimensions: human assets, financial assets, and physical assets, using the index developed by Dolli (2006) and Biradar *et al.* (2011). For the human asset dimension, the mean score for DCS members was 58.44, compared to 51.33 for non-DCS members. The t-value of 2.85 was found to be significant at the 1% level, indicating a statistically significant difference in human assets between DCS and non-DCS members. In terms of financial assets, DCS members had a mean score of 42.00, while non-DCS members had a mean score of 30.17. The t-value of 4.91 was significant at the 1% level, suggesting that DCS members had significantly higher financial assets

than non-DCS members. Regarding physical assets, DCS members had a mean score of 51.11, while non-DCS members had a slightly higher mean of 52.00. The t-value for this comparison was 0.02, which was significant at the 5% level, indicating that there was no substantial difference in physical assets between the two groups. The overall asset index, which combines human, financial, and physical assets, was 55.11 for DCS members and 44.50 for non-DCS members. The t-value of 3.89 was significant at the 1% level, further emphasizing the positive impact of DCS membership on the accumulation of economic assets. These results suggest that dairy cooperative societies have a positive effect on the economic empowerment of their members, particularly in enhancing human and financial assets, while the impact on physical assets was less pronounced (Table 4).

Table 4. Asset creation status among members and non-members of Dairy Cooperative Societies (DCS)

Particulars	Category	Mean
Human asset	DCS members	58.44
	Non DCS members	51.33
	t value	2.85**
Financial asset	DCS members	42.00
	Non DCS members	30.17
	t value	4.91**
Physical asset	DCS members	51.11
	Non DCS members	52.00
	t value	0.02*
Overall	DCS members	55.11
	Non DCS members	44.50
	t value	3.89**

*Significant at $p \leq 0.05$, **Significant at $p \leq 0.01$

Comparison of income, expenditure and savings of the DCS Members with Non DCS Members

The economic empowerment of dairy farmers through dairy cooperative societies was further assessed by comparing their income, expenses, and savings with those of non-DCS members. As shown in Table 5, the average annual income for DCS members was ₹2.72 lakhs, with 75.03% of this income derived from dairy farming. In contrast, non-DCS members had an average annual income of ₹1.73 lakhs, with 63.60% of their income coming from dairy farming. The t-value of 4.45, which was statistically significant at the 1% level, indicates that DCS members had significantly higher incomes, with a greater proportion derived from dairy farming compared to non-DCS members.

Table 6 presents the overall average annual expenditure for DCS and non-DCS members. For the DCS members, the average annual expenditure

Table 5. Annual Income among the Dairy Cooperative Society (DCS) and Non DCS members (in Lakhs)

Category		Dairy	Non-Dairy	Overall Income	t-value
DCS members	Total	153.04 (75.03)	50.93 (24.97)	203.97 (100)	4.45**
	Average	2.04	0.68	2.72	
Non DCS members	Total	27.56 (63.60)	15.78 (36.40)	43.34 (100)	
	Average	1.1	0.63	1.73	

The figure in the parentheses indicate percentage to the total income.

**Significant at $p \leq 0.01$

was ₹2.29 lakhs, with approximately 58.76% of this expenditure allocated to the dairy unit. In contrast, non-DCS members had an average annual expenditure of ₹1.52 lakhs, with 50.44% spent on their dairy unit. The t-value of 4.64, which is significant at the 1% level, indicates a statistically significant difference between the two groups in terms of total expenditure and the proportion spent on dairy-related activities. The largest share of expenditure in both groups was allocated to the dairy unit, with DCS members spending 58.76% and non-DCS members spending 50.44%. Following dairy-related expenses, the next largest category of expenditure for both groups was food, with non-DCS members spending a higher proportion (22.24%) on food compared to DCS members (18.85%). Education for children was another significant category of expenditure, with 13.09% of DCS members' expenditure and 16.45% of non-DCS members' expenditure allocated to this area.

Comparison of savings among the DCS and Non DCS members

The overall average annual savings for DCS

members was ₹42,845.96, compared to ₹21,508.69 for non-DCS members. The t-value of 2.84, which is significant at the 1% level, indicates a statistically significant difference in savings between the two groups, with DCS members having higher savings. Furthermore, a significant difference was also observed in income and expenditure between DCS and non-DCS members, with t-values of 4.45 and 4.64, respectively, both significant at the 1% level.

Economics of dairy farming

Cost and returns per in milk crossbred cow

Table 8 presents the cost and returns per crossbred cow per day for different categories of sample households. The overall average daily maintenance cost for a milking crossbred cow was ₹149.63, with the breakdown as ₹153.15 for small households, ₹148.32 for medium households, and ₹147.43 for large households. The overall net returns per milking crossbred cow per day were ₹67.53, with small, medium, and large households reporting ₹53.19, ₹78.09, and ₹71.30, respectively. The analysis of cost structure reveals that the variable cost accounted for 93.74% of

Table 6. Distribution of annual Expenditure incurred among Dairy Cooperative Society (DCS) and Non DCS members (in lakhs)

Category of Expenditures	DCS Members			Non DCS members		
	Total	Per cent	Average	Total	Per cent	Average
Food Item	32.39	18.85	0.43	8.44	22.24	0.34
Child Education	22.5	13.09	0.3	6.24	16.45	0.25
Fuel and Electricity	1.65	0.96	0.02	0.38	1	0.02
Health care	2.23	1.3	0.03	0.57	1.49	0.02
Transportation	2.39	1.39	0.03	0.58	1.53	0.02
Clothing	3.29	1.92	0.04	0.85	2.23	0.03
Social and religious	4.15	2.41	0.06	1.2	3.16	0.05
Purchase of Household Materials	2.27	1.32	0.03	0.56	1.46	0.02
Dairy Unit	100.96	58.76	1.35	19.15	50.44	0.77
Total Expenditure	171.83		2.29	37.96		1.52
t-value	4.64**					

The figure in the parentheses indicate percentage of the source of expenditure to the total income

Table 7. Comparison of annual income, expenditure and savings of the Dairy Cooperative Society (DCS) members with Non DCS members (Rs/annum)

Financial status	DCS members	Non DCS members	t-value
Income	271958.60	173361.71	4.45**
Expenditure	229112.64	151853.02	4.64**
Savings	42845.96	21508.69	2.84**

** Significant at $p \leq 0.01$

the total gross cost. Among the variable costs, feed was the major expenditure, constituting 70.55% of the total cost. Labour costs made up 20.43% of the gross cost, with small, medium, and large households incurring 21.46%, 20.06%, and 19.73%, respectively. These figures are notably higher than the labour cost share of 12.79% reported by Khoveio (2012) in Nagaland, which could be attributed to higher wage rates in the study area. The highest labour cost per in-milk cow was found in marginal households, a finding consistent with the results of Rajadurai (2002) in Madurai district, Tamil Nadu. The fixed costs accounted for 6.26% of the gross cost, with small, medium, and large households reporting 7.27%, 6.15%, and 5.33%, respectively.

The net return was highest for medium-sized households and lowest for small-sized households,

primarily due to greater resource use efficiency and better market economics among medium farmers. Medium households were able to incur lower costs for purchasing feed, chemicals, and labour for managing milch animals, which contributed to their higher net returns. The overall average milk yield per milking animal was 5.08 liters per day. For small, medium, and large households, the average milk yields were 4.97, 5.25, and 5.02 liters per day, respectively. The overall cost of milk production per liter was ₹29.48, with small, medium, and large households incurring costs of ₹30.82, ₹28.25, and ₹29.37 per liter, respectively. The relatively higher cost of milk production per liter for small households was mainly attributed to the high cost of concentrate feed, which accounted for 34.85% of the gross cost. The overall sale price per liter of milk was ₹42.74, with

Table 8. Cost and returns per in-milk crossbred cow (Rs/animal/day)

Cost component	Herd size category			
	Small	Medium	Large	Overall
Variable cost				
Green fodder	29.16	27.92	25.99	27.69
Dry fodder	25.26	26.93	26.67	26.28
Concentrate	51.52	51.59	54.94	52.68
Medicines and vaccines	3.30	3.23	3.11	3.21
Labour	33.18	30.06	29.40	30.88
Miscellaneous	0.98	0.91	0.98	0.96
Total variable cost	143.39	140.64	141.08	141.70
Fixed cost				
Depreciation on fixed capital	6.41	5.57	5.20	5.73
Interest on fixed capital	4.84	3.65	2.75	3.74
Total fixed cost	11.25	9.22	7.94	9.47
Gross Cost	154.64	149.86	149.02	151.17
Value of dung	1.49	1.53	1.59	1.54
Net cost	153.15	148.32	147.43	149.63
Sale price of milk (Rs/L)	41.52	43.13	43.58	42.74
Milk production	4.97	5.25	5.02	5.08
Gross return	206.34	226.41	218.73	217.16
Net return	53.19	78.09	71.30	67.53
Cost per litre	30.82	28.25	29.37	29.48

Table 9. Cost and returns per in milk local cow (Rs/animal/day)

Cost component	Herd size category			
	Small	Medium	Large	Overall
Variable cost				
Green fodder	9.14	8.99	9.04	9.06
Dry fodder	11.02	10.61	10.71	10.78
Concentrate	16.42	18.98	18.57	17.99
Medicines and vaccines	1.51	1.46	1.69	1.55
Labour	15.34	16.22	13.23	14.93
Miscellaneous	0.95	1.08	1.02	1.02
Total variable cost	54.38	57.34	54.26	55.33
Fixed cost				
Depreciation on fixed capital	5.14	4.38	5.21	4.91
Interest on fixed capital	1.83	1.92	1.79	1.85
Total fixed cost	6.96	6.30	7.00	6.75
Gross Cost	61.34	63.64	61.26	62.08
Value of dung	1.44	1.37	1.49	1.43
Net cost	59.90	62.27	59.77	60.65
Sale price of milk (Rs/L)	41.75	43.83	42.61	42.73
Milk production (L/day)	1.86	1.89	1.93	1.89
Gross return	77.85	82.67	82.24	80.92
Net return	17.95	20.40	22.47	20.27
Cost per litre	32.13	33.02	30.97	32.04

small, medium, and large households receiving ₹41.52, ₹43.13, and ₹43.58 per liter, respectively. The price received by small households was the lowest, as most of them sold their milk to dairy cooperative societies, where payments were based on the fat and solid-not-fat (SNF) content of the milk. However, this lower sale price was offset by the provision of subsidized services and feed supplements, which helped reduce overall production costs.

Cost and returns per in milk local cow

Table 9 presents the daily cost and returns of local milking cows across different herd size categories. The overall average daily maintenance cost per milking local cow was ₹60.65, with small, medium, and large households incurring costs of ₹59.90, ₹62.27, and ₹59.77, respectively. Feed costs accounted for 60.94% of the gross cost, with small, medium, and large households having feed cost shares of 59.63%, 60.62%, and 62.55%, respectively. The primary component of the feed cost was concentrate, which alone constituted 28.98% of the gross cost. Green fodder and dry fodder made up 14.59% and 17.36% of the gross cost, respectively. Labour costs represented 24.05% of the total gross cost. These costs were highest

for medium-sized households (25.49%) and lowest for large households (21.60%). This finding aligns with the results of Khoveio (2012) in Nagaland, suggesting that local cows are often reared using traditional methods, which may require more labour, particularly among medium-sized households. The fixed cost share of the gross cost was 10.87%, with small, medium, and large households incurring fixed costs of 11.35%, 9.90%, and 11.43%, respectively. The overall per liter cost of milk production from local cows was ₹32.04, with small, medium, and large households having milk production costs of ₹32.13, ₹33.02, and ₹30.97 per liter, respectively. The average milk yield per in-milk local cow was 1.89 liters per day, with small, medium, and large households yielding 1.86, 1.89, and 1.93 liters per day, respectively. The net returns from local cows were found to be very low, primarily due to the low milk yield, with the smallest herd size category reporting the lowest net return of ₹17.95 per in-milk local cow.

CONCLUSION

In conclusion, the study clearly demonstrates that membership in Dairy Cooperative Societies (DCS) has a positive impact on the economic empowerment of dairy farmers in Nagaland. DCS members possess

more assets than non-members, with the exception of physical assets, reflecting the benefits of cooperative membership in terms of human and financial capital. Additionally, DCS members report significantly higher overall average annual income, expenditure, and savings compared to non-DCS members, underlining the economic advantages of being part of a cooperative. When analyzing net returns from milk production, the study reveals that medium-sized households, followed by large and small households, achieved the highest net returns from crossbred cows, while large households followed by medium and small households experienced the best returns from local cows. This suggests that larger herd sizes, along with better management practices fostered by DCS membership, contribute to greater profitability in dairy farming. Moreover, the expenditure pattern highlights that DCS members spend a larger portion of their income on maintaining dairy units compared to food items, demonstrating the importance of dairy farming to their livelihoods. Overall, the study indicates that dairy cooperative societies have played an important role in enhancing the income, savings capacity, and asset accumulation of dairy farmers. These improvements, in turn, contribute to the broader economic empowerment of farmers. Policy recommendations suggest that small and medium milk producers should consider adopting more crossbred cattle to increase milk production and retain more surplus income. Additionally, increasing milk procurement prices could help address challenges like inflation and the declining number of cooperative members, ensuring the continued growth and sustainability of the dairy sector.

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