Chapter - I I

Review of Literature
CHAPTER - II

REVIEW OF LITERATURE

This chapter records the findings of the research studies conducted previously on the dairy production and marketing in various parts of India and other countries.

2.1. REVIEW OF LITERATURE RELATED TO CHARACTERISTICS OF THE MILK PRODUCERS

Dhanabal. M. (2009)\(^1\) opined that dairy has an important role in improving the overall economic conditions of rural India. To maintain the ecological balance, there is need for sustainable and balanced development of agriculture and allied sectors. From our first plan onwards, planners have given priority to allied sector for the economic development of the rural sector. Dairy farming is described as a small industry which provides gainful employment opportunities. It comprises of about six per cent of the national income.

Mandeep Singh and Joshi. A.S. (2008)\(^2\) reported the economic analysis of dairy farming has been reported for marginal and small farmers in Punjab for the year 2003-04. It has been found that a majority of the farm households are not able to meet their requirements from their income from crops. Further dairy farming has emerged as a major allied enterprise for supplementing the income of marginal and small farmers in Punjab. Income from off-farm sources has been identified another important factor contributing significantly to the disposable income of these farm households. The study has suggested to further exploit the potential of off-farm sources towards meeting the domestic expenditure. Also, the technical efficiency of crops and dairy farming should be improved to provide more income to farmers.

Islam. S., Goswami. A. and Mazumdar. D. (2008)\(^3\) have analysed Tehatta-II block of Nadia district in West Bengal. There were 17 blocks in the Nadia district of

---


which Tehatta-II block was selected purposely. The block consisted of 7 gram panchayats and 2 gram panchayats namely Palsunda-I and Barnia were selected randomly. Fifty dairy farmers were selected from each gram panchayats based on judgement sampling. The study area was more or less homogenous with respect to animal husbandry practices, socio-cultural conditions, facilities for service and critical inputs. Most of the dairy farmers in study areas were unorganized in milk production. Relevant information from the individual milk producers (dairy farmers) has been collected through personal interrogation method with the help of a structured interview schedule prepared for the study. The study revealed that crossbred cows were more economical and gave higher yield than the indigenous cows and inclusion of a few crossbred cows can increase the income of a dairy entrepreneur and provide gainful and round the year employment. Family labour work was carried out in the mill pocket areas of eight districts of Marathwada region. About 59 percent of the dairy farmers belong to general (unreserved) category, 25 percent were backward class and only 8 percent each of SC and ST. The landless dairymen equally contributed with dairymen having (large) land; 13 landless dairymen reported comparable lactation yield as the number of milch animals increased, the herd lactation performance decreased. The animals maintained by joint family were not properly cared for while they were cared for properly by singly family.

**Sintayehu Yigrem, et al. (2008)** studied about two hundred forty dairy producers. Both rural and urban producers in the four major towns representing the Shashemene–Dilla area in southern Ethiopia, were selected using a multi-stage sampling techniques, with the objective of characterizing dairy production, processing/handling, marketing systems as well as to prioritize constraints and opportunities for dairy development in the area. To characterize dairy marketing systems in the study area, a Rapid Market Appraisal (RMA) technique was employed. Dairy marketing systems were studied with the help of topical guidelines. Dairy producers were interviewed using a pre-tested and structured formal questionnaire. Two major dairy production systems, namely the urban and mixed crop–livestock

---

systems were identified, and again classified into two categories based on the major crops grown as a cereal crop producing and earnest-coffee producing areas. The average family size of urban and rural dairy producers was 7.19 ± 0.26 and 7.58 ± 0.23 persons, respectively. Dairy contributed about half of the income of urban producers but it made up only 1.6% of the total income of families in the mixed crop-livestock production system. Average farm size of households in the mixed system was 1.14 ± 0.99 ha, while more than 97% of the urban producers use their own residence compound for dairying, which is only 200–400 square meters. Average herd size per household in the cereal based mixed system (3.8 ± 0.42) was higher than in the earnest-coffee based systems (2.3 ± 0.36). Out of the total herds of urban producers, 32% of cattle were local cows while 19% were crossbred. Husbandry practices like feeding, watering, housing, breeding, milking, calf rearing, waste management, and record keeping were also different between the two production systems. An estimated total of 9,645,020 litres of milk was produced annually from 4463 small and medium farms in the four towns. The majority of producers (61.7%) in the mixed crop–livestock system process produced milk for home, while the majority of urban producers (79.2%) produced milk for sale.

Radha Krishnan, Nigam:S, and Shantanu Kumar (2008)\(^5\) in their opinion growing human population, rising per capita income and increasing urbanization are fuelling rapid growth in the demand for food and animal origin in developing countries. India possesses the largest livestock population in the world. Contrary to the large population of livestock in India productivity of Indian livestock is low compared to many developing countries.

Waghmare P.R. and Hedgire D.N. (2007)\(^6\) opined that Milk productions in India during 1950-51 was 17 million tonnes which has reached 78 million tonnes in 1997-98. Presently India ranks first in the world in milk production. The Operation Flood Programme was instrumental in dairy development activities. These programmes are useful in upgrading the standard of living of farmers.


Hasan Cicek, et al. (2007) examined to determine the technical and socio-economic factors that may affect the cost in dairy enterprises. In this context, the annual production records (2005-2006) if 77 dairy enterprises running in Western Turkey were examined. Data were analyzed by using multiple regression models. Results showed that the parameters such as education of the producers, scale of the enterprise, feed consumption, feed procuring and litter size had significant effect (P < 0.05) on the average milk costs. On the other hand, marketing, main occupation and age of the producer were found to be statistically insignificant (P > 0.05). In conclusion controlling the technical and socio-economic factors were found to have important effect on decreasing the cost of the production as well as increasing the profitability of the enterprise.

Karmakar K.G. and Banerjee G.D. (2006) pointed out that growth in milk production is likely to continue at the present rate of 4.4% in the near future. Who is going to handle this incremental milk? We must bear in mind both income and price. We must bear in mind both income & price elasticity account for approximately 15% of the total expenditure of food. Demand for milk, at current rate of income growth is estimated to grow at 7% per annum. Interestingly, demand for milk is expected to grow steadily over the next two decades as the low income rural and urban families who have higher expenditure elasticity would also increase their income due to new economic environment.


---

and on cross section of beneficiaries. It provided an assured market to milk producers, released them from the clutches of unscrupulous middle men by offering them a fair and transparent deal. The project, thus, created a favorable environment for higher production of milk. During two year period the milk production increased by 81 percent with the average daily production per pourer increasing from 2.6 litres to 4.7 litres. However, the impact was differential on different categories of farmers with big farmers gaining up to the maximum.

The project also introduced several technological changes such as artificial insemination, fodder cultivation, urea treated straw, improved health care and dairy management in the dairy sector, the adoption of which is likely to pick up in coming days. Similarly, the project contributed to the capacity building of members in terms of awareness generation, gain in knowledge, skill development through orientation and training albeit to a varying degree. The project has created a motivating and enabling environment for the members to move ahead and for women leadership to grow.

Ramakrishnappa. V. and Jagannatha Rao. R. (2006)\textsuperscript{10} opined that the dairy enterprise is an established sector in rural India and is playing a vital role in generating additional income and employment. In Karnataka, dairy development is a positive and significant as state contributes towards milk production, marketing, and processing of various dairy products in India. The microfinance programmes extended in dairy sector are helpful to take up dairy as main occupation among economically backward communities in the state. In this paper, an attempt was made to analyze the different aspects of microfinance scheme (New Swarnima) implemented by KBCDC. The implementation of New Swarnima Scheme, one of the most popular microfinance schemes in the state to promote dairy among backward communities, was assessed at micro level by selecting 18 beneficiaries belonging to landless labourers, marginal and small farmers in Kolar district in Karnataka state. The study found that the microfinance scheme has positive impact on income and employment generation, and has improved the natural resource management options.

Jacques Somda, Mulumba Kamuanga and Eric Tollens (2005) suggested that the domestic milk production has been for a long time hindered by many factors including lack of interest from decision makers, distorted economic policy and biotechnical constraints. For the last 20 years, many developing countries have been attempting to develop the domestic milk production sector. However, research on the basic realities and the viability status of enterprises within this sector remain largely unproved in many developing countries. This study focuses on the characteristic of smallholder milk producers in Gambia. Data were collected from 90 smallholder farm households to characterise milk producers and evaluate the profitability and viability status of this activity. Based on current typology of farms and gross margin analyses at farm level, the study identified two resource-based types of smallholder farms. The current milk production system is surely viable. Constraints to increased productivity include lack of improved technology at farm level and weak institutional support. Despite the low viability status, it is shown that milk production generates reliable incomes, which could be a departure for most farmers to intensify farming systems, particularly in areas where no loan schemes exist for purchasing agricultural inputs.

Isabelle Schluep Campo and John Beghin (2005) explored and investigate Japanese dairy markets. We first provide an overview of consumer demand and how it evolved after World War II. Using historical data and econometric estimates of Japanese dairy demand, we identify economic, cultural, and demographic forces that have been shaping consumption patterns. Then we summarize the characteristics of Japanese milk production and dairy processing and policies affecting them. We next describe the import regime and trade flows in dairy products.

The analysis of the regulatory system of the dairy sector shows how its incentive structure affects the long-term prospects of various segments of the industry. The paper concludes with policy recommendations of how to reform the Japanese dairy sector.

---


Jeyachandra Reddy M., Reddy Y.V.R. and Ramakrishna Y.S. (2004) studied and analysed the economics of milk production in three areas, viz., Chittoor district in Andhra Pradesh, Erode District in Tamil Nadu and Kolar district in Karnataka involving aspects related to existing cost structure of milk production, profitability of crossbred dairy cows in the three states under the changed socio economic political scenario and also suggest methods to improve the viability and profitability of these enterprises. The data were collected by survey method during the year 2003. Seventy five farmers were selected at each location giving due importance in the selection of all categories of households. The number of dairy cows studied were 108 in Chittoor, 178 in Erode and 84 in Kolar districts. The net cost of maintenance of a cross bred cow per day worked out to Rs.38.99, Rs.49.36 and Rs.48.88 in Andhra Pradesh, Tamil Nadu and Karnataka respectively. The cost per litre of milk worked out to Rs.5.48, Rs.7.20 and Rs.5.84 in the same order. Feed cost was the major component in gross cost which accounted for 63.88 per cent in Andhra Pradesh. 72.14 per cent in Tamil Nadu and 71.62 per cent in Karnataka. The net profitability varied from 43 per cent in Tamil Nadu. 70 per cent in Andhra Pradesh and 83 per cent in Karnataka. The variations among the three studied locations are due to variation in breed, feeding pattern, maintenance of animals, etc. The study has further brought out the fact that higher fat content provides higher price as milk is priced based on fat and solid-Net-Fat (SNF) content by dairies. Hence proper scientific breeding procedure is to be followed to improve fat content in the milk as well as milk production per animal.

Besides, scientific breeding, feeding, treatment and veterinary care and management would not only increase milk production and fat content in addition to reduction in cost, but also incomes of farmers. Thus dairy farming is considered an instrument for socio economic change in rural areas.

---

Rakesh Saxena (2002)\(^{14}\) in his view, Milk production in India is characterized by a large number of milch animals, a large number of milk producers, mixed farming and low productivity of milk per animal. Most of the total milk production in the country comes from indigenous cows (27%), crossbred cows (15%) and buffaloes (54%). Goats and other animals contribute only a minor share (4%) to the total milk production. The population of crossbred cows and buffaloes is kept largely for milk production while the population of indigenous cows is maintained for producing both milk and drought animals. About 58 per cent of the total population of cattle and buffaloes in India in this study uses the LCA approach to estimate the environmental impact of milk production in terms of methane emissions. The study focuses only on bovine milk production as it accounts for about 96 per cent of the total milk production in India. The methane emissions in the study are estimated at the level of indigenous cows, crossbred cows and buffaloes instead of the usual two categories of cows and buffaloes. The analysis of methane emissions in terms of per kg of milk production has been extended to methane emissions per rupee worth of milk production, as the prices of cow and buffalo milk are very different due to the different fat content. The environmental impact has been assessed in two steps: (1) inventory analysis and (2) impact assessment. Under the first step, an inventory has been taken of raw materials and associated emissions. The impact of these raw materials and emissions has been assessed under the second step. The raw materials used by cattle and buffaloes are divided into two categories, namely (1) concentrates and (2) roughages. The roughages are sub-divided further into green fodder and dry fodder. The emissions of methane associated with bovine milk production take place mainly at three stages, namely (1) enteric fermentation, (2) manure management, and (3) use of dung as domestic fuel. The study has used IPCC guidelines and is based largely on the secondary data available from various sources.

Triveni Dutt (2001)\(^{15}\) opined that the Cattle and buffalo production is an integral form of rural economy and contributes substantially to the family income. Milk provides 63% of animal protein and almost 100% of animal fat in the daily diet.


of an average Indian. Milk contributed 66.8% of the total value of output from livestock (1998-99). In addition to milk and milk products for human consumption, cattle and buffaloes also provide animal power for agricultural operations and rural transport needs. The draught animal power, which is valued at Rs.4000-95000 million is not included in the total value of output from livestock. The 75 million draught animals (mostly cattle and buffaloes) contribute 20% of energy input into crop farming. Although there has been large reduction in contribution of draught (DAP) from 72% in 1961 to 23% in 1991 mainly due to mechanization, the requirement of DAP shall continue to be around 20% in years to come. Milk production in 1998-99 was estimated to be 74.7 million tonnes, which is less than 10% of world production. Around 54% of this total milk comes from buffaloes, 42% from cows and 4% from goats. Large increase in milk production has been due to increase in numbers and change in composition of cattle population mainly due to increase in number of crossbreds.

Hegde, H.G. (2001)\textsuperscript{16} pointed out that there is very little breathing time for Indian farmers to face the challenge of importing milk and milk products under WTO. Our farmers are not prepared to solve them well on time. It is necessary to reduce the cost of milk production by increasing the productivity of our animals. We also need to reduce the cost of handling of milk and processing by reducing intermediary agencies and by adding value to the produce. The quality of the milk should be of international standard which can be improved through screening of the livestock against important diseases and maintaining clean surroundings in the dairy farm. Finally, the policy of producing low fat milk for general consumption while the high fat buffalo milk can be supplied to a selected category of customers interested in high butter fat. We need to discuss with the farmers and understand their problems and solve them at the earliest. Surely, we also need to strengthen our farmers associations to acquire new technologies understand the milk marketing scenario at the international level and find suitable solutions. We hope the task is within our reach for solving.

Rawal and Vikas (2001)\textsuperscript{17} analysed that the comparison of caste, education and land holding of MS farmers with NMS farmers points to a larger proportion of households belonging to the backward caste, being less educated and holding lower size of land are not able to participate in dairying. A recent study of two dairy co-operatives in Gujarat argued that inequality in land ownership, caste, illiteracy and undemocratic functioning of co-operatives are the barriers to entry. Illiteracy might not be a factor in Kerala but land ownership could be one, as among the lower size-class of land owners smaller proportion seem to be keeping cattle.

Gautam Kakaty and Moromi Gogoi (2001)\textsuperscript{18} animal husbandary plays a pivotal role in the agrarian economy of India. It is closely interlinked with the socio-economic matrix of rural society. The development of livestock sector has been receiving significant priority in India in the last two to three decades. Dairy sector contributes significantly in generating employment opportunities and supplementing the income of small and marginal farmers providing by them food security.

Narayana (2001)\textsuperscript{19} opined that the work status of the adult population has no significant difference between MS farmers and NMS farmers could be observed. Women, however, devoted considerable amount of time for dairying, irrespective of whether they reported as working or not working and giving the reason as housewife. Obviously, the categories of work status and employment often used are not very useful in capturing the work input of women in dairying. Time disposal studies do help to bring this aspect of work and show that women’s role in cattle keeping is great. The initiatives undertaken such as Malabar Rural Development Foundation for improving the quality of dairy farmers are welcome as they go beyond the landless as their participation in dairying is low. This needs to be kept in mind while planning welfare interventions.


Manob Kanti Bandyopadhyay (1996)\textsuperscript{20} pointed out that maximum people of thickly populated India live in villages. Majority of them are involved in agriculture in India as the old method of cultivation is still vogue here. Rearing of cattle animal is also an additional source of income of the villagers in our country. We get from our ancient history that the domestication of the cow and the buffalo dates back to nearly 4000 years. Scriptures of India refer to the wealth through the world Godhan’. Maximum properties of cows and buffaloes of the world are seen in India. This amount is too inadequate to meet the country’s demand. The supply of milk in some parts of India is higher than the local demand. On the other hand, supply of milk in the rest of the country as well as urban areas is much lower than the demand. In 1965, National Dairy Development Board (N.D.D.B) was set up with the object of meeting the increasing demand of milk specially in urban areas as well as developing the rural economy through the enhancement of the milk production in the country.

Miriam Sharma and Urmila Vanjani (1993)\textsuperscript{21} are of their opinion that following the proclaimed success of cooperative dairy schemes in other parts of India (Operation Flood based on the Amul model), the Rajasthan government is attempting a similar scheme. A key theme of the project is to bring women into the mainstream of dairy development in order to improve their economic, nutritional, and social status. For this purpose a special program was initiated to train poor rural women in 'dairy camps' on how to care for their milch animals. Successful completion of such 'camp' training then qualifies the woman for a loan to buy an animal in her name. It is hoped that a part of the milk obtained will go to the village dairy cooperative. The major aims of this program are to: remove milch animals from the cities; encourage production of more milk for the cooperative dairies; encourage modern techniques of animal care; put control of the income from milk-selling in the hands of the women who care for the animals by permitting them to own the animals and hence contribute to their 'independence' and 'development;' and to encourage self-sufficiency for the

\textsuperscript{20}Manob Kanti Bandyopadhyay (1996), “Dairy Co-operation and Rural Development (with special reference to comparative study between the Kaira District Co-operative Milk producers’ Union limited and the Himalayan Co-operative Milk producers’ Union Limited)”, 

\textsuperscript{21}Miriam Sharma and Urmila Vanjani (1993), “When more means less: Assessing the impact of dairy 'development' on the lives and health of women in rural Rajasthan (India)”, 
weaker sections by providing loans to the poor. Data for this paper were collected during fieldwork in a village in Alwar District, Rajasthan and specifically from observation and participation in the two-week dairy 'camp' there. Eighteen women were selected on poverty criteria to participate in the program. The general situation of these women is analyzed within the context of a critical discussion of the dairy movement in India, in general, and the intended effects on the lives of the village women, in particular, with special attention to the impact on their workload, nutritional intake and, ultimately, overall health. Concluding remarks are addressed to the broad issues of government development programs and why more of the same type of development strategies persist in the face of often-repeated failures.

**Uma Shankari (1989)**\(^{22}\) opined that in the given the context of a prolonged drought, in which the little income they derived from dairying went a long way in meeting their survival needs, it is no wonder that the farmers of Chittoor district in Andhra Pradesh who studied here had a positive attitude to the crossbreed programme. But while the crossbreed cow is clearly a superior milch animal to the local breed and the local breed cow is fast becoming redundant for all categories of farmers, the fact that the bullocks cannot be dispensed with drives at least a few of the farmers to maintain bullocks. The losses from the bullocks are made up by the gains from the crossbreed cows. The landless, however, tend to maintain local breed cows even if it means far lower incomes since the investments and risks involved are smaller.

**Moran, J.B. (1987)**\(^{23}\) viewed that cattle and buffalo play an important role in the agriculture of South East Asia, providing both milk and meat and also traction for ploughing and transport. The native breeds vary considerably in their characteristics, not only in their inherent qualities but in their response to varying systems of management, some very primitive. Improvement is clearly possible by cross-breeding, but it appears that this is most likely to be achieved within existing native breeds, rather than by introducing exotic ones developed to thrive under very circumstances.


Babita Bohr opined that dairy farming, one of the most important economic activities in the rural mountain areas of Uttarakhand, is closely intertwined with farming systems. Rural communities fondly relish dairy products. Dairying again is the main purpose of animal husbandry in mountain areas. Apart from ensuring nutrient supplies to the families owning dairy farms, dairying also offers promising employment opportunities and handsome economic returns. In Uttarakhand mountains, dairying is especially a promising economic activity for smallholders who constitute the majority of farming communities in the region. Smallholder dairy farming is increasingly gaining importance as a source of family income in mountain areas for quite some. However, contributions of smallholder dairy farming accrued to the community and farming system are still not well recognized. India’s emerging as the top milk producer in the world is largely due to smallholder, rather than intensive, dairy farming linked with the marketing system.

2.2. REVIEW OF LITERATURE RELATED TO THE COST AND PRODUCTIVITY IN THE MILK PRODUCTION

Saravanakumar. V. and Jain. D.K. (2009) viewed that “The two-axes pricing policy is followed normally in the dairy business centres of Tamil Nadu. Though it is scientifically rational, it ignores the input prices, technology and government policies. For sustaining the growth momentum and achieving an annual average growth of 7-8 per cent in the next five years and considering that dairying is practised as a component of mixed farming systems, it becomes imperative to take into account the interrelationship among the enterprises and general economic factors while fixing the milk price. In this study, development of a price determination model has been reported. It is based on the cost of production and takes into account price and non-price factors, viz. technology, and projected different price scenarios of milk for the coming years. The study undertaken in Tamil Nadu state, is based on primary data collected for the year 2002-03 and has used normalized restricted quadratic profit function analysis and price determination models. It has been found that to maintain constant returns to the production cost of milk, the milk price would need an upward adjustment of 9.97 per cent, whereas to provide constant net monetary income, the milk price would need an upward adjustment by 10.30 per cent for buffalo milk. Considering 2002-03 as the base year, the estimated price for milk per litre is expected to be Rs.23.64 at constant monetary income and Rs.23.15 at constant return to production cost in the year 2009-10. The results of the paper are illustrative of the utility approach in generating consistent price sets for milk in response to alternative policy interventions.

Haese M.D., et al. (2009) analysed the efficiency on dairy farms in Reunion Island, a French overseas district located in the Indian Ocean. On this island, dairy farming is promoted with financial and technical support from the European Union, with the French and local governments aiming at reducing dependency on imports of milk powder and dairy products and creating employment. A critical factor for


increasing the local milk production is the limited availability of arable land because of the small size and the volcanic nature of the island. In this paper, we study the efficiency levels of dairy production of 34 farms by using a data envelopment analysis approach. The average technical efficiency score of farms, assuming constant returns to scale, was 0.927, with 19 out of 34 farms not being efficient. The technical efficiency with variable returns to scale specification was 0.951. The efficiency with which farmers used their land (subvector efficiencies) was estimated in the second model. The average subvector efficiencies calculated with constant returns to scale and variable returns to scale models were lower than the technical efficiencies. The farmers on the efficiency frontier had a relatively higher milk production, milk production per cow, and land surface more than those who were less efficient. A policy promoting better use of the land on inefficient farms should increase the milk production-to-land ratio. Possible on-farm strategies improved feeding systems, farms having their own heifer breeding, and improved genetics.

**Mathialagan, Chandrasekaran. D.C. and Manivannan. A. (2009)** in their study conducted with the objective of training the farmers on feeding technologies for improving the SNF content of milk in milch animals and to assess its impact at the field level. About 159 women dairy farmers cum self help group members belonging to ten different villages of Namakkal district were selected for the study. A benchmark survey was conducted for all the women dairy farmers on cost effective feeding practices for dairy cattle, feeding of chopped fodder on the animals and supplementing diet with minerals. The results indicate that 46.37% of cow milk samples had less than 8.0% of SNF content. When the SNF content falls below 8.0% the payment for the milk will be calculated based on the fat content of the milk as per the price policy of milk co-operative societies. In such cases, the farmers would get a lower price of Rs.6.50/- per litre instead of Rs.8.75 / litre of milk.

**Rhone. A., Ward. R., De Vries and Elzo. M.A. (2008)** analysed and investigated determinates of how milk pricing system, farm location, farm size, and

---


month and year affected farm milk price (FMP), farm milk revenue (FMR) and loss in FMR of dairy farms in the Central region of Thailand. A total of 58,575 milk price and 813,636 milk yield records from 1034 farms were collected from November of 2004 to June of 2006. Farms were located in the districts of Muaklek, Pak Chong, Wang Muang, and Kaeng Khoi. A fixed linear model was used to analyze milk price of farms. Two pricing systems were defined as 1 = base price plus additions / deductions for milk fat percentage, solids-non-fat, and bacterial score, and 2 = same as 1 plus bulk tank somatic cell count (BTSCC). Farm size (small, medium, and large) was based on the number of cows milked per day. Results showed that FMP were lower (P < 0.05) in pricing system 1 than in pricing system 2. Most small farms had higher (P < 0.05) milk prices than medium and large farms across in both pricing systems. Large farms lost more milk revenue due to deductions from bacterial score and BTSCC than small and medium farms.

Doyon. M., Criner. G. and Bragg. L.A. (2008) viewed and opined that the New England dairy farmers are under intense price pressure resulting from important growth in milk production from lower cost of production in Southwest states as well as by retailers’ market power. Agricultural officials and legislative bodies in New England and in other Northeast US states are aware of these pressures and have been reacting with emergency dairy farm aid, following a very low 2006 milk price, and with state legislations in an attempt to address perceived excess retailing margins for fluid milk. In this paper, we suggest that a sigmoid demand relationship exists for fluid milk. This demand relationship would explain fluid milk asymmetric price transmission, high-low pricing, and the creation of a large retailing margin (chain surplus) often observed for fluid milk. It is also argued that a sigmoid demand relationship offers an opportunity for state legislators to help Northeast dairy farmers capturing a larger share of the dollar of the consumers through various policy options. Therefore, 5 milk market channel regulatory mechanisms (status quo, price gouging, supply control, fair share policy, and chain surplus return) are discussed and compared. The supply control mechanism was found the most effective at

redistributing the chain surplus, associated with the sigmoid demand relationship for fluid milk, to dairy farmers. However, this option is unlikely to be politically acceptable in the United States. Second-best options for increasing dairy farmers’ share of the consumers’ dollar are the fair price policy and the chain surplus return. The former mechanism would distribute the chain surplus between retailers, processors, and farmers, whereas the latter would distribute it between consumers, retailers, and farmers. Remaining mechanisms would either transfer the chain surplus to retailers (status quo) or to consumers (price gouging).

Kedija Hussen1, Mohammed Yousuf1 and Berhanu Gebremedhin (2008) viewed that the Ethiopia holds the largest ruminant livestock population in Africa, productivity has remained low and its contribution to the national economy is limited compared to its potential. The overall milk production system in Ethiopia could be broadly classified as pastoral and agropastoral, crop-livestock mixed and peri-urban and urban dairy production systems. Cattle, camel and goats are the main livestock species that supply milk. Total annual milk production from about 10 million milk animals is estimated at about 3.2 billion litres, which translates to 1.54 litres per cow per day (CSA, 2008). The bulk of this milk production (81.2%) comes from cattle, while small ruminants and camels contribute 12.5% and 6.3%, respectively (CSA, 2008). The lowland covers 60% of total land area and is home for 12.2% of the total human population. Ecologically it has arid (64%), semi-arid (21%) and sub-humid (15%) areas dominated by semi nomadic transhumane population whose economy is entirely dependent on livestock production (GETACHEW, 2003). Milk is the major source of food and income. Cattle dominate the population (55.4% of the TLU) followed by camels (15.3%), goats (13.7%) and sheep (6.4%), (CSA, 2008), and produce 27% of the total annual milk production (Getachew, 2003). Information is very scanty on the milk production and marketing system in the lowland areas in general. This study was therefore undertaken in the lowlands of Mieso district to (1) characterize the milk production and marketing system, (2)

---

Kedija Hussen1, Mohammed Yousuf1 and Berhanu Gebremedhin (2008), Paper on “Cow and camel milk production and marketing in agro-pastoral and mixed crop-livestock systems in Ethiopia”, Presented at the Conference on International Research on Food Security, Natural Resource Management and Rural Development held at University of Hohenheim, on October 7-9.
identify major constraints for the development of market-oriented dairy production, and (3) formulate recommendations for further development interventions.

**Saravanakumar. V. and Jain. D.K. (2008)** conducted a study ‘Technical Efficiency of Dairy Farms in Tamil Nadu’ which was carried out to evaluate dairy farm households in terms of efficiency of milk production using stochastic frontier production methods. The data for the study comprised of fixed investments on dairy farms, quantity and price of feeds and fodders fed to individual animals, labour utilization pattern, veterinary and miscellaneous expenses, quantity of milk produced and price realized etc. collected from 160 sample households across flush and lean season for the year 2002-03. The coefficients for the value of green fodder and concentrate were found to be statistically significant with a relatively higher magnitude implying their greater and significant role in crossbred cow milk production. The technical efficiency of crossbred cow farms ranged from 72.30 to 97.90 percent with an average of 82.10 percent. The study indicated that there existed a scope to increase milk production of an average farm to 16.32 percent for crossbred cows and 14.04 percent for buffaloes without incurring any extra expenditure on these farms.

**Sharad Gupta (2007)** viewed that the country’s milk production is estimated to have touched 100 million tonnes (mt) last year, which is higher than the estimated 92 mt for rice and 75 mt for wheat. In value terms, too, a kg of milk is worth more than what you and I pay for a kg of rice and wheat. But despite all this and the fact that India is today the world’s largest milk producer, the dairy industry is for some strange reason not considered ‘glamourous’. For policy makers, dairying is viewed as a ‘subsidiary’ activity. This, when milk is one product that generates cash income to farmers almost on a daily basis, unlike sugarcane or wheat. Besides being a source of liquidity and insurance against crop failure, milk is the only crop where the farmer realizes 60-70 per cent of consumer price - against 20 per cent or so in fruits and vegetables. Again, it is striking that there are no commodity futures in milk powder or ghee, whereas the daily turnover volumes in NCDEX and MCX of

---


guarseed, mentha oil, jeera or pepper run to hundreds (even thousands) of crores! One reason for this ‘image problem’ suffered by milk has to do with the absence of proper databases with authentic information on the sector. This is a gap that Dairy India 2007 (Sixth Edition) seeks to fill. A treasure trove of information, this 864-page publication offers the most comprehensive and up-to-date picture about the world’s numero uno dairying nation. An invaluable Databank-cum-Management Guide-cum-Directory, it contains over 120 in-depth articles, 260 statistical tables and charts and reference details of 7,000 organizations including dairy plants and farms, equipment and consumable manufacturers, cattle feed and veterinary pharmaceutical manufacturers, chemicals and food additives, project consultants, breeding and fodder seed farms, analytical and disease-diagnostic laboratories, cooperative institutions and government agencies. The articles cover a range of topics including trends in consumption and market size of milk and milk products, WTO challenges and export potential, management of dairy plants and farms, breeding, feeding and nutrition, health care, clean milk production, food safety and quality standards as well as techno-economic feasibility of small and large scale dairy plants and farms, cattle feed units, and manufacture of cheese, ice-cream, etc. In addition, there is a special section devoted to technology innovations and organized production of indigenous milk products such as paneer, gulabjamun, rasogolla and shrikhand - a potentially lucrative segment ignored so far by the industry in its obsession with butter, cheese and other ‘foreign’ products. Dairy India 2007 has estimated the size of India’s dairy sector in 2005 at Rs.27,340 crore (valued at consumer prices). The largest contributor to this is liquid milk (at Rs.82,835 crore), followed by ghee (Rs.22,980 crore), khoa/chhana/paneer (Rs.24,100 crore), milk powder (Rs.4,680 crore), table butter (Rs.770 crore), cheese/edible casein (Rs.975 crore) and other products such as ethnic sweets, ice-cream, etc (Rs.9,100 crore). Out of the total milk production of 94.5 mt, 77 per cent or 73.1 mt is sold as liquid milk, with the balance 23 per cent or 21.4 mt converted into products. Further, the organized industry handles only 18 per cent or 17 mt of milk, with 36 per cent (34.5 mt) being handled by private dudhias and unorganized players and 46 per cent (43 mt) being retained in rural areas. Within the 18 per cent organized sector share, private and cooperative/government dairies handle an equal 8.5 mt each. By 2011, Dairy India projects the value of the industry to more
than double to Rs.520,780 crore, which includes Rs.159,600 crore from liquid milk, Rs.42,680 crore from ghee, Rs.50,500 crore from khoa / chhana / paneer, Rs.9,100 crore from milk powder, Rs.2,250 crore from table butter, Rs.6,150 crore from cheese/edible casein and Rs.25,050 crore from other products. Interestingly, out of the anticipated milk output of 120 mt, the share of liquid milk will rise to 81 per cent or 97.5 mt and only the rest 19 per cent (22.5 mt) would get converted into products. But the organized industry’s share of total milk handling will go up to 30 per cent (36 mt), while the small players will see their share dip to 22 per cent (26 mt). At the same time, higher rural incomes will marginally boost the share of milk retained in rural areas to 48 per cent or 58 mt. The other significant feature is that within the 30 per cent overall share of organized dairies, the major 20 per cent (24 mt) will be accounted for by the private sector. The cooperatives and government dairies will handle 10 per cent or 12 mt of milk, which will be lower than that of the organized private sector.

Srikanth Reddy. M. and Vasudev. N. (2006) studied and an attempt has been made to quantify the level of consumption, production, and marketed surplus of milk in Karimnagar district of Andhra Pradesh. Better feeding followed by congenial weather conditions during the winter has positive effect on milk production. It was also interesting to note that in relative terms marketed surplus was more in summer (ranging from 58.5 percent to 60 percent) compared to that in rainy season (50 percent to 56 percent). On an average marketed surplus during the year ranged between 55 percent in the case of small farmers to 57.2 percent in the case of medium farmers. But in all the categories of farmers the consumption of milk was above recommended level. i.e. 250 gm / day/person. With the disposal of marketed surplus of milk through different agencies it was evident that the co-operatives and milk vendors emerge as major procurement agencies (more than 70 percent) in all categories of farmers. Majority of the small and medium farmers preferred milk vendors while large farmers preferred milk co-operatives to sell their surplus milk. The large family size, education level of family had influenced the consumption pattern of milk. These lead to consume more, resulting in shrinkage of marketed surplus.

Pranajit Bhowmilk, Smita Sirohi and Dhaka. J.P. (2006)\textsuperscript{34} analysed that the net cost of milk production from crossbred cows is nearly half of the same from local cow, thus in the economic interest of the farmers, strategies aimed at crossing nondescript cattle with superior germplasm should be intensified by the concerned state department. The contribution of technological component in higher milk production for cross breed cows is about 68 percent, thus, propagation of crossbreeding in the region has the potential to ensure reasonable returns of investment. The annual value of inputs saved in one district alone, covers 87 percent of the expenditure on dairy development made by the state in four years. Therefore, from the planners’ perspective also, it is a winsome proposition.

Bhowmilk (2006)\textsuperscript{35} opined that the Cost and returns from milk production were estimated separately for local and crossbred cattle. The gross cost of maintenance was worked out as the sum of fixed and variable costs items. The net cost was arrived at by deducting the value of dung from gross cost per milch cattle per day was divided by the average milk yield per day of the respective breed. The net return was calculated by deducting gross cost from gross return.

Chauhan. A.K., Raj Vir Singh and Raina. B.B. (2006)\textsuperscript{36} examined the economics of manufacturing of different dairy products, viz. ghee, full-cream milk, standardized milk, toned milk, double-toned milk, skimmed milk and ice-cream (processing only) have been reported. The study has been conducted in an ISO-9002 dairy plant situated in the north-eastern part of Haryana. It has been observed that all the products, except the double-toned milk are being produced above the recommended breakeven level. A comparison of unit manufacturing cost with unit price received by the plant for different products has revealed that ice-cream manufacturing has been the most profitable proposition among different dairy products, and standardized milk has provided the maximum profit margin among the


milk pouches manufactured during the study period, 2000-01. The double-toned milk has revealed a loss. Therefore, the study has suggested that the quantity of double-toned milk production should be raised at least equal to the recommended break-even level to avoid losses, if there is a market demand for this product or the resources of this product could be shifted to some other profitable products.

Ashok Shivagaje, Nanda Pandharikar, and Mayura Mathankar (2004) viewed that India’s estimated milk production in the year ending March 1999, 74 million tonnes, was 13% of the world’s milk production. This has been appreciated by the United Nation’s Food and Agriculture Organization (FAO), which has declared India as the world’s largest producer of milk. FAO-estimated milk production of 71 million tonnes by USA in the same year is placed second in the list. Data on estimates of milk production in the world and India during 1985–2000 reveal that a linear regression \( Y = a + bt \), where \( t \) is the year and \( Y \) the estimate of milk production, is the best fit to the data. For India, the estimates of \( a \) and \( b \) are 41.14 and 2.28 respectively, and for the world they are 501.85 and 3.80 respectively. This implies that an annual increase in estimate of India’s milk production is found to be 2.28 million tonnes \( (P < 0.01) \), whereas it is 3.8 million tonnes \( (P < 0.01) \) for the world. Assuming that the rate of increase will remain the same for the year 2010, estimates of India’s milk production will be 100.52 million tonnes, whereas the world’s milk production is estimated to be 600.56 million tonnes. The demand for milk products would increase as a result of increase in national GDP. In order to meet the demand, it is essential to have consistent increase in milk production, which will be possible on successful implementation of ‘Operation Flood’ and evolution of new animal breed.

Khem Chand and Gajja B.L. (2004) in their attempt to analyse the livestock composition, population pattern and factors affecting it in the arid zone of Rajasthan. For the purpose of study, secondary data of livestock population pertaining the animal census year 1961, 1966, 1972, 1977, 1983, 1988, 1992 and 1997 were collected. For the estimation of fodder availability, data on crop production, hallow land, culturable waste and policy area etc. were collected for the year

---


1996-1997. The requirement of fodder and nutrient intake was also estimated for the region. The study revealed an increase in buffalo population in the region while a sharp decline was observed in per cent share of cattle in the total livestock population. The major deficiency of fodder was felt in the case of bovine in the array region. The factors responsible for increase in buffalo’s population are increasing cropping intensity and rural population density in the arid region while the same factors resulted in a decrease in cattle population. The arid region farmers also adopted buffalo as drought resistance strategy since unproductive buffalo can be sold during drought, which does not affect the religious sentiments as in the case of cattle.

The study recommends storage of foliage produced in good monsoon year for use in the deficit period. The government of India is also implementing a scheme for this region for developing and rejuvenate the pasture land to be available on the large scale to improve the livestock situation in this region.

**Prashant Khare Sharma and Singh (2003)** of their opinion, Milk collection was higher in healthy season (from September to February) and lower in unhealthy season (from March to August). In spite of more production in the month of July and August, the producer members of the society were not in position to transport their product due to lack of all weather roads. As the distance of the milk producer’s co-operative society increases form the dairy plant, the volume of milk collection decreases, the milk collection was higher in those societies, which are well connected to the dairy plant. The variable cost was the main component of cost of milk production and the maximum cost incurred in the purchase of feed and fodder and in labour management. Low price of milk was the most important problems in the collection of milk, followed by lack of cold storage, delay in payment, inadequate water for animals, lack of all weather roads, small quantity of marketable surplus of milk, improper treatment, lack of cross breed animals and uncertainty of electricity. Hence, efforts should be made to solve all there constraints.

---

White S.L., Benson G.A. and Washburn S.P. (2002) in their 4-yr study examined total lactation performance of dairy cows in two feeding systems: pasture-based and confinement. Spring and fall calving herds were used and each seasonal herd had 36 cows on pasture and 36 cows in confinement with 282 Holstein and 222 Jersey cows included over seven seasonal replicates. Pasture-fed cows received variable amounts of grain and baled haylage depending upon pasture availability. Confinement cows received a total mixed ration with corn silage as the primary forage.

Data were collected on milk production, feed costs, and other costs. Pasture-fed cows produced 11.1% less milk than confinement cows. Across treatments, Jerseys produced 23.3% less milk than Holsteins, but calving season and various interactions were not significant. Feed costs averaged $0.95/cow per day lower for pastured cows than confinement cows. Feed costs were lower for Jerseys than Holsteins and for cows calving in spring. Income over feed costs averaged $7.05 ± 0.34 for confinement Holsteins, $6.89 ± 0.34 for pastured Holsteins, $5.68 ± 0.34 for confinement Jerseys, and $5.36 ± 0.34 for pastured Jerseys; effects of breed were significant but treatment, season, and interactions were not. Economic factors such as labor for animal care, manure handling, forage management, and cow culling rates favored pastured cows. Higher fertility and lower mastitis among Jerseys partially offsets lower income over feed cost compared with Holsteins. Milk production was lower in this study for pasture-based systems but lower feed costs, lower culling costs, and other economic factors indicate that pasture-based systems can be competitive with confinement systems.

Hemme. T., Garcia. O. and A.R. Khan (2002) in their opinion 130 million people in Bangladesh should consume at least 120 g of milk per day (as fluid or processed in any form), the annual milk demand would be about 5.70 million tons. This estimate of milk demand in Bangladesh demand is over two and half times

---


FAO’s recorded national milk production for the country (for 2002). Therefore, meeting Bangladesh’s potential milk demand is a huge national task and the question arises how well-positioned Bangladesh is to meet this milk demand. This study shows that the 2 cow farms (BD-2) not only cover full economic costs, but can produce milk at a cost almost as low as the larger farms included in the study.

This should be very encouraging for more than 7.2 million Bangladeshi families involved in small scale cattle rearing, of which few make a profit and most consider it a highly risky activity. The small farm (BD-2) is competitive at the national level but not at the international level. The cost of milk production of all farms in comparison to larger farms in India, Pakistan and Oceania is around 50% higher. Assuming a liberal trade of dairy products in the future all farms analysed will have to improve the production systems significantly to gain from the growing demand of dairy products in the country. Further studies of small dairy farms in Bangladesh need to include a land-less milk production system, a typical goat milk production system and a more exhaustive evaluation of the non-cash benefits obtained from dairy cattle (like draught power). Moreover the cost reduction potential of the farms by improvements in farm management should be analysed.

Khem Chand, Kulwant Singh and Raj Vir Singh (2000) revealed that milk production in commercial dairy herds is an economically viable and profitable enterprise in Bikaner city. It generated around 973 man-days of gainful employment per year in an average dairy herd. The contractual procurement and auctioning system of milk has helped a lot in increasing the number of diary herds in the city, the optimum herd size analysis has suggested the scope for further increases in the number of milch animals in the dairy herds. Though these dairy herds have helped in increasing the supply of milk, they have created many problems too. The herd owners many times set their animals free, which generally choked due to disposal of animal waste in it. These problems are created by around 40 percent of dairy herds which are maintained inside the city. The shifting of diary herds to the outskirts of the city can solve the problem. Another way to improve upon the situation is by developing a

modern dairy complex along the lines of Aarey milk colony, Mumbai with provision of good infrastructure facilities.

Rougoor C.W., Sundaram. R. and Van Arendonk J.A.M. (2000) investigated the relation between breeding management and 305-day milk production. Second goal of the study was to investigate advantages and disadvantages of principal components regression (PCR) and partial least squares (PLS) for livestock management research. Multicollinearity was present in the data set and the number of variables was high compared to the number of observations. Out of 70 variables related to breeding management and technical results at dairy farms, 19 were selected for PLS and PCR, based on a correlation of $\geq 0.25$ or $\leq -0.25$ with 305-day milk production. Five principal components (PCs) were selected for PC-regression with 305-day milk production being the goal variable. Related variables were combined into one so-called synthetic factor. All synthetic variables were used in a path-analysis. The same path-analysis was worked out with PLS. PLS forms synthetic factors capturing most of the information for the independent $X$-variables which are useful for predicting the dependent $Y$-variable(s) while reducing the dimensionality. Both methodologies showed that milk production per cow is related to critical success factors of the producer, farm size, breeding value for production and conformation. Milk production per cow was the result of the attitude of the farmer as well as the genetic capacity of the cow. It was found that at high producing farms the producer put relatively much emphasis on the quality of the udder and less on the kg of milk. Advantages of PLS are the optimization towards the $Y$-variable, resulting in a higher $R^2$, and the possibility to include more than one $Y$-variable. Advantages of PCR are that hypothesis testing can be performed, and that complete optimisation is used in determining the PCs. It is concluded that PLS is a good alternative for PCR when relations are complex and the number of observations are small.

---

Prasad. D.S (1999) observed that the concentrates contributed as an important input in the milk production having significant and positive regression coefficient for all the breeds of buffaloes. The dummy variables for the both the winter and rainy seasons had negative regression coefficients for the local and graded buffaloes but for murrah buffaloes the same were positive and significant for both the seasons. This shows that more yields are realized in the summer season for local and graded buffaloes while higher yields are realized in the winter and rainy seasons for murrah buffaloes. This clearly demonstrated that the summer season contributed significantly to the milk yield in the case of local and graded buffaloes, while the winter and rainy seasons significantly facilitated the murrah buffaloes in increasing the milk yield as compared to the other season. The higher milk yield among the local and graded buffaloes during the summer season might be due to the reason that a majority of these buffaloes might have calved during the summer season itself on the sample farms. Inter-seasonal fluctuations in milk production can be minimized by adjusting the calving dates of buffaloes. The milk yield of the animals can be stabilized through advance planning of calving dates of ensure continuous milk production on the farm through adjustment of mating dates of the buffaloes. This means that at a given time all the buffaloes would not go dry and at least one or two animals would be giving milk to the dairy farmers.

Bennett, Charles D. Fullhage, and Donald L. (1999) conducted a comparative analysis of two nutrient management systems for Missouri dairies. Annual ownership and operating costs were computed for herd sizes of 100-1,000 cows. A break-even analysis was also provided for irrigation systems used with the lagoon system. Lagoon systems consistently handled dairy nutrient at a lower cost than liquid tank systems for all herd sizes. Even though nutrients from liquid tank systems are more concentrated and valuable than nutrients from lagoon systems, the liquid system's net cost was 1.5 to 2.4 times greater than the lagoon system's net cost, depending on herd size. The liquid tank system also required a 5 to 10 times larger

---


plant filter area than the lagoon system. This can be an important consideration for operations with limited acreage. Dairies with more than 300 cows benefited from purchasing a travelling gun irrigator rather than relying on a custom operator to remove nutrients from lagoon systems.

Rajendran, K. and Dr. Prabakaran, R., (1998)\(^{46}\) pointed out the present Scenario of milk production in India. India’s agriculture has been dominated by the belief that its base is in crop production. Also, the focus should be shifted from quantity to quality in the daily diet by enhancing the intake of animal proteins, the major source of which are milk, eggs and meat. In recent years, one unfortunate trend has seen the decreasing per capita availability of pulses, the only major source of protein for the large majority of the population. The nutritional demand has to be bridged rapidly and the milk, egg and meat provide affordable alternative sources of protein. Recently, the annual rate of the growth in milk production has been encouraging which has gone up from 4.5 percent in the seventies to 5.7 percent in the eighties. Today, India ranks as the World’s second largest milk producer after USA. By then, India’s milk output is expected to range between 84 million tonnes at the minimum and 88 million tonnes at the maximum. India’s per capita consumption of milk does not commensurate with its ranking as world second largest milk producer. However, the present per capita availability of 214 grms / day (78 kgs / year) is much higher than the average of 26.27 kg / year for the developing countries in Asia / Pacific region. Today milk is India’s second most important agricultural commodity in terms of value of its output, ranking after paddy, but much above wheat.

Verma, N.K., Singh, and Des Raj. (1997)\(^{47}\) conducted a study in Karnal town of Haryana to ascertain deterioration in milk quality during marketing and to estimate real margins in milk trade, it was reported that in the lean seasons milk supplied to consumers by producers directly was of better quality at an average price of Rs.5.68/- per litre than that was sold to Halwai and vendor at Rs.4.75/- and Rs.4.04/- per litre respectively. Raju (1992) on consumer’s perceptions about milk


marketed by Vijaya cooperative Dairy in Hyderabad revealed that Vijaya dairy milk had powdery smell which used to easily get curdled compared to vendor milk and buffalo farm milk. Consumers judged the quality of milk fat content, color and taste, thickness, freshness, hygiene, curd formation and flavor of the raw milk. A majority of consumers, irrespective of all income groups, considered thickness, taste curd formation to be most important factors in judging the quality of milk. In Orissa, Omfed milk was perceived better than unbranded milk on thickness criterion whereas it lagged behind on taste and freshness.

Pander, B.L. and Hill, W.G. (1993) argued that the genetic prediction of heifer’s 305-day lactation yield from complete test day records or from records in progress was investigated. The accuracies of genetic indices predict breeding value for total yield from all 10 test day records of milk, fat and protein yields were 0.71, 0.66 and 0.67, respectively. These accuracies were slightly higher than if indices were computed to predict phenotypes and from these breeding values of 305-day records. The accuracy for a repeatability model (giving equal weight to each record) was not far below that of an optimal index. Inclusion of records in progress in genetic evaluation was investigated using a repeatability model and a phenotypic index to predict the phenotype for complete lactation from test day records. Approximate expansion factors to equate the genetic variance of past records to that of complete records and weights to give to past records in genetic evaluation using an animal model were derived. For genetic prediction of heifer lactation yield from test day records, a repeatability model giving equal weight to each record could be used without increasing computational facilities and could be implemented directly in current genetic evaluation in the UK. Records in progress could easily be incorporated.

Hansen and Brandon, D. (1993) viewed that the primary objective of his study was to develop a series of worksheets to analyze the economic, financial, risk, and environmental impacts of alternative nutrient management methods for a

---


representative western Washington dairy farmer. He considered total waste that must be handled, facilities and equipment associated with each alternative, transportation of manure to storage, storage procedure, transport to land, and soil incorporation. He examined capital investment required, annual costs, financing, cash flow, nutrient values of the waste, and financial and environmental risks. The dairy selected by Hansen needed a larger nutrient handling system to accommodate expansion for 69 additional mature cows and 42 additional heifers. He considered two alternatives: (1) add a second lagoon, use a solid separator, and purchase a big-gun pumping system for distribution of liquid nutrients on land, or (2) add a second lagoon without a solid separator, and hire a custom service to pump liquid nutrients from the lagoons. Alternative 2 had a lower capital investment, a net annual cost advantage, a lower net annual cash outflow and lower financial risk because of less debt. Alternative 1 had a lower risk of environmental damage because of excess lagoon capacity.

Garsow, James D., and Sherrill B. Nott (1992) examined seven liquid handling systems and one solid manure handling system for three Michigan dairy herd sizes ranging from 60 to 250 cows. They found that investment costs for the least expensive system could be less than a fifth of the most expensive system. Yet, more stringent manure handling regulations could cause some producers to leave the industry because the additional costs of improved manure handling systems could force their break-even price above the expected milk price. The likelihood of a producer leaving the industry depended on the farm’s current financial position and performance.

Oltenacu P.A., Smith T.R. and Kaiser H.M. (1989) elucidate the effect of a base-excess seasonal pricing plan on pattern of production and the role played by various factors related to management and to breeding practices on seasonality of production were investigated. A mail survey of a randomly selected group of farmers in New York State provided the data; 1061 farmers responded to the questionnaire. Seasonality coefficient (difference between spring and fall production as a proportion

---


of fall production) was used as a measure of seasonal production pattern. Three major conclusions were: 1) the use of a base-excess plan in addition to the Louisville plan reduced seasonality when compared with the Louisville plan alone; 2) seasonality was associated with region, type of housing, and herd production; and 3) farmers’ perceptions that spring milk production is more profitable than production in other seasons was an important cause of seasonality.

Morgan, Russell M., and Luther H. Keller (1987) emphasized the need for reliable and complete cost and benefit data in their evaluation of nutrient management systems for Tennessee dairy farms. Considering alternative herd sizes, they computed direct construction and installment costs, annualized costs, and stability of cost/return relationships of different nutrient systems. They also conducted a sensitivity analysis of nutrient loss rates of different nutrient management systems during storage and varying nutrient values after application to land. They noted the substantial cost of all nutrient management systems and the fact it could be expected to increase significantly should more stringent environmental regulations be applied to the dairy farm sector (as they have now been applied in Washington).

Young C.W., Hillers J.K. and Freeman A.E. (1986) in their comparative analysis, Production and consumption of milk fat, milk protein, and lactose were compared for 1970, 1975, 1979, and 1983 to determine whether production and consumption were balanced and, if not, to determine how balance might be achieved. Ratios of these components in milk produced remained virtually constant from 1970 to 1983. However, increased cheese consumption during this period resulted in increased per capita consumption of fat and protein despite reduced consumption of these components in other dairy products. Because lactose is not in cheese, lactose consumption declined. Because of these changes, imbalances of production and consumption of milk components now exist and are due almost entirely too much lactose being produced. Because of small variation of lactose percentage, this imbalance could be reduced by increased fat and protein percentages. Milk pricing

---

should encourage this by emphasizing fat and protein (not solids-not-fat). Fat and protein differentials should differ from market to market and should be based on utilization. Milk pricing is reviewed, and a procedure for determining blend differentials is outlined.

Emerson M. Babb (1981)\textsuperscript{54} analyzed the relationship between milk prices and production costs as sources of change in the level and geographic distribution of United States milk production. Milk prices and direct and total costs of production from 1974 to 1980 were estimated as a function of distance from the upper Midwest by ordinary least-squares regression. Milk prices and costs increased with distance of production areas from the upper Midwest, but the increases were less than transportation costs. The cost and price changes during 1974 to 1980 provided a strong incentive for increased milk production in all regions. Changes in milk prices and cost of production did not encourage production expansion in higher cost regions relative to expansion in the upper Midwest.

Vijay Gorakh Patil (1981)\textsuperscript{55} conducted a random sample survey study on fifty dairy farmers from eight villages of Shirpur Tehsil of Dhule District of Maharashtra (India) was undertaken to know the cost of production of milk in the study area. The total cost of milk production per cow/buffalo was Rs.113.87 in which the variable cost was 83.76 percent (Rs.95.38) and remaining Rs.16.24 percent (Rs.18.49) was fixed cost. In variable cost, the cost of feed stuff was 73.39 percent (Rs.70). Labour cost was 15.73 percent (Rs.15.00), the cost of medical treatment was 2.62 percent (Rs.2.50) and interest on working capital was 8.26 percent (7.88). Finally it was found that the cost of milk was Rs.9.10 per litre in the study area. Dairy farming has been recognized as an important source of income and is more remunerative in comparison to crop production in India. Milk production in India is predominantly the domain of small farmers in mixed farming system. Scientific dairy management helps the farmer to channelize his limited resources to maximize returns from his dairy farm.


The importance of dairying lies not only in products but also it brings about significant changes in socio-economic structure of rural economy. The National Commission on Agriculture (1976) observed dairying as an additional enterprise for improving the status of rural masses especially weaker sections consisting of small, medium & landless laborers. It therefore, becomes essential to examine the production cost of milk.
2.3. REVIEW OF LITERATURE RELATED TO CHANNELS OF MARKETING

Daniel R. Block (2009) explored that the agricultural policy in the United States is often structured around conflicts and relationships within particular production regions. These regional solutions may evolve into national policies. This paper explores a historical example of this, the development of fluid milk policy and the fluid milk economy in the Chicago milkshed between 1900 and the New Deal. This example is particularly interesting because it was the part of the rise of the post-World War II modern food system. Both urban and rural groups were important in this development. Urban groups took a particular interest in milk production and regulation due to its importance as a nutritious but highly perishable staple. Rural groups responded to urban attempts to control production practices by organizing cooperatives. Negotiations and strikes resulted in an agreement in 1929 that was positive for farmers, the Chicago Department of Health, and other major entities in the milkshed. It attempted to place regulatory barriers around the milkshed. However, it soon failed due to improvements in transportation technology and new distribution systems that allowed for cheaper retail prices.

The group then proposed a marketing plan to the USDA, which became the ancestor of the federal milk marketing order program. This story sheds light on the manner in which local interest groups and internal politics within the U.S. Department of Agriculture combined to shape New Deal agricultural legislation.

India Post (2008) opined that the demand for value added milk products, such as cheese, dahi (Indian yoghurt) and probiotic drinks is increasing at a double digit rate. At present, India seems to be self-sufficient in meeting its requirement for milk and milk products. However, given that demand is growing faster than supply, there could be serious issues with respect to self-sufficiency in the near future. Any increase in milk production is dependent on the farm gate price received by the producer. Farm gate prices have increased by more than 50 percent in the last three years. Focused efforts would be required on two fronts increasing farm size (currently

---

the average number of animals per producer is three to four), and increasing productivity of milk producing animals. Global milk production, approx. 655 million tones in 2006/07, is estimated to be growing at 1.6 percent per annum. India ranks second in terms of milk production after the EU-27 and accounts for 15 percent of global production. Annual milk production in India was at 100.9 million tones in 2006-07 and was growing at 4 percent per annum. The market for liquid milk, as well as value-added dairy products, is still largely dominated by the unorganized sector. India has an insignificant share of the global dairy trade, less than 1 per cent, despite being a leading producer of milk.

Rangasamy, N. and Dhaka, J.P. (2008)\textsuperscript{58} analysed the marketing of milk and milk products by dairy plants of co-operative and private sectors in Tamil Nadu and compared. The study is based on the data collected for toned milk, standardized milk, full cream milk, flavoured milk, butter and ghee from the selected co-operative and private dairy plants of the Coimbatore district for the financial year 2001-2002. It has been found that the marketing cost for toned milk is the same in both the dairy plants, whereas it is higher for standardized milk, full cream milk and flavoured milk in the co-operative dairy plant. The marketing cost has been found less in the cooperative plant for products like butter and ghee. All the dairy products earn more marketing margins in the private sector than in co-operative dairy plant, except for toned milk. The marketing efficiency of cooperative dairy plant for all dairy products has been observed relatively less than that of private dairy plant, except for toned milk. The study has suggested the development of co-operative dairy industry in a sustainable manner, and the co-operative dairy plants should formulate long-term vision and strategy. The study has observed that value addition in dairy products should be done without compromising the quality and consumer-oriented market research and development should be accorded greater attention.

Kamat, G.S. (2008)\textsuperscript{59} has emphasised on the market-oriented dairy development. In his opinion it can alone ensure success of dairy units whether they


are in public, private or co-operative sector. There is a great need to instutionalise milk trade from the stage of production to marketing.

Sharma. M.L., Raka Saxena, and Dipan Das (2007) of their opinion that India is the leading milk producer in the world and the dairy cooperatives are the backbone of Indian dairy industry. This study has analyzed the inefficiencies existing in improving milk production, procurement pattern, marketing channels, and price spread of a dairy cooperative, Uttaranchal Cooperative Dairy Federation Ltd (UCDFL), also known as the Kumaun region of Uttarakhand and has proposed a model for eliminating these inefficiencies. It has been found that UCDFL is focused mainly on liquid milk marketing and has not adopted product diversification, which is the need of the day. Nainital and Almora districts of Kumaon region have been selected for the study; these cover almost 40 percent of cattle population in the division, except Udham Singh Nagar. It has been found that due to insufficient margins, the number of agents working for other private dairies has increased. Different marketing channels for milk have been identified and price spread has been calculated for all the channels. Lack of business development services related to dairy industry has been found leading the farmers to disassociate from Anchal. The study has suggested that Anchal should evolve a definite policy with regard to procurement of milk in both lean and regular periods and to sustain its members, incentive package should be provided. Anchal should find ways to establish fodder banks at strategic locations for providing fodder during emergencies and periods of fodder scarcity. Local sale of milk at the society level should be encouraged to increase the popularity of Anchal brand

Denford Chimboza and Edward Mutandwa (2007) viewed that branding is increasingly being used as a strategy for managing markets in developed countries while developing countries still lag behind. The objective of this study was to assess the level of brand awareness and factors underlying brand preference of dairy brands in Chitungwiza and Harare urban markets in Zimbabwe. A total of 90 respondents

---


who included individual and institutional consumers were selected using judgmental and simple random sampling respectively. Primary data was collected using structured interview schedules developed for each category of consumers. Consumer product awareness indices, cluster analysis and factor analysis were the main tools used in the analysis. The findings of the study showed that 52% of the respondent consumers were aware of ARDA dairy brands despite having come across few ARDA DDP advertisements. Four factors were identified as key determinants of dairy product choice namely promotion, price and availability of product, attractive packaging and product quality. There is need for agricultural marketers to incorporate these findings in the formulation of responsive marketing strategies.

Edward V. Jesse, Norman F. Olson and Vijay P. Sharma (2006)\(^{62}\) opined that, in the third in depth country study, the Babcock Institute study team discusses India’s dairy sector. India is an interesting case study because it has the world’s second largest population making it the world’s largest milk-producing country. The country’s main system of dairy productions involves a smallholder production system in which most of the milk produced is consumed on the farm or distributed through informal channels.

This system of production, combined with Indian policies that encourage self-sufficiency and restrict dairy imports, leaves much unused potential in the Indian dairy market.

Fengxia Dong (2006)\(^{63}\) presented a 10-year outlook for major Asian dairy markets (China, India, Indonesia, Japan, South Korea, Malaysia, the Philippines, Thailand, and Vietnam) based on a world dairy model. Then, using Heien and Wessells’s technique, dairy product consumption growth is decomposed into contributions generated by income growth, population growth, price change, and urbanization and these contributions are quantified. Using the world dairy model, the paper also analyzes the impact of alternative assumptions of higher income levels and


technology development in Asia on Asian dairy consumptions and world dairy prices. The outlook projects that Asian dairy consumption will continue to grow strongly in the next decade. The consumption decomposition suggests that the growth would be mostly driven by income and population growth and, as a result, would raise world dairy prices. The simulation results show that technology improvement in Asian countries would dampen world dairy prices and meanwhile boost domestic dairy consumption.

Stukenberg. D., Blayney. D. and Miller. J. (2006)\textsuperscript{64} suggested that the Federal dairy programs have been instituted to assist dairy farmers in marketing their milk. Milk marketing licenses were issued for city markets in 1933 during the depression. Federal Milk Orders replaced licenses in 1937 with enactment of the Agricultural Marketing Agreement Act. Low prices returned in the late 1940s and Congress passed the Agricultural Act of 1949 creating the support program for milk. Congressional involvement in milk marketing was minimal until passage of the 1977 Farm Bill.

A support price adjustment to seek favorable political responses from farmers resulted in higher prices and ultimately higher production. Large expenditures and burdensome supplies caused Congress to make major changes to both programs. Other milk marketing programs have evolved from Congressional actions, including export and promotion programs. The exciting and consolidation of the dairy processors and producers have lead to a reduction in the number of marketing orders.

Rajendran. K. and Samarendu Mohanty (2004)\textsuperscript{65} explained that the operation Flood and dairy co-operatives emerged in India as the largest rural employment scheme, enabling the modernization of the dairy sector to a level from where it can take off to meet not only the country’s demand for milk and milk products but can also exploit global market opportunities. This study reviews the existing status of milk marketing and dairy co-operatives in India and provides recommendations to meet future challenges. The results of the study indicate that 80


percent of the milk produced by the rural producer is handled by an unorganized sector and the remaining 20 percent is handled by an organized sector. It is found that the dairy co-operatives play a vital role in alleviating rural poverty by augmenting rural milk production and marketing. Involvement of intermediaries; lack of bargaining power by the producers; and lack of infrastructure facilities for collection, storage, transportation, and processing are the major constraints which affect the prices received by producers in milk marketing. Milk quality, product development, infrastructure support development, and global marketing are found to be future challenges of India's milk marketing.

Kurup (2003) viewed that the price realized by farmers from informal sector was Rs.9.5 to Rs.10 per litre, whereas cooperatives paid between Rs.8.00 and 8.50. Further, the middlemen who bought from them made instant cash payments whereas it took 12-15 days to realize payments from the cooperative system.

Samajdar, Tanmay and Chander, Mahesh. (2003) in his study about the livestock husbandry of the Vangujjars of Uttarakhand also observed that even though they possess sound experience about various aspects of animal husbandry, they are vulnerable to and open for exploitation by the middlemen to whom they sell milk despite the existence of cooperatives in that area. They are often riddled with debt and stand marginalized. The study recommended that the cooperatives should come forward to find out the reasons for Vangujjars’ apathy towards cooperatives and involve them as society members.

Ray and Sunil (2000) conducted a study in Jaipur city reported that local milkmen supply fresh raw milk at the doorsteps or to the vendor who in turn supplies it to households. The prices varied from Rs.13-20 per litre for cow’s milk depending on adulteration of milk with water and the category of customer. The price generally realized by small farmers from the local vendor was about Rs.10-12 per litre, whereas they got only about Rs.9-10 from the cooperatives. Some middlemen also deployed

---


daily wage workers to collect milk by using bicycles, jeep or camel cart to collect milk from the doorstep and take it to different selling points in nearby major cities.

**Sharma (2000)** conducted an opinion survey in Andhra Pradesh regarding the consumer perception and attitude towards the different sources of milk purchase. It revealed that a majority of the families purchase milk from private vendors due to non-availability of Dairy milk within the reasonable distance from the consumer’s residence. Several households reported that the housewives are unable to collect the milk in person from the milk booths as it involves time and energy and they are forced to employ servants for collection of milk from the booths, which involves additional cost and delay. Further, they also expressed dissatisfaction with the present arrangement of milk supply from the booths and suggested home delivery. Nearly, 60 percent of the families felt that the home delivery of milk in polythene sachets is advantageous and indicated willingness to pay additional costs/service charges for the same. So, the co-operatives may have to seriously think about the system of home delivery of milk in order to bring more consumer families under its fold. Other reason for household preference to private vendor was non-availability of milk in small packing of less than half litre with the Dairy as several small families and those belonging to lower income groups strongly felt that such facility is essential to enable them to purchase the Dairy milk. It is also true with small size families irrespective of their economic status. Similarly, it was also noticed that in Orissa, a majority of higher income group (85.6%) were not purchasing OMFED milk due to absence of home delivery, poor taste, less cream, bad smell and nonavailability of credit structure in co-ops. There was also strong correlation between income and proportion of home delivered milk. For example, in Orissa, the percent of milk that was home delivered increased from 40 percent for those with income less than Rs.4,000 to 63 percent for those with income more than Rs.10,000.

**Shah, D. (2000)** in his opinion that the predominance of middlemen in this area was mainly due to the non-existence of co-operative infrastructure. Generally, the middlemen advanced money to needy milk producers and procured milk at a low

---


price round the year. It was reported that 75 percent of marketed surplus of small producer’s production was cornered by them. Similar observations were reported in a study conducted in Jalgaon and Kolhapur districts of Maharashtra.

Owango. M., Staal. S.J. and Lukuyu. B. (1998)\(^71\) in their opinion, Liberalisation in the dairy industry in Kenya is currently under way in several forms. The urban milk market monopoly of the Kenya Co-operative Creameries has been lifted. Clinical veterinary and artificial insemination (AI) services are no longer publicly supported in many areas. Private sector response to these reforms was expected to be the greatest in the high-potential market-oriented dairy zones of Central Province, where the dairy farmers’ co-operative societies play a central role in meeting the needs of dairy producers. A survey conducted by the authors measured the changes between 1990 and 1995 in milk marketing and service provision by the dairy co-operatives. Tabular and GIS analyses were used to evaluate the survey data. Dramatic changes in milk market patterns are apparent, in ways unintended by the policy reforms. Most notable has been a large increase in the role of the unregulated raw milk market. This helped increase real milk prices paid to producers by up to 50%, but also led to a steepening of the price gradient with distance from urban consumption centres. Large increases were observed in the provision of veterinary and AI services by the dairy farmers' co-operatives societies, whose producer client base and credit facilities may enable them to compete effectively with the independent private sector. Market liberalisation therefore expanded the role of the raw milk market and the participation of the dairy farmers' co-operative societies in milk marketing and the provision of input services.

Deepak Shah (1997)\(^72\) viewed that though milk production in Maharashtra over last decade has increased by leaps and bounds, only 25 percent of the milk co-operatives are economically viable in the state. Differential price structure and mismanagement of co-operatives has led to poor procurement of milk resulting in vast regional imbalances in terms of milk production. For the smooth functioning of the


milk co-operatives, it is not enough to give remunerative prices to the producers, but the co-operatives themselves should take over the onerous task of ensuring necessary inputs so as to improve productivity and overall genetic stock of milch animals.

Ntengua Mdoe, Steve Wiggins (1996) in their view a priority in developing African dairy industries is to build marketing systems which provide incentives for local farmers and supply consumers with the produce they demand. Studies were carried out in Kilimanjaro Region, northern Tanzania to investigate the regional demand for dairy produce and the marketing system. Demand proved to be buoyant, with an average LME consumption of 142 kg/person/year and an income elasticity of demand of 0.9 in the urban areas, and 45 kg/person/year and 1.1 for the rural areas. The main products taken were fresh and sour milk. More than half, the milk was consumed in the rural areas. Demand was forecast to grow from 1990 to 2000 at 5%/year. The marketing system consisted of competing multiple channels involving a parastatal, cooperatives and private traders. There was ample evidence that the system was efficient, with producers obtaining as much as 78% of the final milk price. The main policy concern was the adequate upkeeping of rural feeder roads during the rains. Public intervention in marketing was not necessary for successful development of a regional dairy industry in this case.

Vijayalakshmi S., Sitaramaswamy J. and John De Boer (1995) in their remarks on developmental efforts for animal production systems in India started with organized milk procurement, processing and marketing. Most rural areas around Bangalore and Kolar districts of Karnataka state are covered by an organized dairy development program. Parallel to this organized sector, the unorganized (informal) dairy sector also functions with different strategies. This study compared the cost of procurement/distribution of the organized and informal sectors of the dairy industry in Bangalore and Kolar districts. The optimum quantity of milk to procure per collection route in the organized sector was calculated and a saving of Rs.0.09 kg⁻¹ of milk marketed could be generated using this level, compared to a loss of Rs.0.13 kg⁻¹ of

---


milk marketed under existing conditions. By contrast, the informal marketing sector, by using differential procurement price, diversified procurement channels and selective selling channels, earned Rs.0.42-0.77 kg\(^{-1}\) of milk marketed. To reduce losses in the organized sector and assist producers who are not able to participate in the formal sector, control points in the existing system were identified and analyzed.

**Pawar and Sawant (1995)**\(^7\)\(^5\) examined the marketing efficiency of three channels - private, cooperative and government - in Western Maharashtra. Their results suggest that private dairies paid somewhat higher prices to the producers and still managed to supply milk to the consumer at competing prices. This was due to higher efficiency in procurement, processing, transportation and distribution.

**Kalsi, (1992)**\(^7\)\(^6\) viewed that the unorganized sector usually scores over the organized sector on account of the consumers’ confidence, the richness of milk as indicated by “Malai” on milk, the freshness of their products, their ability to give credit and the low overheads.

**Raju, (1992)**\(^7\)\(^7\) opined that the general practice of milk vendors in Hyderabad was that they finance the producers for purchasing milch animals and other personal needs and thereby bind the producer to sell milk to them round the year.

**Richard F. Fallert, et al. (1978)**\(^7\)\(^8\) examined the major structural changes in marketing occurring with the integration of food chains into the processing and distribution of fluid milk. Thus, the objectives of this study were 1) to determine the extent of vertical integration by food chains and 2) to explore the implications of such for the dairy industry. The study was confined to the Southern Region. Response to a survey indicated that 60% of the food chains were involved in some type of vertical integration with 84% of these initiated during the past 15 yr. Lower cost and uniform merchandising were the most prominent reasons for having some type of central milk buying programs. Vertical integration leads to increased market power of food chains and can affect both price and market structure. The actual vertical integration of food

---


\(^7\)\(^6\) **Kalsi (1992)**, “Let’s All Do It- Market More Milk”, *Indian Dairyman*, 44(8), Pp. 393- 400.


chains into fluid milk processing through ownership of processing facilities tends to increase the barriers to entry into a market. For processors, the barrier is the non-availability of market outlets. For the food chain, the number of stores and ownership of processing facilities for fluid milk necessary to compete economically may be the barrier. A continuation of these structural trends can be expected.
2.4. REVIEW OF LITERATURE RELATED TO CONSTRAINTS IN MILK PRODUCTION AND MARKETING

Shisode. M.G., Dhumal. M.V. and Siddiqui. M.F. (2009)\textsuperscript{79} on their opinion that the constraints expressed by the dairy cattle owners of Rajarambapu Patil Sahakari Dudh Sangh Ltd. Islampur as regards the reproduction, nutrition, management, health, economic and milk distribution were studied. Some remedial measures like trainings, exhibitions, brain storming sessions, poster presentations, radio talks and programmes on Door-darshan can be taken up to create awareness in dairy farmers and to impart knowledge to them to undertake new animal managemental practices to increase the milk yield.

Peter Enderwick (2009)\textsuperscript{80} analyses the problem of “quality failure” in China using as an illustration the recent case of melamine contaminated dairy products. This conceptual paper examines whether it is possible to anticipate the incidence of quality fade and, if so, what can be done to minimise the likelihood of such problems occurring. Drawing on theoretical frameworks of alternative transactions governance modes, the discussion highlights the interaction between environmental operating conditions and effective governance modes. The discussion suggests that it is possible to anticipate quality and safety problems and identifies the key environmental conditions in China that contribute to the problem of quality deterioration. Analysis of three primary transaction governance modes - contracts, hierarchy and trust - and local operating conditions reveal a dairy industry which, in contrast to many of the developed economies, is highly fragmented, politicised, ineffectively regulated and characterised by corrupt and opportunistic behaviour. The dairy industry case provides a concrete application of recent conceptual analysis of quality and safety concerns in emerging markets. This case allows the derivation of recommendations on appropriate management practices for maintaining quality in the challenging business environment of China.


Albert Christopher Dhas (2008)\textsuperscript{81} in his opinion, from independence, size and composition of bovines in Tamil Nadu showed differential growth pattern. The total bovine population showed an increasing trend up to the early-Sixties and thereafter stagnant till the early Eighties. While the milch animal stock increased steadily, the work animals showed a declining trend from seventies. These trends not only indicate the growing importance of dairy animals but also the competitive linkage between work and milch animal population. The work animal stock is highly influenced by the agro-climatic, institutional and economic factors and an analysis of capturing them is attempted in this paper. Initially, the changes in the size and composition of bovines, work animal population and its density since independence are traced. Subsequently, the factors determining work animal population and its density are examined using regression models. Two regression analyses are made; one representing phase I (1956-1974) and the other for phase II (1977-1994). Phase I basically represents the period when mechanization in agriculture had been at the early stages and phase II represents the period when mechanization (both energisation of irrigation and tractorisation) was at a relatively higher level. The study revealed that while the agro-climatic and irrigation factors had played a major role in shaping the work animal density during the period prior to mid-Seventies, the technological, economic and institutional factors played a major role in recent years.

Satbir Singh, Timothy James Coelli and Euan Fleming (2008)\textsuperscript{82} viewed that, Since the 1970s, the policy of Indian government has been to promote dairy development on the basis of the cooperative organizations. During the 1990s the dairy industry in India was liberalized. This study examines the impact of the liberalization policy on the cooperative dairy plants in India. Data envelopment analysis (DEA) and the Fisher index approach are applied to measure economic efficiency and total productivity changes, respectively. The data involves 65 observations from a complete panel of 13 cooperative dairy plants from 1992/93 to 1996/97. The

\textsuperscript{81} Albert Christopher Dhas (2008), “Determinants of Work Animal Density in Tamil Nadu: An Econometric Analysis”, MPRA Paper from University Library of Munich, Germany.

empirical results show that the deregulation and liberalization of the dairy industry alone is not the answer.

Shamsuddin. M., Alam. M.M. and Hossein. M.S. (2007)\textsuperscript{83} assessed resources, challenges and prospects of the dairy industries in four districts of Bangladesh (Mymensingh, Satkhira, Chittagong and Sirajganj) with the participation of 8 to 12 dairy farm families in each district. We used ten participatory rural appraisal (PRA) tools, namely social mapping, semistructured interview, activity profiles, seasonal calendar, pie charts, mobility diagram, matrix ranking, preference ranking and scoring, system analysis diagram and focus group discussion in 57 PRA sessions from September through October 2002. Dairying contributed more to family income (63 to 74\%) and utilized a smaller portion of land than did crops. Twenty seven to 49\% of cattle feed is rice straw. Only Sirajganj and Chittagong had limited, periodic grazing facilities. Fodder (Napier, Pennisetum purpureum) cultivation was practised in Sirajganj and Satkhira. Fodder availability increased milk production and decreased disease occurrence. Friesian crossbred cows were ranked best as dairy cattle. The present utilization of veterinary and AI services were ranked highly.

Farmers outside the milk union desired milk purchasing centres as the most required service in the future. They identified veterinary and AI services as inadequate and desired significant improvements. The PRA tools effectively identified resources, constraints, opportunities and farmers’ perspectives related to the dairy industries in Bangladesh.

Kathiravan. G., Thirunavukkarasu. M. and Selvakumar. K.N. (2007)\textsuperscript{84} opined that the Livestock has been an integral part of the Indian rural economy and an indispensable tool of income and employment generation to millions of poor households in India. A study was undertaken in Tamil Nadu (India) to ascertain the cost of livestock services availed by farmers. The districts of Tamil Nadu state were classified into two categories, viz., ‘livestock-developed’ (LD) and ‘livestock under developed’ (LUD), based on initial baseline. The cost of treatment of cattle was more


compared to other species of animals with the similar disease condition. The mean cost of treatment of a chronic medical case in cattle at a public veterinary centre was INR 20.83, in which the labour cost alone accounted for INR 17.35, with the remaining amount for the drugs purchased outside. However, the mean costs of treating a chronic medical condition in buffalo and small ruminant at public veterinary centres were only INR 13.34 and INR 10.80, respectively. Cost of treating an acute surgical case in cattle at a public veterinary centre was INR 43.08 and treating a chronic surgical case was INR 41.85, while an acute medical case cost INR 35.69 and a gynaecological case INR 31.68. The major component of cost in all cases was the labour cost incurred to bring sick animal to the centre.

The charge collected at public veterinary centres per insemination was uniform at INR 15.00. However, the average total cost, including labour cost for transport accrued to the farmers varied from INR 27.58 for cows to INR 29.17 for buffaloes. Overall average cost of insemination by engaging a veterinarian at farm gate was INR 57.83 for cows and INR 45.00 for buffaloes. Although no charges were made for animal health care services rendered at public veterinary centres, the charges in terms of imputed labour cost for bringing the animal to the centre was incurred. Service fee accounted for more than 60 per cent of cost of treatment for home service by a veterinarian or a para-veterinarian.

Frank H. Fuller, Jikun Huang, and Scott Rozelle (2006)\textsuperscript{85} pointed out that with the rapid growth in China’s dairy industry, a number of recent papers have addressed either the supply or the demand trends for dairy products in China. None, however, presents a systematic explanation for the recent growth in both the supply and demand for dairy products. The goal of this paper is to sketch a more comprehensive picture of China’s dairy sector and to assess the nature of the sector’s development in the coming decades. Drawing upon several empirical studies, we examine the trends in dairy product consumption to create a composite picture of the factors underlining the recent growth. We also empirically investigate the sources of production gains in milk supply and assess the relative importance of expanding herd

size, changes in the nature of production, technological change, and improvements in efficiency to the overall growth of milk production.

Rajarajan. T.R. (2006) opined that the combined effects of both domestic reforms and WTO commitments in the last decade have changed the environment in which the Indian dairy industry will operate in future. A term of trade is a significant indicator of gains from trade and efficiency of domestic industry. In average terms, the terms of trade of Indian dairy products have declined in the post-liberalization period compared to pre-liberalization years. The year-wise trend is unstable with wide fluctuations in post-liberalization years. The real effects of trade liberalization will unfold only when the WTO provisions are properly implemented.

Yue Yaguchi and Kei Kajisa (2006) pointed out that it was widely believed that not only a Green Revolution in a crop sector but also a White Revolution in a dairy sector has generated the great momentum of agricultural development in India since the late 1960s. However, owing to the dominance of sector-specific analyses, the importance of the interaction between these two sectors has been neglected in the existing literature. The interaction is important in that the dairy sector provides manure to crop production while the crop sector supplies fodder to the dairy. Using household data collected in Tamil Nadu, India for three decades from 1971, we show that the increase of fodder production as a byproduct of Green Revolution in 1970s enabled subsequent White Revolution in 1980s and the byproduct of the White Revolution, i.e., increased manure availability is enhancing the recent revival of organic farming system for sustainable agricultural development.

Suzuki N. and Kaiser H.M. (2005) in their opinion, say that Dairy is highly regulated in many countries for several reasons. Perishability, seasonal imbalances, and inelastic supply and demand for milk can cause inherent market instability. Milk buyers typically had more market power than dairy farmers. Comparative production advantages in some countries have led to regulations and policies to

---


protect local dairy farmers by maintaining domestic prices higher than world prices. A worldwide consensus on reduction of border measures for protecting dairy products is unlikely, and dairy will probably be an exception in ongoing World Trade Organization (WTO) negotiations. Under the Doha Round framework agreements, countries may name some products such as dairy as “sensitive,” thereby excluding them from further reforms. However, new Doha Round framework agreements depart from the current WTO rule and call for product-specific spending caps. Such caps will greatly affect the dairy sector because dairy accounts for much of the aggregate measure of support (AMS) in several countries, including the United States and Canada. Also, the amount of dairy AMS in several countries may be recalculated relative to an international reference price. In addition, all export subsidies are targeted for elimination in the Doha Round, including export credit programs and state trading enterprises, which will limit options for disposing of surplus dairy products in foreign markets. Currently, with higher domestic prices, measures for cutting or disposing of surpluses have been used in many countries. Supply control, which is not regulated by WTO rules, remains as an option. Although explicit export subsidies are restricted by WTO rules, many countries use esoteric measures to promote dairy exports. If countries agree to eliminate “consumer financed” export subsidies using a theoretical definition and measurements proposed herein as Export Subsidy Equivalents (ESE), dairy exports in many countries may be affected. Although domestic supports and export subsidies will be reduced in the Doha Round, possible exclusion of “sensitive” products from tariff reduction will help some countries’ dairy sectors survive after those final agreements. A key concern for those countries will be the simultaneous restriction of surplus-disposing measures. With fewer marketing options for surpluses, countries that continue border protection and high internal prices will likely be forced to use domestic supply control programs in the future.

Rajput A.M. and Sandeep Yadav (2004) in their study in indore district of Madhya Pradesh study the economics and identify the constraints relating to cross

---

bred cow milk production. Specifically, it examines the cost and returns per year, the net return, cost of milk production per litre and benefit cost ratio on small, medium and large size groups of cross bred cow farms. Multi stage stratified random design was used for the selection of the ultimate unit of the sample. Indore block of the Indore district was selected for the study and five villages were selected randomly from Indore Block. In all 50 milk producer households were selected for one allocation period covering the agricultural year 2003-2004 and the data was collected by survey method. The results of the study revealed that, on an average, the total cost of maintenance of a cross bred cow per annum was worked out to Rs.21, 657.76. After deducting the income received from cross bred cow dung and sale of the young stock, the average net cost of maintenance came to Rs.19,942.15 per cross bed cow. The farmers of large size groups had incurred higher expenditure on the maintenance of a cross-bred cow as they had maintained cross-bred cows of relatively better breed and had made higher investment on fodder and concentrates for maintaining them. However, large number of cross bred cow dairy entrepreneurs complained that the weak financial status, cost factor and management difficulties were the main constraints in not maintaining good quality of animals on the farms. The respondent’s farm families strongly expressed the dire need for finance for the purchase of animals and also for feed, fodder and veterinary aid. A large number of commercial cross bred cow dairy entrepreneurs reported insufficient storage facilities on their farms. Milk and milk products fall under highly perishable group of commodities and have to be stored under controlled conditions of temperature and humidity in cold storage and deep freezers.

Sukhpal Singh (2004)\textsuperscript{90} pointed out that Indian dairy industry has witnessed many policy and market changes in the last decade both in the domestic as well as the international markets. In this context, this paper examines the profile of organized private sector in liquid milk business, its growth, performance, business and marketing strategies and prospects, with special reference to the Gujarat state and the Ahmedabad milk market, besides assessing the impact of policy changes in the recent

years. It is primarily based on the secondary data and the interviews with the co-operative and private dairy unit owners and managers in Ahmedabad city mainly focused on liquid milk as Ahmedabad is one of the most competitive milk markets in the country with more than 25 brands of liquid milk being marketed in the city. The nature and dynamics of the Ahmedabad milk market are analysed and marketing strategies of various types of players are examined. The policy of delicensing and its impact on milk marketing in India is also addressed. The paper concludes by discussing important steps for achieving competitiveness in the domestic and international markets.

Dhawal Mehta, Jatin Pancholi and Paurav Shukla (2004)\textsuperscript{91} in their action research have extensively used world-wide for decision making related to policy due to its nature of involving the researcher and decision maker in the process. Following independence in India, one of the major revolutions was brought about in the dairy sector with regard to complete management systems.

Most innovations and changes occurred in the line function while the staff function was more often neglected in the overall change. The authors undertook an action research study focusing on staff function and re-laid improvements that can influence policy related to decision making. The authors have also developed the MPS model for staff function which can help a company or industry in appraising their own staff and functions which can thereby aid in utilizing their potential.

Ashutosh Shrivastava (2003)\textsuperscript{92} conducted a study to find out the impact of milk processing on income and employment on small farms of Damoh district, Madhya Pradesh and to examine the problems faced by the small milk processing farms and suggest measures thereon. Twenty small milk processing farms mainly producing deshi ghee and 20 non-milk processing farms were selected. The study concludes that the processing of milk definitely increased income and employment of the small milk processing units compared to non-milk processing units which sold directly to other vendors. The major problems faced by the processing farms are non-availability of good quality of milch animals, inefficient management of feeding and


breeding of animals, lack of proper organized market system (farmers did not receive remunerative prices every time), lack of storage facilities, technical and infrastructure support system and packaging facilities. To overcome these problems the study suggests that since the processing units are looked after by household workers, good training programmers for managing these units be developed for manufacturing low cost packaging material and dairy feed formulations at the village level. The collection centres must be established on co-operative basis. Sufficient financial assistance by the government credit agencies at cheaper rates of interest must be provided to encourage the small producers and infrastructure facilities and extension activities must be developed.

Sarvesh Kumar and Sirohi Smita (2003)\textsuperscript{93} opined that the Indian dairy industry has undergone substantial changes during the 1990s due to opening of dairy products processing for the private players after industrial delicensing in 1991. At the same time concerns have emerged about the viability of increasing number of private processing units competing with each other and with existing plants for fixed supply of raw material, that is milk. The study attempts to address this concern using the data of financial statements of 30 dairy processing firms in the private sector (including 5 multinational corporations) for the period 1991-92 to 2000-2001. The economic performance of these firms is assessed on the basis of growth trends and ratio analysis. The growth trends indicate positive growth in scales (at current prices) and value of output (at constant prices) for 25 out of 30 firms and compound annual growth rate varied from 172 percent to 4.20 percent for sales and 147 percent to 1.43 percent for value of output. The newly established firms registered very high growth rates due to low base levels. The investments in terms of gross fixed assets (at current prices) also increased in all the firms excepting one. It was found that there existed in general large inter-firm variations in the economic performance of the dairy forms. On one hand, are the MNCs that have made heavy investments in dairy business, capturing a sizeable share of the market showing good economic performance. On the other extreme are the chronically sick units and some other poor performing ones.

that are basically facing teething problems. In between these two extremes are some Indian firms that have shown considerably good performance and have a foothold in the market. One common problem affects all the firms is the underutilization of installed capacity due to shortage of raw milk in relation to their processing capacities. The establishment of large number of private dairy plants after industrial delicensing has aggravated the shortages. The study concludes that the dairy industry has the potential of improving its performance provided that there is more milk flow through the organized sector.

David A. Hennessy and Jutta Roosen (2003)\textsuperscript{94} of their opinion that the Milk production is seasonal in many European countries. While quantity seasonality poses capacity management problems for dairy processors, a European Union policy goal is to reduce price seasonality. After developing a model of endogenous seasonality, we study the effects of three E.U. policies on production decisions. These are private storage subsidies, production removals, and production quotas. When cost functions are seasonal in a specified way, then arbitrage opportunities interact with storage subsidies to reduce both price and consumption seasonality. But production seasonality increases because storage subsidies promote temporal market integration. Conditions are identified under which product market interventions increase quantity seasonality.

Jan M. Sargeant, et al. (1998)\textsuperscript{95} studied the association between protein production and individual-cow reproductive performance, health, and culling were investigated in a 2-year observational study involving a convenience sample of 75 Ontario, 5 Alberta, and 3 Nova Scotia dairy farms. Protein production was defined by 305-day lactation protein yields and by estimated breeding values for protein yield. After controlling the level of milk production, herd, parity, breed, and season of calving, there were no significant associations between either measure of protein production and days open or days to first breeding. The only associations between protein production and disease were small positive associations between the estimated


breeding value for protein yield and cystic ovaries and mean lactation somatic cell count. The risk of culling, after controlling for the level of milk production, was negatively associated with previous-lactation 305-day protein yield for parity three animals only. The estimated breeding value for protein yield had a small negative association with the overall risk of culling, although the associations were not significant for individual lactations.

**Janakiraman.K. (1990)** pointed out that the scientific management of a dairy herd is essential not only to exploit the genetic potential of the animals, but also for taking care of the animals and use the resources in an optimal manner. The management inputs have been decomposed into various aspects like breeding, feeding, housing, health management and general up keeping of animals. Almost all the stalls maintained their own bulls for breeding purposes. Though the State Government has set up stockmen / artificial insemination (AI) centers in the vicinity of the area where most of the stalls are located, the majority of stall owners preferred natural service to AI because of high success rate. The success rate in AI is reported to be low.

**Robert W. Blake (1979)** in his study emergence of government action to define a national policy on food and nutrition implies increased emphasis on programs for food production and marketing. Optimal policy will rely upon information from targeted basic and applied research. Dairy cattle are discussed in the context of their comparative advantage among livestock species for providing high quality protein in the human diet Research needs are suggested to supply economical milk protein by improving biomass efficiency, economic efficiency, milk pricing, and aggregate analyses of systems of dairy production.

**Nagaracenkar. R. (1979)** viewed that all the dairy herds in the Bikaner city were situated either inside the walled city or in the adjoining areas. A part of the residential house was converted into cattlesheds to house the animals. No additional

---


land was available with the dairy owners to grow fodder for the animals. On an average, 404, 623 and 1309 sq. meters (sq.m) area was available to maintain an average small, medium and large herd respectively. In other words, the area allocated to each animal varied from 17 to 18 sq.m. which included the area for feeding, milking and free movement. These areas were quite close to the recommended floor space (15. sq.m) per animal.