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Sustainability And Challenges In Dairy Farming: A Study Of Emerging Farmers In Thiruvananthapuram District

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ABSTRACT

Dairy farming plays a vital role in the rural economy by providing income, employment, and nutritional security. This study focuses on examining the sustainability and challenges faced by emerging dairy farmers in Thiruvananthapuram District. The study is based on primary data collected from 75 respondents using a structured questionnaire, supported by secondary data from various reports and journals. A descriptive and analytical research design was adopted, and statistical tools such as percentage analysis, mean score, T-test, ANOVA, correlation, and regression were used for analysis.

The findings reveal that most of the respondents are middle-aged, moderately educated, and operate small-scale dairy farms with limited herd size. Among sustainability practices, animal health care is widely adopted, while the use of modern technology remains low. The study identifies high feed cost, lack of credit facilities, and price fluctuations as the major challenges faced by farmers. Statistical analysis indicates that income and experience have a significant positive impact on sustainability practices, while gender does not show a significant influence.

The study concludes that although dairy farming is moderately profitable, its sustainability is affected by financial, technical, and institutional constraints. It emphasizes the need for improved access to credit, enhanced training programmes, better veterinary services, and promotion of modern technologies. The findings of the study provide useful insights for policymakers and stakeholders to strengthen the dairy sector and support emerging farmers in achieving sustainable development

KEYWORDS: Dairy Farming, Sustainability, Emerging Farmers, Challenges, Profitability

INTRODUCTION

Agriculture remains the backbone of the Indian economy, and within it, the dairy sector occupies a prominent position due to its contribution to income generation, employment creation, and nutritional security. India has emerged as the largest producer of milk globally, with the dairy industry playing a vital role in supporting rural livelihoods, especially among small and marginal farmers. Unlike crop farming, dairy farming provides a steady and regular source of income, thereby reducing economic vulnerability and enhancing financial stability for farming households.

In recent years, there has been a growing interest among *emerging farmers*, particularly young entrepreneurs and first-generation agriculturists, in taking up dairy farming as a viable livelihood option. These farmers often bring innovation, adaptability, and a willingness to adopt modern technologies such as improved breeding techniques, scientific feeding practices, mechanization, and digital marketing. Their entry into the dairy sector is seen as a positive development that can enhance productivity, efficiency, and overall sectoral growth.

However, the concept of sustainability has gained increasing importance in the dairy sector due to rising environmental concerns, economic uncertainties, and social responsibilities. Sustainable dairy farming involves maintaining a balance between productivity and environmental conservation, ensuring animal health and welfare,

optimizing resource use, and achieving long-term economic viability. It also includes practices such as efficient waste management, reduced greenhouse gas emissions, water conservation, and the use of renewable energy sources. Despite its significance, achieving sustainability remains a major challenge for many dairy farmers, especially those who are newly entering the sector

Emerging dairy farmers face a wide range of constraints that hinder their ability to sustain and expand their operations. These challenges include high initial investment costs, rising prices of feed and fodder, lack of access to timely and affordable institutional credit, inadequate veterinary and extension services, and limited awareness of modern dairy management practices. Additionally, market-related issues such as price fluctuations, dependence on intermediaries, and lack of organized marketing channels further complicate their economic stability. Climate change and environmental degradation also pose serious threats by affecting fodder availability, animal productivity, and overall farm sustainability.

Thiruvananthapuram District, the capital region of Kerala, provides a unique context for examining these issues due to its distinct socio-economic and agro-climatic characteristics. The district has witnessed a gradual shift in agricultural patterns, with increasing emphasis on dairy farming as a supplementary and sometimes primary source of income. The presence of cooperative institutions like Milma and various government initiatives has contributed to the development of the dairy sector. However, emerging farmers in the region still encounter multiple structural and operational challenges that affect their sustainability and growth prospects.

In this context, it becomes essential to analyze the sustainability practices adopted by emerging dairy farmers and to identify the key challenges they face in maintaining viable dairy enterprises. This study attempts to explore the socio-economic profile of these farmers, examine their adoption of sustainable practices, and assess the institutional support available to them. By doing so, the research aims to provide valuable insights for policymakers, development agencies, and stakeholders to design effective strategies for promoting sustainable and resilient dairy farming systems in Thiruvananthapuram District.

REVIEW OF LITERATURE

Gayathri S. Lal et al. (2023), "An Outlook on Commercial Dairy Farming in India", conducted a study on the development and performance of the dairy sector in India. The study revealed that dairy farming has shown considerable growth due to increasing demand for milk and supportive government initiatives. It was found that improved breeding techniques and better disease management practices have contributed to higher milk production. The researchers identified lack of awareness and limited technical knowledge among farmers as key constraints. The study also pointed out inadequate infrastructure and poor extension services affecting farm productivity. Further, issues related to marketing and price fluctuations were found to reduce farmers' profitability. Limited access to organized markets forces farmers to depend on middlemen. The study also highlighted insufficient training programmes for small-scale farmers. Financial constraints and difficulty in accessing institutional credit were additional challenges. The study concluded that improving awareness, infrastructure, and institutional support is essential for the growth of dairy farming.

Ramesh Kumar and Singh (2023) conducted a study on sustainability practices in dairy farming among small-scale farmers. The study found that adoption of eco-friendly practices such as proper waste management and efficient water usage remains low among emerging farmers. Lack of training and awareness were identified as major barriers to sustainable practices. The study also revealed that farmers face challenges in maintaining animal health due to inadequate veterinary services. High cost of feed and fodder was another major constraint affecting profitability. The researchers emphasized the need for government intervention and awareness programmes to promote sustainable dairy farming.

Anitha P. and Joseph (2023) examined the role of cooperative societies in enhancing dairy farmers' income in Kerala. The study found that cooperative institutions play a significant role in ensuring fair pricing and regular income for farmers. However, the study identified issues such as delayed payments, limited coverage of cooperative networks, and lack of modernization. It also highlighted that emerging farmers face difficulty in accessing cooperative benefits due to procedural complexities. The study concluded that strengthening cooperative systems and improving accessibility can enhance farmers' sustainability.

Suresh Babu et al. (2022) conducted a study on the economic viability of dairy farming in South India. The findings indicated that dairy farming is profitable when managed efficiently, but rising input costs significantly affect net returns. The study revealed that small-scale farmers struggle with high investment requirements and limited access to credit facilities. It also pointed out that market fluctuations and unstable milk prices create uncertainty among farmers. The researchers suggested that financial support and subsidies are essential to sustain dairy farming.

Deepa K. (2022) analyzed the challenges faced by emerging dairy farmers in Kerala. The study found that lack of technical knowledge, inadequate training, and poor access to modern technology are major issues. It also highlighted the impact of climate change on fodder availability and animal productivity. The study emphasized that institutional support and skill development programmes are necessary to overcome these challenges and improve sustainability.

Manoj Kumar (2021) conducted a study on problems and prospects of dairy farming in rural areas. The study revealed that dairy farming provides employment and supplementary income to rural households. However, it identified major challenges such as lack of infrastructure, poor veterinary services, and high maintenance costs. The study also pointed out that farmers face difficulties in marketing their products due to lack of organized channels. The researcher concluded that improving infrastructure, providing training, and strengthening marketing systems are essential for the development of the dairy sector.

STATEMENT OF THE PROBLEM

Dairy farming has emerged as an important source of livelihood for many rural households in India, particularly among small-scale and emerging farmers. In districts like Thiruvananthapuram, dairy farming is increasingly being adopted as a means of generating regular income and improving socio-economic conditions. Despite its potential, the sector faces several challenges that hinder its growth and sustainability.

Emerging dairy farmers, especially first-generation entrepreneurs and youth entrants, encounter numerous difficulties in establishing and maintaining profitable dairy enterprises. High initial investment, rising cost of feed and fodder, and limited access to timely institutional credit create financial constraints. In addition, inadequate technical knowledge, lack of proper training, and insufficient veterinary and extension services affect productivity and animal health. Many farmers are also unable to adopt sustainable practices due to lack of awareness and support systems.

Further, market-related issues such as price fluctuations, dependence on intermediaries, and limited access to organized marketing channels reduce farmers' income and profitability. Environmental concerns, including climate change and resource scarcity, also pose significant threats to sustainable dairy farming. Although government schemes and cooperative institutions exist, their reach and effectiveness among emerging farmers remain limited.

In Thiruvananthapuram District, these issues are more pronounced due to regional constraints such as limited land availability, urbanization, and changing agricultural patterns. As a result, many emerging dairy farmers struggle to sustain their operations in the long run. Therefore, there is a need to systematically examine the sustainability practices adopted by emerging dairy farmers and to identify the key challenges they face. This study seeks to address this gap by analyzing the socio-economic conditions, institutional support, and operational difficulties of dairy farmers in Thiruvananthapuram District, with the aim of suggesting measures to improve the sustainability and viability of dairy farming in the region.

SCOPE OF THE STUDY

The present study focuses on examining the sustainability and challenges in dairy farming among emerging farmers in Thiruvananthapuram District. It primarily covers first-generation dairy farmers, young entrepreneurs, and small-scale farmers who have recently entered the dairy sector. The study analyzes the socio-economic profile of the respondents, including factors such as age, education, income, and farming experience.

The scope further extends to evaluating the sustainability practices adopted by farmers, such as resource utilization, waste management, animal health care, and adoption of modern dairy technologies. It also includes an assessment of the financial aspects like investment patterns, access to institutional credit, and profitability of dairy farming.

In addition, the study investigates the major challenges faced by emerging dairy farmers, including high input costs, lack of technical knowledge, inadequate infrastructure, marketing issues, and climate-related risks. The role of institutional support, including government schemes, cooperative societies, and extension services, is also examined within the scope of the study. Geographically, the study is confined to selected areas within Thiruvananthapuram District, and the findings are based on the data collected from the respondents during the study period. Therefore, the results may not be generalized to other regions without considering local variations.

EMERGING FARMERS

Emerging farmers refer to individuals who have recently entered the agricultural sector, particularly those who are first-generation farmers, young entrepreneurs, or small-scale producers transitioning into commercial farming. In the context of dairy farming, emerging farmers are those who have started dairy activities in recent years and are in the process of establishing and expanding their operations.

These farmers are typically characterized by limited farming experience, smaller herd sizes, and constrained access to resources such as land, capital, and technology. However, they often demonstrate a higher willingness to adopt modern techniques, innovative practices, and sustainable methods compared to traditional farmers. Emerging farmers may also rely more on institutional support such as government schemes, training programmes, and cooperative societies to develop their farming enterprises.

Despite their potential, emerging farmers face several challenges including financial constraints, lack of technical knowledge, inadequate infrastructure, and market uncertainties. Their role is crucial in shaping the future of the dairy sector, as they contribute to increased productivity, modernization, and sustainability in agriculture.

OBJECTIVES OF THE STUDY

1. To analyze the socio-economic profile of emerging dairy farmers in Thiruvananthapuram District using variables such as age, education, income, and farming experience.
2. To assess the level of sustainability practices adopted by emerging dairy farmers in terms of resource utilization, waste management, and animal health care.
3. To examine the cost, returns, and profitability of dairy farming among the selected respondents.
4. To identify and rank the major challenges faced by emerging dairy farmers in sustaining their dairy enterprises.

SAMPLING DESIGN

The sampling design of the study outlines the method of selecting respondents, sample size, and sampling technique adopted for data collection.

Population of the Study

The population of the study consists of all emerging dairy farmers in Thiruvananthapuram District who have recently entered the dairy farming sector.

Sampling Method

The study adopts a multi-stage sampling technique. In the first stage, selected panchayats/areas within Thiruvananthapuram District are chosen based on the prevalence of dairy farming activities. In the second stage, purposive sampling is used to identify emerging dairy farmers who meet the criteria (less than 10 years of experience, small to medium herd size). Finally, respondents are selected using simple random sampling from the prepared list to ensure representation.

Sample Size

A total of 75 emerging dairy farmers are selected as the sample size for the study. The sample size is considered adequate to represent the population and to apply statistical tools such as T-test, ANOVA, correlation, and regression analysis effectively.

Sampling Unit

The individual dairy farmer is considered as the sampling unit.

Data Collection Method

Primary data are collected through a structured questionnaire administered directly to the selected respondents.

LIMITATIONS OF THE STUDY

- The study focuses only on emerging dairy farmers, and does not include experienced or large-scale farmers, which may limit comparative analysis.
- The study mainly considers selected factors related to sustainability and challenges, and there may be other influencing factors that are not included in the analysis.

ANALYSIS

Table 1: Socio-Economic Profile of Respondents

Variables	Category	No. of Respondents	Percentage (%)
Age	Below 30	12	16.0%
	30–40	20	26.7%
	40–50	25	33.3%
	Above 50	18	24.0%
Gender	Male	48	64.0%
	Female	27	36.0%
Education	Primary	15	20.0%
	Secondary	22	29.3%

	Higher Secondary	18	24.0%
	Graduate	20	26.7%
Experience	Below 3 years	18	24.0%
	3–5 years	27	36.0%
	5–10 years	30	40.0%
Herd Size	Up to 5 animals	32	42.7%
	6–10 animals	28	37.3%
	Above 10	15	20.0%
Monthly Income (₹)	Below 20,000	20	26.7%
	20,000–40,000	30	40.0%
	Above 40,000	25	33.3%
Total		**75**	**100%**

Sources: Primary Data

The socio-economic profile indicates that the majority of respondents (33.3%) fall within the age group of 40–50 years, followed by 30–40 years (26.7%), showing that middle-aged individuals are more actively engaged in dairy farming. A smaller proportion (16%) belongs to the younger age group below 30 years, indicating limited youth participation. Gender-wise distribution reveals that males (64%) dominate the sector compared to females (36%), suggesting gender disparity in dairy farming activities. In terms of education, most respondents have secondary (29.3%) and graduate-level education (26.7%), reflecting a moderate level of literacy which may influence adoption of improved practices. Experience-wise, 40% of farmers have 5–10 years of experience, confirming that the study focuses on emerging farmers. Herd size analysis shows that 42.7% maintain up to 5 animals, indicating small-scale operations. Income distribution reveals that a majority (40%) earn between ₹20,000–₹40,000, suggesting moderate economic status among respondents.

Table 2: Sustainability Practices

Factors	**Mean Score**	**Rank**
Animal Health Care	4.20	**I**
Waste Management	3.95	**II**
Water Management	3.70	**III**
Use of Modern Technology	3.40	**IV**

Sources: Computed Data

The analysis of sustainability practices shows that animal health care (Mean = 4.20) is the most widely adopted practice among dairy farmers. This indicates that farmers give high priority to maintaining the health and productivity of their livestock. Waste management (Mean = 3.95) ranks second, suggesting a moderate level of awareness regarding environmental practices. Water management (Mean = 3.70) is also reasonably practiced, though there is scope for improvement. The use of modern technology (Mean = 3.40) ranks lowest among all factors, indicating limited adoption of advanced techniques such as automated milking or digital monitoring systems. This may be due to financial constraints or lack of technical knowledge. Overall, the results show that traditional practices are more commonly followed than modern sustainable methods. There is a need to promote awareness and provide training to improve technological adoption.

Table 3: Cost and Return Analysis

Particulars	Mean (₹)
Initial Investment	85,000
Feed Cost	45,000
Veterinary Expenses	10,000
Total Cost	1,40,000
Total Income	1,85,000
Net Profit	45,000

Sources: Computed Data

The cost and return analysis reveals that the average initial investment in dairy farming is ₹85,000, indicating a moderate capital requirement for entry into the sector. Feed cost (₹45,000) constitutes the major portion of total expenditure, highlighting it as a key cost component. Veterinary expenses are relatively lower at ₹10,000, but still essential for maintaining animal health. The total cost incurred by farmers is ₹1,40,000, while the total income generated is ₹1,85,000. This results in a net profit of ₹45,000, suggesting that dairy farming is economically viable. However, the margin of profit is not very high, indicating vulnerability to cost fluctuations. Rising input costs, especially feed, can significantly affect profitability. Therefore, efficient cost management is essential for improving returns.

Table 4: Ranking of Challenges

Challenges	Mean Score	Rank
High Feed Cost	4.50	**I**
Lack of Credit	4.10	**II**
Price Fluctuation	3.95	**III**
Poor Veterinary Services	3.80	**IV**
Lack of Training	3.60	**V**

Sources: Computed Data

The ranking of challenges faced by dairy farmers shows that high feed cost (Mean = 4.50) is the most critical issue affecting their operations. This indicates that increasing input prices significantly reduce profitability. Lack of access to credit (Mean = 4.10) is the second major challenge, suggesting financial constraints among farmers. Price fluctuation (Mean = 3.95) also affects income stability, making it difficult for farmers to plan their finances. Poor veterinary services (Mean = 3.80) highlight gaps in institutional support for animal health. Lack of training (Mean = 3.60) is ranked lowest but still remains an important concern. Overall, the findings indicate that both economic and institutional factors pose challenges to sustainability. Addressing these issues is essential for improving the performance of dairy farming.

Table 5: T-Test (Gender vs Sustainability Practices)

Gender	Mean	Std. Deviation	t-value	p-value
Male	3.85	0.52	1.25	0.215
Female	3.70	0.48		

Sources: Computed Data

The T-test analysis compares sustainability practices between male and female farmers. The mean score for male respondents (3.85) is slightly higher than that of female respondents (3.70), indicating marginal differences in adoption levels. However, the p-value (0.215) is greater than the standard significance level of 0.05. This indicates that the difference between the two groups is statistically insignificant. Therefore, gender does not have a significant impact on sustainability practices in dairy farming. Both male and female farmers exhibit similar levels of adoption. This suggests that awareness and practices are uniformly distributed across genders. Hence, policies and training programmes can be designed without gender bias.

Table 6: ANOVA (Age vs Sustainability Practices)

Source	Sum of Squares	df	Mean Square	F-value	p-value
Between Groups	2.45	3	0.82	3.10	0.032
Within Groups	18.75	71	0.26		
Total	21.20	74			

Sources: Computed Data

The ANOVA results examine the differences in sustainability practices across different age groups. The calculated p-value (0.032) is less than 0.05, indicating that the differences are statistically significant. This means that age plays an important role in influencing sustainability practices among farmers. The variation suggests that different age groups adopt practices at different levels. Younger farmers may be more open to innovation, while older farmers may rely on traditional methods. The F-value (3.10) further confirms the presence of variation among groups. This highlights the need for age-specific training and awareness programmes. Tailored interventions can help improve adoption across all age groups.

Table 7: Correlation Analysis

Variables	Income	Experience	Sustainability
Income	1	0.45	0.52
Experience	0.45	1	0.48
Sustainability	0.52	0.48	1

Sources: Computed Data

The correlation analysis shows the relationship between income, experience, and sustainability practices. There is a moderate positive correlation between income and sustainability (0.52), indicating that higher income leads to better adoption of sustainable practices. Similarly, experience is positively correlated with sustainability (0.48), suggesting that experienced farmers are more likely to adopt improved methods. The relationship between income and experience (0.45) also indicates that experienced farmers tend to earn more. All relationships are positive, showing a consistent pattern. This implies that both economic capacity and experience contribute to sustainability. Therefore, improving farmers' income and skills can enhance sustainable practices.

Table 8: Regression Analysis

Variables	Coefficient (β)	t-value	p-value
Constant	1.25	2.10	0.038
Income	0.42	3.25	0.002
Experience	0.35	2.90	0.005

Sources: Computed Data

The regression analysis identifies the impact of independent variables on sustainability practices. The results show that income (β = 0.42) has a significant positive effect on sustainability, with a p-value of 0.002. Experience (β = 0.35) also has a significant positive influence, with a p-value of 0.005. This indicates that both variables play an important role in determining sustainability levels. The constant value is also significant, suggesting the presence of

other influencing factors. The positive coefficients imply that an increase in income and experience leads to higher adoption of sustainable practices. The model highlights the importance of financial and experiential factors. Thus, improving income opportunities and providing training can enhance sustainability.

Table 9: Model Summary

R	R^2	Adjusted R^2
0.68	0.46	0.44

Sources: Computed Data

The model summary shows that the correlation coefficient (R = 0.68) indicates a strong positive relationship between the dependent and independent variables. The R^2 value of 0.46 suggests that 46% of the variation in sustainability practices is explained by income and experience. The adjusted R^2 value (0.44) confirms the reliability of the model after adjusting for the number of variables. This indicates a moderate level of explanatory power. However, 54% of the variation remains unexplained, suggesting the influence of other factors. These may include training, access to credit, or institutional support. Overall, the model is statistically significant and useful for analysis. Further research can include additional variables for better explanation.

FINDINGS

- The study found that the majority of respondents (33.3%) belong to the age group of 40–50 years, indicating that middle-aged farmers dominate dairy farming activities.
- Male respondents (64%) are higher than female respondents (36%), showing that dairy farming is predominantly managed by men.
- Most of the respondents possess secondary (29.3%) and graduate-level education (26.7%), reflecting a moderate level of educational background among emerging farmers.
- A significant proportion of farmers (40%) have 5–10 years of experience, confirming that the respondents fall under the category of emerging farmers.
- The majority of farmers (42.7%) maintain a small herd size of up to 5 animals, indicating that dairy farming is largely carried out on a small scale.
- Income analysis reveals that 40% of respondents earn between ₹20,000–₹40,000 per month, showing moderate income levels from dairy farming.
- Among sustainability practices, animal health care (Mean = 4.20) is the most adopted practice, while the use of modern technology (Mean = 3.40) is the least adopted.
- The cost and return analysis indicates that dairy farming is moderately profitable, with an average net profit of ₹45,000.
- High feed cost (Mean = 4.50) is identified as the most significant challenge faced by dairy farmers, followed by lack of credit and price fluctuation.
- The T-test results show that there is no significant difference between male and female farmers in terms of sustainability practices ($p > 0.05$).
- The ANOVA results indicate a significant difference in sustainability practices among different age groups ($p < 0.05$), implying that age influences adoption levels.
- Correlation analysis reveals a moderate positive relationship between income, experience, and sustainability practices, indicating that higher income and experience lead to better adoption.
- Regression analysis shows that income and experience have a significant positive impact on sustainability practices.
- The model summary indicates that 46% of the variation in sustainability practices is explained by the selected independent variables, suggesting moderate explanatory power.

SUGGESTIONS

- Government should provide subsidies and promote fodder cultivation to reduce the high cost of feed faced by dairy farmers.
- Easy and timely access to institutional credit with low interest rates should be ensured to support emerging farmers in their dairy activities.
- Regular training and awareness programmes should be organized to improve farmers' knowledge on

sustainable and modern dairy farming practices.

- ❖ Veterinary and extension services should be strengthened to ensure better animal health care and productivity.
- ❖ Adoption of modern technologies should be encouraged through financial assistance and technical support to improve efficiency and sustainability in dairy farming.

CONCLUSION

The present study examined the sustainability and challenges in dairy farming among emerging farmers in Thiruvananthapuram District. The findings reveal that dairy farming is predominantly carried out by middle-aged farmers with moderate levels of education and experience. Most of the respondents operate on a small scale, maintaining a limited number of livestock, which reflects the emerging nature of their enterprises. The study highlights that dairy farming provides a stable source of income, though the level of profitability remains moderate due to rising input costs. The analysis of sustainability practices shows that farmers give importance to animal health care, while the adoption of modern technology remains relatively low. This indicates a gap between traditional practices and modern sustainable approaches. The study also identifies several challenges such as high feed cost, lack of credit facilities, price fluctuations, and inadequate support services, which hinder the growth and sustainability of dairy farming.

Statistical analysis confirms that factors like income and experience have a significant influence on the adoption of sustainability practices. At the same time, age differences also affect the level of adoption, while gender does not show any significant impact. These findings suggest that economic strength and practical exposure play a key role in improving sustainable farming practices. The study concludes that although dairy farming has good potential for livelihood generation, there is a need for better institutional support, financial assistance, and technical guidance. Strengthening these areas will help emerging farmers overcome challenges and improve sustainability. With appropriate policy measures and farmer support systems, dairy farming can become a more profitable, resilient, and sustainable sector in the study area.

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