



An economic analysis of value added milk products in East Khasi Hills District Milk Co-Operative Union Limited of Meghalaya

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ABSTRACT

India occupies the first position in the world in milk production with a production of 221 million metric tons in 2021-22. Around 46 per cent of the milk is consumed in the form of liquid milk, 47 per cent as traditional dairy products and 7 per cent as western dairy products. At present, 36 Dairy Co-operative Societies have been organized and functioning within the East Khasi Hills and Ri Bhoi Districts of Meghalaya. East Khasi Hills District Milk Co-operative Union Limited (NaRi) is a successful cooperative working on value addition of milk in Meghalaya. Milk value addition has a greater scope to improve the profitability. Keeping in view the above facts, the study has been proposed in the State of Meghalaya with the following objective to assess the cost and returns of value added milk products. The employees of NaRi organization were selected purposively. The tools and techniques such as standard cost of returns aspects are applied and Garrett's ranking technique was applied to achieve above objectives. Results of the study found that the total quantity of milk procured during the year of 2021 was 50,36,899 liters and distributed 46,60,571 liters of milk. The remaining 3,73,528 liters was utilized for value addition. Calculation of cost and returns revealed that profitability of the various milk products produced by NaRi with the benefit cost ratio of 1.61 for dahi, 1.26 for paneer, 1.21 for cream, 1.32 for butter and 1.38 for ghee. Dahi was found to be more profitable among the value added milk products. Major constraints faced in the processing of milk products were handling loss of milk followed by fluctuations in the electricity and failure of the processing machines.

1. Introduction

In the last decade, India's dairy sector has experienced significant growth, making it one of the world's leading suppliers of milk and its value-added products. India ranked first among the world's milk-producing countries, registered fifty-one percent increase during the last eight years i.e., during the year 2014-15 and 2021-22 and increased to twenty-two crore tonne in the year 2021-22. Per capita availability of milk increased to 427 grams per day during 2020-21, was above the global average of 321 grams per day in 2020 (FAO,2021). Dairy sector accounts for around 4.2 per cent of overall GDP and provides nearly 28.63 per cent of the entire value of agriculture GDP (Economic Survey, 2021).

1.1 Indian scenario

During 2020, the Indian dairy market generated an estimated revenue of ₹11.35 lakh crore. Over the past 15 years, the Indian dairy sector has demonstrated remarkable growth, expanding at an annual rate of approximately 15 percent. Projections suggest that it is poised to reach a market size of around Rs. 26 lakh crores by 2026. Notably, liquid milk accounts for nearly half of the nation's dairy market. In the last three years, the organized sector's share in the global liquid milk market has increased from 32 percent to 41 percent. By 2026, it is anticipated that the dairy sector's share will further rise to 54 percent. (DAHD, 2022).

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While other milk products like cheese, flavor-enhanced milk, lassi, buttermilk, curd and organic milk are expected to increase by more than 20 per cent annually. Other traditional dairy goods like paneer, ghee, ice cream, khoa and curd, etc, will see an annual rise between 11.00 and 20.00 per cent. The total amount of milk and milk-related products consumed by households was 16.1 crore tonnes.

Table 1. Top ten milk producing states in India

Sl.No	State	Production in tonnes
1	UttarPradesh	31,854
2	Rajasthan	25,573
3	MadhyaPradesh	17,109
4	Gujarat	15,263
5	AndhraPradesh	15,292
6	Punjab	13,348
7	Maharashtra	12,024
8	Haryana	11,735
9	Bihar	10,480
10	TamilNadu	8,759

(Source: NDDB, 2020)

During November 2020, the production of skimmed milk powder (SMP) and white butter reached 162,508 MT and 65,307 MT, respectively. The following year, their stocks increased to 181,310 MT, marking a 12.00 percent rise for SMP, and 66,369 MT, representing a 2.00 percent increase for white butter in the cooperative sector. By 2030, these figures are expected to surge to 26.7 crore tonnes. Approximately 46 percent of milk is consumed in its liquid form, while 47 percent is used in traditional dairy products, with the remaining 7 percent being utilized in Western-style dairy products. (Chaudhary *et al.*, 2019). The country's milk output is expected to reach 21 crore MT in 2020–21 with an increase of 6.20 percent per year in previous five years. In 2020–21, milk per capita availability is 427 grams per day. Milk output is anticipated to reach over 30 crore tonnes by 2030. In order to serve the nation's expanding dairy industry, infrastructure for processing dairy products must be strengthened (DAHD, 2022).

1.2 Meghalaya scenario

Meghalaya's per capita availability of milk was 84 grams per day (NDDB, 2020). At present, thirty six Dairy Co-operative Societies (DCS) have been organized and functioning within the districts of East khasi hills and Ri-Bhoi. It is also proposed to organize thirty Dairy Co-operative Societies in Jaintia Hills District and thirty one Dairy co-operative societies in Garo Hills Districts (The Northeast Today, 2020).

2. Methodology

The study was conducted to know the cost and returns of the value added milk products in the East Khasi Hills District Cooperative Milk Union (EKHDCMU) Limited and to know problems faced in the value addition of milk. Both primary and secondary data was used in order to fulfill the objectives of the study. Primary data was collected directly by interviewing the employees of the EKHDCMU Limited and other skilled workers of the organization, involved in processing of the milk products. Secondary data was collected from website, journals and company literatures. Meghalaya State has been selected purposively, in that EKHDCMU Limited in East khasi hills district has been selected for study purposively. Total 10 respondents who involved in processing and accounting has been selected purposively for the study.

2.1. Net profitability

Net profitability of the organization has been estimated by deducting total costs from gross returns of the organization.

$$\text{Net profit} = \text{Gross returns} - \text{Total costs}$$

2.2. B: C ratio

In order to assess the economic performance of milk processing unit as such, the Benefit-Cost ratio has been worked out by using the following formula.

$$\text{B: C ratio} = \frac{\text{Gross returns}}{\text{Total cost}}$$

2.3. Depreciation: Straight line method

$$\text{Depreciation (Rs/year)} = \frac{\text{Original cost} - \text{junk value}}{\text{Useful life of asset}}$$

2.4. Constraints faced in value addition of milk products through Garrett Ranking Technique.

$$\text{Percent position} = 100 (\text{Rij} - 0.5) / \text{Nj}$$

The percent position estimated is converted into scores. Then for each factor, the scores of each individual are added and then total value of scores is calculated.

3. Results and Discussion

The East Khasi Hills District Milk Co-operative Union Limited produces five types of milk products: dahi, paneer, cream, butter, and ghee. In the year 2021, they manufactured a total of 28,186 kilograms of dahi, earning ₹30,37,576 in revenue. Additionally, they produced 2,775 kilograms of paneer, generating ₹10,65,600 in revenue. The production of cream amounted to 12,650 liters, resulting in ₹40,48,000 in revenue. Butter production reached 1,471 kilograms, bringing in ₹8,06,108 in revenue. Finally, the manufacture of ghee amounted to 4,988 liters, with revenue totaling ₹36,41,240.

Table 2. Types of milk products produced in NaRi organization for the year 2021

S.No	Particulars	Quantity produced	Gross returns in ₹
1	Dahi	28,186 kgs	30,37,576
2	Paneer	2,775 kgs	10,65,600
3	Cream	12,650 ltrs	40,48,000
4	Butter	1,471 kgs	8,06,108
5	Ghee	4,988 ltrs	36,41,240

3.1 To work out the cost and returns of value added milk and milk products.**3.1.1 Cost and returns of Dahi****3.1.1.1 Gross returns per year**

Table 3. showed that 28,186 kg of dahi they had a return of ₹ 30,37,576 having a wholesale rate of ₹ 116 per kg.

Table 3. Gross return per year of dahi

Total production (Kg)	Rate(₹)	Return(₹)
28,186	116	30,37,576

3.1.1.2 Total cost per year

Table 4. showed that total variable cost per year of dahi including all the particulars like added ingredients, electricity, transportation, packaging, labour wages, repair and maintenance, was a sum total of ₹18,10,792. Among all particulars raw material (milk and bacterial culture) was the maximum *i.e.* ₹13,35,486.

Further investigation of the table revealed that total fixed cost per year of Dahi including all the particulars like land rent depreciation, interest was a sum total of ₹75,846.1. Among all the paramers, interest of fixed capital was maximum *i.e.* ₹38,584.5.

Table 4. Manufacturing cost of Dahi for the year of 2021

S.No	Particulars	₹/ year	Per cent
1	Land rent	1,267.78	0.07
2	Depriciation	3,6048.9	1.91
3	Interest	38,584.5	2.05
	Total fixed cost (A)	75,846.1	4.02
1	Raw materials	13,35,486	70.78
2	Wages and bonus of workers	58,703.5	3.11
3	Electricity	1,67,622	8.88
4	Traveling charges	28,497.4	1.51
5	Spares and repairs of machinery	76,728	4.07
6	Factory building repairs and maintainance	19,678.1	1.04
7	Materials and supplies(packing)	11,9061	6.31
8	miscellanious	5009.99	0.27
	Total variable cost (B)	18,10,792	95.98
	Total cost(A+B)	18,86,693	100.00

3.1.1.3 Cost and returns of dahi per year

As indicated in Table 5, the production of dahi amounted to a total of 26,186 kilograms. The total cost, which includes both variable and fixed costs, for manufacturing dahi was ₹18,86,693. With a selling price of ₹16 per kilogram, the gross return from dahi sales reached ₹30,37,576. Consequently, the net profit, calculated as the difference between the gross return and the total cost, amounted to ₹11,50,883. The Benefit-Cost Ratio (BCR) for the dairy cooperative society's dahi production stands at 1.61.

Table 5. Cost and returns of dahi

S. No	Particulars	₹/ Year
1	Total cost	18,86,693
2	Gross Returns	30,37,576
3	Net returns	11,50,883
4	Total production	26,186 kg
5	Sale Price per kg	₹116
6	B: C ratio	1.61

3.2 Cost and returns of Paneer**3.2.1 Gross returns per year**

Table 4. Showed that 2775 kg of paneer they had a return of ₹ 10,65,600 having a wholesale rate of ₹ 384 per kg.

Table 6. Gross return per year of Paneer

Total production (Kg)	Rate(₹)	Return(₹)
2775	384	10,65,600

3.2.2 Total cost per year

Table 7. showed that total variable cost per year of Paneer including all the particulars like added ingredients, electricity, transportation, packaging, labour wages, repair and maintenance, was a sum total of ₹8,31,371. Among all particulars raw material (milk and citric acid) was the maximum *i.e.* ₹7,32,600.

Further investigation of the table revealed that total fixed cost per year of Paneer including all the particulars like land rent depreciation, interest was a sum total of ₹14,342.86 Among all particulars interest of fixed capital was maximum *i.e.* ₹7,015.02.

Table 7. Manufacturing cost of paneer

S.No	Particulars	₹/ year	Per cent
1	Land rent	1287.53	0.03
2	Depreciation	6,040.28	0.71
3	Interest	7,015.02	0.95
	Total fixed cost (A)	14,342.86	1.70
1	Raw materials	7,32,600	86.63
2	Wages and bonus of workers	12,646.15	1.50
3	Electricity	21,469.04	2.54
4	Traveling charges	10,044.52	1.19
5	Spares and repairs of machinery	19,580.03	2.32
6	Factory building repairs and maintenance	6,142.09	0.73
7	Materials and supplies(packing)	27,565.88	3.26
8	miscellaneous	1,153.763	0.16
	Total variable cost (B)	8,31,371	98.30
	Total cost(A+B)	8,45,714	100

3.2.3 Cost and returns of Paneer

Table 8. showed that total 2,775 kg of paneer has been produced. The total cost (total variable cost + total fixed cost) incurred for manufacturing paneer was ₹ 8,45,714, by selling one kg at ₹ 384 gives gross return of ₹ 10,65,600. Net profit (Gross return – Total cost) made by the dairy cooperative society on paneer was ₹ 2,19,886 with the Benefit Cost Ratio of 1.26.

Table 8. Cost and returns of Paneer

S. No	Particulars	₹/ Year
1	Total cost	8,45,714
2	Gross Returns	10,65,600
3	Net profit	2,19,886
4	Total quantity produced	2,775 kg
5	Sale value per kg	₹384
6	B: C ratio	1.26

3.3 Costs and returns of cream**3.3.1. Gross returns per year**

Table 9. showed that for 12650 liter of cream they had a return of ₹ 40,48,000 having a wholesale rate of ₹ 320 per liter.

Table 9. Gross return per year of cream

Total production (ltr)	Rate(₹)	Return(₹)
12,650	320	40,48,000

3.3.2 Total cost per year

Table 10 showed that total variable cost per year of cream including all the particulars like added ingredients, electricity, transportation, packaging, labour wages, repair and maintenance, was a sum total of ₹33,24,580. Among all particulars raw material (milk) was the maximum *i.e.* ₹30,45,108.

Further investigation of the table revealed that total fixed cost per year of cream including all the particulars like land rent depreciation, interest was a sum total of ₹44,090.79. Among all particulars interest of fixed capital was maximum *i.e.*, ₹2,2045.4.

Table 10. Manufacturing cost of cream for the year of 2021

S.No	Particulars	₹/ year	Per cent
1	Land rent	690.79	0.02
2	Depreciation	2,1354.6	0.63
3	Interest	2,2045.4	0.65
	Total fixed cost (A)	44,090.79	1.31
1	Raw materials	30,45,108	90.39
2	Wages and bonus of workers	33,578.68	1.00
3	Electricity	63,012.59	1.87
4	Traveling charges	2,0663.8	0.61
5	Spares and repairs of machinery	48,986.43	1.45
6	Factory building repairs and maintenance	13,305.33	0.39
7	Materials and supplies(packing)	95,840.41	2.85
8	miscellaneous	4,684.18	0.12
	Total variable cost (B)	33,24,580	98.69
	Total cost(A+B)	33,68,671	100

3.3.3. Cost and returns of Cream

Table 11. showed that total 12,650 liters of cream has been produced. The total cost (total variable cost + total fixed cost) incurred for manufacturing cream was ₹ 33,68,671, by selling one liter at ₹ 320 gives gross return of ₹ 40,48,000. Net profit (Gross return – Total cost) made by the dairy cooperative society on cream was ₹ 6,79,329 with the Benefit Cost Ratio of 1.21.

Table 11. Cost and returns of Cream

S. No	Particulars	₹/ Year
1	Total cost	33,68,671

2	Gross Returns	40,48,000
3	Net profit	6,79,329
4	Total quantity produced	12,650 liters
5	Sale value per liter	₹320
6	B: C ratio	1.21

3.4 Cost and returns of butter

3.4.1 Gross returns per year

Table 12. showed that for 1471 kgs of butter they had a return of ₹ 8,06,108 having a wholesale rate of ₹ 548 per kg.

Table 12. Gross return per year of butter

Total production (Kg)	Rate(₹)	Return(₹)
1,471	548	8,061,08

3.4.2 Total cost per year

Table 4.2 showed that total variable cost per year of butter including all the particulars like added ingredients, electricity, transportation, packaging, labour wages, repair and maintenance, was a sum total of ₹5,87,603. Among all particulars raw material (cream) was the maximum *i.e.* ₹4,85,364.

Further investigation of the table revealed that total fixed cost per year of cream including all the particulars like land rent, depreciation, interest was a sum total of ₹22,921.9 Among all particulars interest of fixed capital was maximum *i.e.* ₹10,364.2.

Table 13. Manufacturing cost of butter for the year 2021

S.No	Particulars	₹/ year	Per cent
1	Land rent	250.7	0.84
2	Depreciation	12,244	2.01
3	Interest	10,364.2	1.70
	Total fixed cost (A)	22,921.9	3.74
1	Raw materials	4,85,364	79.51
2	Wages and bonus of workers	15,703	2.57
3	Electricity	25,127.3	4.12
4	Traveling charges	9,737.6	1.60
5	Spares and repairs of machinery	7,218.6	1.18
6	Factory building repairs and maintenance	5,965.4	0.98
7	Materials and supplies(packing)	37,697.2	6.18
8	miscellaneous	789.6	0.13
	Total variable cost (B)	5,87,603	96.26
	Total cost(A+B)	6,10,524	100

3.4.3 Costs and returns of butter

Table 14. showed that total 1,471kg of butter has been produced. The total cost (total variable cost + total fixed cost) incurred for manufacturing butter was ₹6,10,524, by selling one liter at ₹ 548 gives gross return of ₹8,06,108. Net profit (Gross return – Total cost) made by the dairy cooperative society on butter was ₹1,95,647 with the Benefit Cost Ratio of 1.32.

Table 14. Cost and returns of Butter

S. No	Particulars	₹/ Year
1	Total cost	6,10,524
2	Gross returns	8,06,108
3	Net profit	1,95,647
4	Total quantity produced	1,471kg

5	Sale value per kg	₹548
6	B: C ratio	1.32

3.5 Cost and returns of Ghee

3.5.1 Gross returns per year

Table 15 revealed that from the production of 4,988 liters of ghee, the dairy cooperative society achieved a return of ₹36,41,240, with a wholesale rate of ₹730 per liter.

Table 15. Gross return per year of ghee

Total production (ltr)	Rate(₹)	Return(₹)
1,471	730	36,41,240

3.5.2 Total cost per year

As depicted in Table 4.2, the total variable cost for ghee production per year, encompassing all expenses such as added ingredients, electricity, transportation, packaging, labor wages, and repair and maintenance, amounted to ₹26,18,734. Among these various components, the highest cost was attributed to raw materials (specifically cream), which totaled ₹25,11,580. Further investigation of the table revealed that total fixed cost per year of cream including all the particulars like land rent depreciation, interest was a sum total of ₹20,191.4. Among all particulars interest of fixed capital was maximum *i.e.* ₹11,010.4.

Table 16. Manufacturing cost of ghee .

S.No	Particulars	₹/ year	Per cent
1	Land rent	914.3	0.31
2	Depreciation -	8195.4	0.19
3	Interest	11,010.4	0.29
	Total fixed cost (A)	20,191.4	0.48
1	Raw materials	25,11,580	95.45
2	Wages and bonus of workers	28,369.6	1.08
3	Electricity	45,691	1.74
4	Traveling charges	6,247.9	0.24
5	Spares and repairs of machinery	5,765.4	0.22
6	Factory building repairs and maintenance	2,882.7	0.11
7	Materials and supplies(packing)	17,867.5	0.68
8	miscellaneous	229.5	0.01
	Total variable cost (B)	26,18,734	99.52
	Total cost(A+B)	26,38,926	100

3.5.3 Cost and returns of Ghee

Table 17. showed that total 4,988 liters of ghee has been produced. The total cost (total variable cost + total fixed cost)incurred for manufacturing ghee was ₹26,38,926, by selling one liter at ₹ 730 gives gross return of ₹36,41,240. Net profit (Gross return – Total cost) made by the dairy cooperative society on ghee was ₹10,02,314with the Benefit Cost Ratio of 1.38.

Table 17. Cost and returns of Ghee

S. No	Particulars	₹/ Year
1	Total cost	26,38,926
2	Gross returns	36,41,240
3	Net profit	10,02,314
4	Total quantity produced	4,988 liters
5	Sale Price per liter	₹730
6	B: C ratio	1.38

3.6 The constraints faced in value addition of milk products

The major constraints encountered in the value addition of milk products were identified through a Garrett's Mean Score assessment. The most significant constraint reported was the handling loss of milk, which received a score of 56.9. Respondents noted that this loss occurred during the preparation of dairy products and posed a major concern. The second major constraint, with a Garrett's Mean Score of 54.1, was related to electricity problems. Fluctuations in power supply disrupted the value addition process, necessitating the use of supplementary power sources. The third constraint, with a Garrett's Mean Score of 52.0, was the occasional failure of machinery. Despite having spare machines and a dedicated staff for repairs, these breakdowns disrupted the value addition process.

At the fourth position, the issue of sensor malfunction during product packaging received a Garrett's Mean Score of 50.4. Respondents reported occasional problems with non-functional sensors, causing disruptions. Lastly, misprints on milk product packaging, with a Garrett's Mean Score of 49.6, were identified as the fifth major constraint. Sometimes, these misprints led to concerns about the quality of the product, particularly given the perishable nature of milk, introducing uncertainty in achieving the desired quality.

Table 18. Constraints faced in value addition of milk products (n=10)

S.No	Constraints	Garrett's Mean Score	Rank
1	Handling loss of milk	56.9	I
2	Electricity problem	54.1	II
3	Machine failure	52.0	III
4	Sensor problem while packing	50.4	IV
5	Misprinting of packaging products	49.6	V
6	Not getting desired quality	46.8	VI

4. Conclusion

The analysis of cost and returns has indicated the profitability of various milk products produced by NaRi, with benefit-cost ratios of 1.61 for dahi, 1.26 for paneer, 1.21 for cream, 1.32 for butter, and 1.38 for ghee. Notably, dahi emerged as the most profitable among the value-added milk products. To further enhance the dairy sector, there is a need to promote the development of efficient milk collection centers equipped with proper cooling facilities and cold storage. Initiatives like the Meghalaya Milk Mission scheme should be encouraged, and awareness of such schemes should be disseminated effectively.

Improving the quality of procured milk is essential, and this can be achieved through training and awareness programs for dairy farmers at milk producers' cooperative societies and collection centers, focusing on hygiene in milk production. Such efforts will, in turn, enhance the quality of processed dairy products. NaRi can adopt the marketing mix concept to concentrate production on profitable value-added products like dahi and ghee. Additionally, diversifying the product range to include more profitable items such as ice cream, especially targeting urban and semi-urban areas in the state Meghalaya.

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