

Dairy Farming In India: A Theoretical Review

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Abstract

Indian dairy farming sector is among the high priority sectors that provide active linkage between agriculture and industry. According to economic survey 2022-23, the livestock sector grew at a CAGR of 7.9 percent during 2014-15 to 2020-21 and its contribution to total agricultural GVA has increased from 24.3 percent in 2014-15 to 30.1 percent in 2020-21. Recognizing the importance of dairy sector in India this study has been done to review the works of other scholars on dairy farming in India. The success in dairy farming improved the socio-economic status and the position of farm women in their home and village. The modern milk supply chain seems to have an inclusive structure and the scalability of the modern milk supply chain depend on the development of milk collection and transportation facilities. The association with modern milk supply chain enhanced the prospects of higher compliance with food safety measures. With various positive aspects dairy farming too had various problems including inadequate infrastructure, lack of quality control, inefficient supply chain, absence of adequate policies and untrained manpower.

Keywords Dairy farming, Supply chain, Marketing Chain, Food Safety Measures, Entrepreneurial behavior, Efficiency.

Introduction

India is primarily an agricultural economy with more than 47 percent of its population living in villages depend on agriculture, animal husbandry and allied activities for their livelihood. Though there are various livestock enterprise, dairy farming is the most ancient occupation in India and rural people are practicing it from long time. Generating employment opportunities and helping the small and marginal farmers and laborers in India, dairying practices play a crucial role besides providing food security. Products from milk such as curd, ghee, paneer, sweets and other byproducts are valuable and important nutrient for daily life. Through proper dairying practices dairy farmers could be benefited and economy will get sustainability (Tamang et al., 2023)

Dairying plays an important role in strengthening rural economy of India. It is perceived to be an effective instrument for bringing socio-economic transformation. Dairying contributes more than one-fifth to the agricultural value of output and provides employment to about 21 million people, the majority of whom are resource poor. In India dairying has come a long way, from being written off as a basket case to the largest milk producer in the world. Milk production has increased tremendously despite the fact that 70 percent of its producers are small landholders and landless households (Kumar et al., 2013). The livestock sector helps ease inequality and poverty in the country's rural areas and creates jobs for farmers. Dairy is an important sub-sector in India's rural economy within the livestock sector (Parida et al., 2022).

The Indian dairy farming system is witnessing a gradual transformation from traditional production to commercial production during the last decade. Creating employment opportunities to convert small and medium scale dairy farming into commercial farming ventures is another dimension. The ever increasing demand for milk cannot be ignored due to growth of three key drivers, population, urbanization and per capita income. Indian dairying has a massive and mounting domestic market in which milk consumption is constantly rising in concord with the increase in purchasing power of people, increasing urbanization, changing food habits and lifestyle, and demographic growth (Gayathri et al., 2023)

Objective of study

The following are the objectives of the study:

1. The main objective of the paper is to study the works and views of other scholars on dairy farming in India.
2. To study the aspects of supply chain and marketing chain of dairy farming in India.
3. To study the aspects of food safety measures of dairy farming in India.
4. To study the aspects of entrepreneurial behavior and sources of information utilized by dairy farmers in India.
5. To study the aspects of efficiency in dairy industry in India.

Review of Literature

Many research studies related to the overview of dairy farming in India have been reviewed. The contribution of dairy sector in respect of women empowerment, supply chain and marketing chain, food safety measures in dairy sector, entrepreneurial behavior and sources of information utilized by dairy farmers and efficiency in dairy sector along with its growth aspects and relevance has been analyzed.

Methodology

The paper is based on secondary work. This information is taken from different journals, google scholar and annual reports of various departments and ministries of government of India.

Analysis

A. Supply Chain and Marketing Chain

The set of findings related with dairy farming include supply chain and marketing chain aspects. Kumar et al., (2011) studied the smallholder dairy farmer's access to modern milk marketing chain in India. The data for the study was collected from two states Bihar and Punjab. The total sample size was 450 comprising 225 dairy farmers from each state. The study used logit model for the analysis. The study revealed that education, milk price, milk test and presence of cooperative milk collection centers in villages have a significant positive influence on farmers' decision to integrate with modern formal milk marketing supply chain whereas household size implying greater labour availability has negative influence on farmers decision to integrate with formal markets. The study concluded that the modern milk supply chain seems to have an inclusive structure and the scalability of the modern milk supply chain will depend on the development of milk collection and transportation facilities. Brar et al., (2018) explored the factors influencing choice of milk marketing channel among small and medium dairy farmers in Punjab. The study used a binomial logistic regression model for the analysis. The study categorized marketing channels into organized and unorganized and revealed that age of household and distance to selling point has negatively influenced the producers' likelihood towards the organized sector. Other factors influencing were total milch animal holding, price of milk sold and availability of advances. The study suggested strengthening of collection of milk, promotion of liberal loans and remunerative prices for growth and expansion of dairy business in Punjab.

In one of the studies Mor et al., (2018) explored the supply chain practices in dairy industry. The study did this with the help of a structured literature review. The study revealed that food safety, product quality and associated economic benefits in dairy industry can be achieved through technological innovation, eradication of uncertainties and introducing the global supply chain management practices into lean and green initiatives. Kumar, (2022) tried to evaluate the effect of information and communication technology (ICT) on supply chain performance in the dairy industry. The study revealed that the supply chain performance parameters such as transportation cost, order fulfillment cycle time, on time delivery, frequency of stock out, backorder rate, cash to cash cycle, return on assets to firm, procurement cost, production cost were significantly impacted by adopted ICT tools and techniques. The study concluded that ICT tools and techniques play a crucial role in enhancing the performance of the dairy companies in the form of an increase in performance matrix indicators. The study suggested the dairy firms to shift their business from the traditional approach to ICT enabled supply chain system as it enables the dairy firms to support with the various business functions along with focusing on new business tactics.

Narayanan et al., (2023) empirically investigated the production-consumption relationships among households that participate in organized markets versus those that do not. The study used the data from International Crops Research Institute for the Semi Arid Tropics (ICRISAT) and regression model for the analysis. The study revealed that milk consumption is correlated with production and a large presence of formal milk buyers in a village was associated with lower milk consumption in dairy household. The presence of formal value chains were found uncorrelated with the milk consumption of households that do not own dairy animals. The study suggested that policymakers should focus on market development and market segmentation based on marketing channels while designing interventions. In another recent investigation Chaturvedi and Singh (2024) examined sustainable milk supply chain practices in the Indian dairy industry. The study used Logistic Multiple regression analysis to test statistical hypothesis and

revealed that adopting sustainable supply chain management practices and technological adoption in the dairy business improves the overall performance and productivity of milk supply chain.

B. Food Safety Measures

Ruegg, (2003) explored the practical interventions that can enhance the safety of dairy products and dairy farm environment. The study reviewed other works and revealed that safety of dairy products can be enhanced by minimizing the sources of microbial contamination of milk by adopting adequate hygienic standards. The other management practices recommended by the study for safety measures are diagnosis of salmonellosis or listeriosis on farm, coliform counts as an indicator of fecal contamination, reduction in national regulatory limit for somatic cells in bulk tank etc. In an another study Kumar et al., (2011) tried to examine the status of compliance with food safety measures in the Indian dairy sector at farm level and cost implications of compliance with food safety measures in Bihar, Punjab and Uttar Pradesh. The study revealed that the adoption intensity of food safety practices varied from 0.42 in Bihar to 0.57 in Punjab, this implied that farmers were adopting only 42 to 57 percent of the food safety measures at farm level. The additional per liter cost of compliance with food safety measures was 0.70 Indian Rupees (INR) in Bihar, INR 0.44 in Uttar Pradesh and INR 0.39 in Punjab. The logit model analysis reveals that education level of farm household head and herd size had a significant influence on adoption of food safety practices.

Kumar et al., (2020) examined the impact of the adoption of food safety measures (FSM) on milk yield and profitability of the smallholder dairy farms in Patna, Bihar. The study used two-stage residual inclusion method for the analysis. The study revealed that on an average dairy farmer adopted only 29 percent of the recommended FSM. The herd size, experience in dairy farming, caste of farmers and share of milk consumed at home were found to influence adoption of FSM positively. The econometric analysis showed a positive relationship between FSM and milk yield and profitability, the adoption of an additional FSM increased milk yield by 1 percent and profits by 2.3 percent. In another investigation Singh et al., (2020) investigated the knowledge and practices of dairy farmers at farm level regarding milk quality and safety in five villages of five different agro climatic zones of Punjab. The study revealed that 64 percent farmers had low knowledge scores in respect of milker's hygiene, animal hygiene, environmental hygiene, milk handling and chemical residue in milk. The milk handling was ranked first in affecting milk quality and safety followed by animal hygiene, personal hygiene, environmental hygiene and other residues in milk. The study suggested that extensive awareness program on milk safety and quality should be undertaken for dairy farmers. Another study Arshad et al., (2023) examined the link between the willingness of smallholder dairy farmers to adopt minimum food safety standards and country's ability to export agri-food products. The data was analyzed using Structural Equation Modeling (SEM) and Confirmatory Factor Analysis (CFA). The study found significant mediation of supply chain learning and value addition between compliance with minimum food safety standards and country's export potential.

In a recent study Nyokabi et al., (2024) empirically investigated the adoption of Food Safety Measures (FSM) in small holder dairy systems. The study used the cross sectional survey including 159 farming households and 18 participant observations from participating farms. The study considered 36 different FSM and constructed a weighted food safety index ranging from 0 to 100. The study revealed that overall food safety index ranged between 59.97 - 60.75 and majority of dairy farmers were categorized as moderate adopters of FSM 9 (Index ranging between 30 – 70 percent). The study suggested that there is need to enable farmers to access financing and technology that can lead to increased adoption of FSM.

C. Entrepreneurial behavior and sources of information utilized by Dairy Farmers

Some of the authors throw light on the aspects of entrepreneurial behavior and information sources utilized by dairy farmers. In a study of Tamil Nadu Lawrence and Ganguli, (2012) revealed that most of the dairy farmers (55 percent) had medium entrepreneurial behavior. The majority of small and medium dairy farmers had medium entrepreneurial behavior. The majority of large dairy farmers had high entrepreneurial behavior; this was due to resource richness and high risk taking ability of large farmers. The regression analysis revealed significant relationship between entrepreneurial behavior and variables like education, landholding, housing, material possession, economic status, social participation, training on dairy farming, knowledge about AI and extension services. On the other hand Singh et al., (2016) undertook a study titled "information needs and seeking behavior of dairy farmers in Punjab" to ascertain these needs of dairy farmers of state Punjab in India. The study revealed that 23.52 percent dairy farmers had attended training programmes organized by universities, dairy development board, cooperatives; animal husbandry department etc at some point of time, the remaining 76.48 percent respondents had not participated in any such training program. The 70.58 percent of dairy farmers needed information about different subsidy

schemes of the government, followed by 70 percent on feed and fodder and 64.70 percent on animal breeding. About 89.21 percent dairy farmers fulfilled their information needs from Pashu Palan Mela and animal welfare camps and 85.29 percent received the needed information from television and newspapers. Rakesh et al., (2016) explored the entrepreneurial behavior of dairy farmers in Hisar and Jind district of Haryana. The study revealed that majority of dairy farmers possessed medium level of entrepreneurial behavior. Only age of dairy farmer was negatively correlated with entrepreneurial behavior and all other variables such as education, annual income, dairy farming experience, market orientation etc had positive and significant relation with entrepreneurial behavior. The variables fitted in the regression analysis explained 95.42 percent of variations towards entrepreneurial behavior of dairy farmers.

In another study of rural Punjab Singh et al., (2022) used a three point continuum Total Rank Order Score (TROS) and revealed that among all the information sources, ICT was having maximum utilization with Mean Rank Score (MRS) of 5.31 and Mean Score (MS) of 1.063 followed by mass media sources with MRS of 6.41 and MS of 0.802, followed by personal cosmopolite channel with MRS of 7.61 and MS 0.755 and the least used were personal localite sources with MRS of 1.28 and MS 0.517. The regression analysis revealed that the estimates of education, information source utilization and knowledge level had a significant effect on ICT utilization. The Mann-Whitney U Test revealed that large farmers had significantly higher information source utilization as compared to small farmers. Deepanka et al., (2023) examined the level of entrepreneurial behavior of women and their social participation among different organizations of dairy farming at Mathura district of Uttar Pradesh. The study revealed that 62.50 percent respondents had no social participation, 25.83 percent had participation in one organization and 11.67 percent had participation in more than one organization. Another study in Telangana by Karthik et al., (2023) revealed that education, dairy farming experience, social participation, land holding, livestock possession, milk production, milk sale, annual income, marketing behavior, information seeking behavior, knowledge on improved dairy farming practices had positive and significant relationship with entrepreneurial behavior of young in dairying, whereas gender and family size had negative and significant relationship. The independent variables covered in the study explained 78 percent of variations in entrepreneurial behavior.

In another recent study about entrepreneurial behavior among Farmer Producer Organization (FPO) members in Kerala Jose et al., (2023) revealed that there was positive and significant relationship between education, annual income, training, scientific orientation, group cohesion and creativity with entrepreneurial behavior. The variables such as age and credit orientation exhibited non-significant correlation coefficients and thus indicated no significant relationship with entrepreneurial behavior.

D. Efficiency in Dairy Farming

A fair amount of scholars and authors investigated the efficiency of dairy industry. In one of the studies Ohlan, (2013) investigated the Total Factor Productivity (TFP) growth and efficiency levels in the Indian dairy processing industry. The study used Tornqvist index and Data Envelopment Analysis (DEA) for the study. The study revealed that TFP of the Indian dairy processing industry had grown significantly. The average technical efficiency level was revealed as 72 percent implying 28 percent of inefficiency. The decomposition of TFP growth indicated that growth was driven more by technical efficiency changes than that of scale efficiencies. Anand & Aggarwal, (2019) tried to compare the efficiency of Indian dairy industry by using different efficiency ratios of Amul, Kwality and Mother Dairy for the period 2011-18. The study revealed that for capital turnover ratio the p value was 0.442 which was more than 0.05 resulting in acceptance of null hypothesis at 5% level of significance, revealing no significant difference between working capital turnover ratios in Indian dairy industry. For fixed asset turnover ratio the p value was 0.081 which was more than 0.05 resulting in acceptance of null hypothesis at 5% level of significance, revealing no significant difference between fixed asset turnover ratios in Indian dairy industry. For total asset turnover ratio and inventory turnover ratio the p value was 0.000 which was less than 0.05 resulting in rejection of null hypothesis, revealing significant differences between total asset turnover ratios and inventory turnover ratio in Indian dairy industry. George et al., (2022) tried to examine the resource use efficiency in milk production among different types of dairy farms in Kerala. The study revealed that coefficient of concentrate, total roughage and adoption index were positive and statistically significant ($P < 0.01$) in small farms with R^2 as 63 percent, indicating the importance of these inputs in increasing milk production. The labour cost was positive and significant ($P < 0.05$) in small farms. At medium farms the coefficient of concentrate was highly significant and roughage was significant at 5% level. At large farms also the coefficient of concentrate was highly significant. The overall results showed positive and highly significant effects of concentrate and adoption index and significant effect of total roughage ($P < 0.05$) with an R^2 value of 67 percent.

Some set of the authors investigated the technical efficiency of dairy farmers. Nagrale et al., (2023) examined the technical efficiency and determinants of technical inefficiency of dairy farmers in Maharashtra. The study reveal that mean technical efficiency of dairy farmers was 80.17 percent. Only 28.6 percent of milk producers were found highly efficient realizing 90 percent of technical efficiency. The feed cost and capital cost was found positively significant to milk production whereas labor cost was negatively significant. The determinants of technical inefficiency estimates revealed that the education, marketed surplus and distance from milk sale place had negative association with technical inefficiency. Yadaveni et al., (2023) investigated the levels of production efficiencies and its determinants across private and cooperative structures in Andhra Pradesh. The study revealed a marginal but significant efficiency advantage to the cooperative plants over private plants. The mean technical efficiency of all the firms was 0.69, that of the cooperatives at 0.72 and private dairies at 0.66. The cooperative ownership of the plant and greater women employment rate was found to enhance production efficiency.

Conclusion

The above discussed literature reviews clearly indicate that dairy farming sector is quite significant in Indian economy. The livestock sector grew at a CAGR of 7.9 percent during 2014-15 to 2020-21 and dairy sector being its important sub sector has vast growth potential. Dairy sector has various forward and backward linkages with agriculture sector and its characteristics such as abundant livestock, suitable agro climate conditions, and growing consumer demand for its products has contributed to the growth of dairy sector in India. The dairy sector is likely to accelerate agricultural growth through diversification and thus has created various sources of income and employment for the people employed in dairy farming. Dairy sector boosts the manufacturing sector by providing cheap material used in the manufacturing process. With several advantages of the dairy sector various constraints were found in the literature relevant to the dairy sector including inadequate infrastructure, lack of quality control, inefficient supply chain, absence of adequate policies and untrained manpower. Despite of this, the dairy sector has awesome potentials for development in the coming decades and requires proper policy initiatives and their proper implementation by the government to boost the rural Indian economy.

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