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Dynamics of Dairy Farming in North-East India: Fostering Growth in the Land of Diversity

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

The current research was carried out in the North-Eastern part of India. Assam, Meghalaya, and Tripura were chosen based on the highest milk production to examine the socio-economic status of the dairy farmer. A total of 300 dairy households were selected by implementing a multistage purposive and random sampling design to conduct a comprehensive analysis. It was found that, on average, large dairy farmers had more dairy farming experience than medium and small farmers. The scenario of a large group of dairy farmers (91.49 %) had the highest literacy rate. The average milk production of crossbred cattle was observed to be 7.02 liters and for indigenous it was 1.15 liters per day. The rainy season exhibited the highest milk productivity both in the case of crossbred and indigenous cattle.

Keywords: Animal productivity; crossbred cattle; indigenous cattle; milch animal.

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1. INTRODUCTION

Dairy farming has been an integral part of the agricultural landscape in Northeast India for generations. The lush green landscapes and favorable climate of the region have made it conducive for livestock rearing. However, the status of dairy farming in Northeast India has undergone significant changes in recent years, driven by a mix of challenges and opportunities. In this article, we will explore the current status of dairy farming in Northeast India and its potential for growth. Northeast India has a long-standing tradition of dairy farming, with smallholders and rural communities relying on cattle for milk production. Beyond its economic implications, dairy farming in North-East India holds immense cultural significance. It is intricately woven into local traditions, rituals, and celebrations, contributing to the preservation of the region's cultural identity. While indigenous breeds are hardy and well-suited to local conditions, they often have lower milk yields compared to modern dairy breeds [1]. According to data from 2020-2021, North-East India collectively produced over 8.6 million metric tonnes of milk, contributing significantly to the nation's dairy production. This production surge, reflecting an approximate 10% increase from the previous year, showcases the sector's resilience and potential for further expansion [2]. This data underscores the critical role played by North-East India in the country's dairy landscape. This article aims to provide an in-depth analysis of the state of dairy farming in North-East India, with a focus on recent developments and the potential for future growth. In the North-eastern (NE) region, the majority of the agricultural production is of a subsistence character, and it is organic by default [3]. Because most people like to include meat in their diets on a regular basis, livestock production is an essential element of the mixed farming system [4]. The majority of people who raise livestock in the NE region live below the poverty line [5], but the sector has the potential to offer alternative livelihoods for those people. The majority of households in the NE region who keep livestock are landless or marginal households. therefore a comprehensive study has been conducted to know the socio-economic characteristics of the dairy farmers for better policy implications in the North-Eastern part of the country.

2. METHODOLOGY

North-East region comprises of 8 states; out of which, 3 states have been selected based on the maximum milk production and these are Assam, Tripura & Meghalaya. Multistage sampling technique was used for selecting sampling units (i.e. households). Two districts were chosen from each state. The districts of Lakhimpur and Nagaon were chosen from a total of 33 districts in the state of Assam. West Tripura and Gomati districts, two of the eight districts in the state of Tripura, have been chosen, along with Ri-bhoi and East Khasi hill districts from the state of Meghalaya. Primary data was collected from 300 randomly selected dairy households.

The study used a random sample of 300 milk-producer households. The primary data was acquired from the sample households by personal interviews utilizing a traditional survey method and a well-structured questionnaires. The sample respondents provided data on socioeconomic and demographic characteristics of households, such as age, education, family composition, occupation, operational land holding, type of livestock, investment in livestock, machinery and equipment, value of feed, fodder, and other miscellaneous expenses, milk production, and input and output prices, among other things. Using the cumulative square root frequency technique and milch animals as the basis of classification, the data acquired from milk producers was post-stratified into small (1-3 milch animals), medium (3-8 milch animals), and large (>8 milch animals) herd size categories. Thus, a total of 300 producer households were classified as 162 small, 91 medium, and 47 large herd sized. Tabular analysis has been done for the study.

3. RESULTS AND DISCUSSION

3.1 Socio-economic Profile of the Sample Household

The households basic socio-economic characteristics may influence their decision-making process and farm profitability. Like other rural households in India, those in North-Eastern states have a wide range of socioeconomic features. As a result, an attempt has been made in this part to capture the significant socio-

Table 1. Socio-economic status of the sample households in the study area

Variable	Small	Medium	Large	Overall
Age of household head (Years)	48.71 (8.71)	43.21 (9.22)	49.01 (7.09)	46.97 (7.22)
Family size (Number)	5.22 (1.98)	6.14 (1.49)	7.32 (1.32)	6.22 (1.10)
Distance to market (km)	7.71 (1.66)	5.69 (2.46)	5.38 (2.55)	6.26 (1.82)
Dairy farming experience (Years)	15.36 (7.43)	16.04 (6.21)	17.09 (5.71)	16.16 (6.07)

Figures in the parentheses indicate the standard deviation

economic profile of dairy households, as well as farm-specific characteristics. In order to have a clear picture of the status and situation of the area, its people, and their economic standing in the society. These socioeconomic factors directly and indirectly impact the production process, so their discussion and policy implications are regarded as extremely important. Primary data were acquired from 300 dairy farms across three states: Assam, Meghalaya, and Tripura. All the dairy farm households were personally interviewed, and the collected data were cleaned and tabulated accordingly.

A glance at the data reveals that large dairy households, on average, had an older household head. Large dairy farms had larger family sizes, as dairy farming in rural areas is widely recognized as a labour-intensive activity, with most labour demands being fulfilled by family members. But small dairy farms were farther away from the market than medium and large households. On an average, large dairy farmers had more dairy farming experience than medium and small farmers.

3.2 Educational Status of the Sample Households

The level of education held by dairy farmers is a good indicator of their capacity for comprehension and can also motivate them to adopt more efficient dairying techniques. Higher motivation to use new technology is associated with more educated farmers. The farmer's education significantly influences the decision-making skills of dairy producers and marketers, farm diversification, and return on investment.

The farm households were divided into five categories based on their level of education, including illiterate (no formal education), primary (up to fifth grade), high school (up to tenth grade), higher secondary (up to twelve grade), and graduation and above. Table 2 shows the educational status of the respondents across different herd size. Overall 90.37 per cent of respondents were literate and remaining 9.63 per cent were illiterate. There were 28.80 per cent of respondents had completed elementary school, 21.46 had completed upper secondary school, and 23.25 per cent had completed graduation. The research area's farming community, in general, had an educational level that was suitable for any form of development program, according to the analysis. The scenario of a large-sized group of farmers (91.49%) had the greatest literacy rate. In small groups of farmers, the percentage of illiterates was found to be the highest i.e. 10.49 per cent.

Table 2. Educational level of the respondents w.r.t. different herd size categories

Herd size categories	Number of respondents	Education Level				Illiterate
		Up to primary	Up to High School	Up to Higher secondary	Graduate and Above	
Small	162 (100)	66 (40.74)	26 (16.05)	29 (17.90)	24 (14.81)	17 (10.49)
Medium	91 (100)	28 (30.77)	14 (15.38)	21 (23.08)	19 (20.88)	9 (9.89)
Large	47 (100)	7 (14.89)	9 (19.15)	11 (23.40)	16 (34.04)	4 (8.51)
Overall	300 (100)	34 (28.80)	16 (16.85)	20 (21.46)	20 (23.25)	10 (9.63)

Figures in the parentheses indicates percentage to the total

Table 3. Number of milch animals across herd size categories in the study area

Category	Milch animals				
	Crossbred	Local	Total milch	Milch animal/ Household	Ratio of Crossbred to total milch
Small (162)	148	91	239	1.48	0.62
Medium (91)	159	75	234	2.57	0.68
Large (47)	197	77	274	5.83	0.72
Overall	504	243	747	2.49	0.67

Figure in the parentheses indicates number

3.3 Composition of the Herd Size in the Study Area

In the study area, the herd size and number of animals include milch animals of indigenous and crossbred cattle. The quantity of dairy animals within a household directly impacts the milk producers' economic status. Furthermore, the proportion of lactating or non-lactating cattle within the livestock population is a crucial determinant of milk yield and financial returns for agricultural producers. The dry period refers to reduced animal productivity, during which the farmer provides only maintenance rations for their sustenance.

Studies conducted by Singh [6], Khoveio [7], Nagrale [8], Priscilla [9] have shown that raising crossbred cows is generally more economically advantageous than raising indigenous cows due to their significantly higher milk productivity. Therefore, households rearing a greater number of crossbred animals are likely to experience increased milk production and potentially greater financial gains. Table 3 displays the distribution of milch animals based on their respective categories. On average, large households possessed a greater number of milch animals (5.83) than medium (2.57) and small (1.48) categories respectively. Milch animal per household was found to be 2.49 in the North-Eastern region. The study revealed that larger farm households exhibited a higher proportion of crossbred milch animals compared to rest of the households.

3.4 Feeding Pattern

The provision of feed and fodder is a critical factor in dairy farming, as it significantly influences the quantity and quality of milk production. The components of feed and fodder typically consist of a combination of green and dry fodder, concentrate, mineral mixture, and salt. Evaluating the feeds and fodder utilization and the associated expenses for feeding are integral to determining the milk production cost. The proportion of feed and fodder components in the overall cost of milk production has been found to vary between 60 to 75 per cent in various studies. Hence, the acquisition of precise data pertaining to diverse feed and fodder varieties provided to livestock is of utmost significance. Data pertaining to animal feeding was gathered across three distinct states, for the year 2021-22. The present study reported various green grasses commonly utilized as animal feed included: Para grass, Alligator weed, Congo signal grass, Napier grass, Broom grass, Wild rice, and bamboo. The leaves of the Jackfruit and Fig trees were also utilised as a source of feed. The study region in most of the states utilized dried paddy straw as a form of dry fodder. The animals were fed with either compounded cattle feed (pallet) or homemade concentrate mix based on their availability and cost. The constituents of the homemade concentrate mixture comprised of mustard cake, rice bran, wheat bran, and broken rice. The inclusion of mineral mixture and common salt was observed in the formulation of dana.

Table 4. Quantity of feed and fodder intake by milch animals (kg/milch animal/day)

Feed and fodder	Crossbred				Indigenous			
	Small	Medium	Large	Overall	Small	Medium	large	Overall
Green fodder	16.24	19.24	26.32	20.60	5.64	6.82	9.41	7.29
Dry fodder	6.04	5.84	5.56	5.81	3.18	2.94	2.66	2.93
Concentrate	3.39	3.88	4.01	3.76	1.84	2.16	2.31	2.103

Table 4 illustrates the average amount of feed that a crossbred and local milking cow consumes on a daily basis for all the group sizes of households. It is evident from the table that the overall average per day quantity of green fodder, dry fodder, and concentrates supplied per milch crossbred cattle was recorded to be 20.60 kg, 5.81 kg, and 3.76 kg. In addition, dairy farmers fed their animals a greater proportion of green and dry fodder because these were easily accessible and cost less than concentrates in the area under investigation. It was discovered that the animals in all the groups were fed within the allowable parameters of the standard. But despite the amount of feed fed to the crossbred there exists a gap in milk yield with the national average. This could be because the animals' efficiency in converting feed into milk was lower. According to the data presented in the Table 4, the average per day quantity of green fodder, dry fodder, and concentrates supplied to each animal was 7.29 kg, 2.93 kg, and 2.10 kg, respectively, for the indigenous cattle. It is evident from the table that green fodder constituted the major share of total feed and fodder provided to the animals, followed by dry fodder and concentrates in the region. It was discovered that crossbred cows received greater amounts of concentrate, dry fodder, and green fodder than the other animals in the various groups. This is because crossbred animals are more productive than indigenous native cows.

3.5 Animal Productivity

A variety of factors influence a dairy animal's milk productivity. The animal's breed and the sort of feed and fodder it is given are two of the most crucial considerations. For dairy farmers, it is the main output that matters economically. Table 5 provides an overview of the average milk productivity (wet average) exhibited by crossbred and indigenous cows. The presented data in the table clearly shows that the average milk production of crossbred cattle was observed to be 7.02 liters and for indigenous it was 1.15 liters per day.

Additionally, the data presented in the Table 5 indicates that there was only a slight variation in average milk production among the three herd size categories. The mean milk production varied across different herd size categories, ranging from 6.47 liters for small herds to 7.48 liters for large herds for crossbred cows and 1.09 liters to 1.21 for indigenous cows. Across different herd size categories, it is observed that the average milk yield per crossbred and indigenous cow tends to be the lowest in the small herd size category, while it reaches its peak in the large herd size category. The rainy season exhibited the highest milk productivity both in case of crossbred and indigenous cattle. One of the primary challenges facing dairy farming in the region is the low milk productivity per animal. Factors contributing to this issue include suboptimal nutrition, traditional management practices, and the prevalence of indigenous breeds with comparatively lower milk yields [10].

3.6 State Breeding Policy

To enhance better productivity of the indigenous cattle breeds of the region, an appropriate breeding strategy would be set to bring changes in the region’s dairy sector. Number of schemes and policies have been implemented by the Central government as well as State animal husbandry department for conservation of indigenous animals such as National Programme for Bovine Breeding (NPBB), National Dairy Plan and Dairy Entrepreneurship Scheme under the government of India which aims to conserve, develop, and proliferate selected indigenous bovine breeds of

Table 5. Milk productivity of animals across herd size categories (litre/animal/day)

	Crossbred cattle			
Category	**Rainy**	**Winter**	**Summer**	**Overall**
Small	6.94	6.23	6.2	6.47
Medium	7.28	7.09	6.94	7.11
Large	7.54	7.49	7.41	7.48
Overall	7.25	6.94	6.85	7.02
Indigenous cattle				
Small	1.21	1.10	0.97	1.09
Medium	1.33	1.12	1.01	1.15
Large	1.35	1.17	1.12	1.21
Overall	1.30	1.13	1.03	1.15

Table 6. State breeding policy

State	Breeding policy		Exotic blood	Targeted area
	Upbreeding	Crossbreeding		
Assam		1. HF 2. Jersey	50% 50-62.5%	Entire state- large scale production
Meghalaya	Red Sindhi Sahiwal	1. HF 2. Jersey 3. Combination	50% 50% 50%	Zone- I: Hills and Rolling and undulating pediment Zone- II & III: Upper and Middle plateau Exotic HF is recommended Zone- IV: Low hills gentle to steep slope and rolling pediment Zone- V: Rolling and undulating pediment and valley land having depression East and Ri-Bhoi District
Tripura	Sahiwal	HF Jersey	50%	Across the states

Source- Compiled by authors from State Breeding Policy Reports

high socio-economic importance. Such approach by the government of India would enable for in situ conservation of existing farm animal genetic resources, the only viable and practical conservation method in countries like India when compared to ex-situ conservation and cryopreservation methods. This method would support the importance of identifying the most adapted genotype capable of coping with the environmental challenges posed by any particular production system.

The Animal Husbandry Department under the State Government has implemented a specific breeding policy for upgrading and crossbreeding to improve the productivity of the animal using suitable germplasm. Using proven bulls for artificial insemination of existing breeds has been found to be very effective for the improvement of indigenous animals for higher milk production and this could be a reasonable sustainable solution in the Eastern and northeastern regions for genetic improvement.

4. CONCLUSION

The status of dairy farming in North-east India reflects a dynamic interplay of tradition and modernization. While challenges such as climate, infrastructure, and low productivity persist, opportunities for growth abound. The region's potential for breed improvement, value addition, market expansion, and government support, coupled with the cultural significance of dairy farming, positions it as a promising sector for economic development and livelihood improvement. With continued efforts and investments, Northeast India can realize its potential as a thriving hub for dairy farming in the years to come. Dairy farming in North-East India is a multifaceted sector that combines tradition, culture, and economic viability. Despite the challenges posed by low productivity, infrastructure deficiencies, and climate variability, the region's dairy industry is poised for growth. Leveraging opportunities in breed improvement, value addition, market expansion, and sustainable practices, coupled with government support and the cooperative movement, can drive the dairy sector's prosperity.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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