Chapter 3

Traditional Products in Indian Dairying

3.0 Introduction

Since times immemorial, significant proportion of milk has been used for manufacturing traditional dairy products all over the world. Traditional dairy foods have always played a pivotal role in preservation of precious milk nutrients and promotion of its consumption among masses. These products are endowed with enormous value and enjoy tremendous mass appeal. Dairy products like cheese and butter are also considered to be traditional from global viewpoints. Cheese is one of the oldest foods of mankind. It is commonly believed that cheese evolved in the Fertile Crescent between the rivers Tigris and Euphrates in Iraq some eight thousand years ago (Kosikowski, 1997). By end of last century, cheese has emerged as one of the largest products utilizing about forty per cent of the total milk production of the world (FAO, 1990).

The traditional dairy products and a great assortment of sweets are integral part of Indian heritage. Of great social, cultural and economic importance, these products have been developed over a long period of culinary skills and carry with them, the age-old wisdom and experience. In addition to preservation of the precious milk solids for longer duration, manufacture of traditional dairy products adds value to milk and also provides considerable employment opportunity. It is estimated that about fifty per cent of total milk produced in India is converted into a variety of traditional milk products, such as khoa, chhana, paneer, dahi, ghee, shrikhand and a wide variety of sweets. Traditional dairy products not only have an established market in India but also have a great export potential because of strong presence of Indian diaspora in many parts of the world.

Realization has set in, albeit late, that the traditional dairy foods have economic potential also for the organized industry. As a major dairying activity of the country, it is directly
related to the livelihood of the milk producing farmers. Globalization of the dairy trade has further accentuated the need for directing scientific pursuits towards the recognition and promotion of the cultural significance attached to these traditional products. The expanding business prospects provided by these products and their accompanying value-addition call for a thorough study of this sector from a management point of view.

Understanding the evolution of Indian organized dairying, relevance of traditional dairy products in the context of Indian dairying, technology and economics of traditional dairy products, market of such products in both domestic and international level is often essential to successful management of this sector. Studying of existing practices and problems of traditional dairy product production and marketing will help in formulating strategies for transformation of this largely unorganized sector into a modern vibrant business entity. An account of limited efforts, so far undertaken towards modernizing this sector will be helpful in up-gradation of chhana manufacturing.

3.1 Evolution of Organized Dairying in India

Historically, dairying has been an unorganized activity in India. However, from the end of the nineteenth century scattered efforts have been initiated to produce and process milk in an organized manner, which got momentum only after independence. A retrospect of the evolution of organized dairying in India will help in understanding the scope of modernization in traditional dairy products sector.

3.1.1 Dairy Scenario in Pre-Independence India

Dairying in India is as old as the Indian civilization itself. Around 1500 to 2000 B.C., the Aryans were first to domesticate cattle, use them for tilling their land and obtain milk to be consumed as food (Ahuja, 2004). Domestication of milch animals like cattle and buffalo subsequently becomes an integral part of the Indian social system. Though the practice of milch animal rearing and milking continued over the centuries, for long time no organized efforts were made to exploit its commercial potentials and it continue to remain as a domestic support system to the society.
If the genesis of organized dairying in India is traced, it was rooted in the later part of nineteenth century, during the pre-independent era, with the establishment of military farms, by the British government. In the year 1886, the Department of Defense established first dairy farm for supplying milk to British troops stationed at Allahabad as advised by the then Board of Agriculture. These farms were established to ensure supply of milk for the British army as advised by the then Board of Agriculture (Khurody, 1974).

The first dairy society - The Katra Cooperative Dairy Society, Allahabad was registered in 1913 in Uttar Pradesh, soon after that Cooperative Societies Act (1912) was enacted (Madan Mohan, 1989). Between 1914 and 1919, seven more such societies were formed. Impressed by the potentiality of milk in India, the then Board of Agriculture advised the Government to appoint an Imperial Dairy Expert. In the year 1920, Mr. William Smith, the Dairy Expert from Britain, planned for enhancing milk production on long-term basis and recommended to improve the same on scientific lines. In the year 1929 Shri Pestonji Edulji Polson, established Polson Model Dairy at Anand to manufacture Polson butter. Dr. NC Wright, the then Director, Dairy Research Institute, Scotland came here in 1936 to review the progress of dairying in India. He made some important observations and recommendations during his four-year stay in India, which formed the basis for future development of Dairy Industry. Two of his recommendations were: a) India had to develop its own technology and technologists to solve the problems of Indian Dairy Industry; b) being a country of villages, inhabited by marginal farmers and landless labourers, the dairy development should be promoted on cooperative lines only, to cover wide areas/rural pockets.

During the year 1937, the first Milk Producer’s Cooperative Union was registered in Lucknow. By the end of the decade there were 19 milk unions covering 264 societies with the total membership of 11,602. The total milk handled by these societies was four million kilograms per year – about 0.1 per cent of the milk marketed in urban India (Madan Mohan, 1989). It was being increasingly realized that Dairy Development
Programmes would be relevant only if the exploitation of the producers and the consumers by the middlemen is eliminated. Hence, the need was felt that a proper provision of necessary infrastructure should be outlined to balance the demand of production and consumption center.

In the early forties, the British Government in India decided to improve the quality of milk consumed in Bombay city. The Municipal Corporation of Bombay city organized a scheme in November, 1945 (known as the Bombay Municipal Corporation Milk Supply Scheme) for bringing milk from Kaira District at a distance of about 400 kilometers from Bombay city, and selling it at subsidized rate to expectant mothers and children (Khurody, 1974). The Bombay Municipal Corporation Milk Supply Scheme purchased a fixed quantum of milk from Polson Limited, a private enterprise located at Anand, then a sub-divisional headquarter of Kaira District. The price paid for milk by the Scheme to Polson was not related to the price Polson paid to the milk producers in the villages. Polson tended to maximize profits by minimizing the price paid to the milk producers. He created a strong network of milk contractors in the district.

The Bombay Municipal Corporation Milk Supply Scheme faced severe financial difficulties during the early days of its operation. In 1946, the Government of Bombay State took over the administration of the Scheme and established a statutory body known as the Bombay Milk Scheme. The Bombay Milk Scheme awarded a monopoly right for procuring milk in Kaira District to Polson, a decision that aroused strong political opposition in the district as the benefits of a relatively high purchase price paid by the Bombay Milk Scheme were not likely to be passed on to the producers (Heredia, 1999). The arrangement was satisfactory to all concerned except the farmers. The Government found it profitable, Polson kept a good margin. Milk contractors took the biggest cut. No one had taken the trouble to fix the price of milk to be paid to the producers. Thus under the Bombay Milk Scheme the farmers of Kaira District were no better off than before. They were still at the mercy of milk contractors. They had to sell their milk at a price the contractors fixed. The discontent of the farmers grew. They went in deputation to Sardar Vallabhai Patel (a prominent freedom fighter and first Home Minister of India), who had
advocated farmer’s cooperatives as early as 1942. He belonged to a village called Karamsad – eight kilometers from Anand. On his advice farmers of Kaira District launched a campaign to organize dairy cooperatives, which paved way for the AMUL model of dairy development in India.

The cooperative dairying in India really came into reckoning from 1946 onwards. The first farmers’ integrated dairy cooperative was established in Anand town of Kaira District of Gujarat in the year 1946, to fight against the exploitation of farmers by the private traders. This cooperative is popularly known as AMUL (Anand Milk Union Limited). AMUL emerged as a result of powerful socio-economic movement, which shook British Bureaucracy in this part of the country. The AMUL cooperative movement began with organization of two village level dairy cooperatives in June 1946 (Heredia, 1999). With five dairy cooperatives as its members, AMUL got registered in December 1946.

However, milk procurement from rural areas and its processing and marketing in urban areas continued to be a major problem for the growth of the sector (Banerjee, 2007). There was no integration between milk production, processing and marketing. Being a tropical country, India has varied seasons ranging from extreme cold to very hot. Although, Indian cattle breeds have evolved to withstand the variation of temperatures, decline in milk production during the summer months is a usual feature, affecting the availability of milk. The seasonal variations and regional imbalances in milk production have been the added impediments. One of the greatest weaknesses of the dairy industry has been the quality of milk. The basic reasons are attributable primarily to the lack of hygiene, inadequate sanitation at the production level, since major milk producers are small, marginal and poor, living at the subsistence level.

3.1.2 Development of Dairying in Post-Independence India

It was being increasingly realized that Dairy Development Programmes would be relevant only if the exploitation of the producers and the consumers by the middlemen is
eliminated. Hence, the need was felt that a proper provision of necessary infrastructure should be outlined to balance the demand of production and consumption center.

The role of government in the sustainable growth of a sector such as that of dairy cannot be over-emphasized. Indian dairy development policies are primarily formulated by the government, both at the center and state levels. The central government formulates policies, which are being implemented by the States since constitutionally agriculture along with dairy and animal husbandry is the State subject. The Central government formulates policies through the Planning Commission of India. In India, the government’s approach towards dairy has passed through three distinct phases. Though it is difficult to earmark the exact year for distinguishing these periods as a shift in policy action is are often staggered over a couple of years, an attempt has been made to demarcate this on the basis of plan periods, namely, first phase (Plan I-III), second phase (Plan IV-VII), third phase (since Plan VIII).

The first phase began immediately after independence when government tried out different strategies to develop organized dairying. Government monopolized the milk supply and distribution in the metros and other major cities through the Milk Control Board. To strengthen the milk production, dairy and animal husbandry programmes were initiated under the Key Village Development programme of the Second Five Year Plan of the Agriculture Ministry, which commenced in 1956. Third Five Year Plan onwards, dairy and animal husbandry were introduced separately as a sub-sector under the Agriculture development programme.

However, due to lack of vertical integration in the milk supply system, most of those milk schemes used to depend on imported commodities for its sustenance (Jha, 2007). The country thus became import-dependent to sustain the city milk supplies, as far as the organized dairying was concerned. Commodities such as milk powder, butter fat/oil etc, were imported into India to meet the occasional gaps that occurred between the urban milk demands and supplies. This has also led to a proliferation of middle-men in the milk supply system, and finally, a decline in the share of producers in the consumer’s price of
milk. As a result of this set of policies, milk production observed a linear trend growth of less than 2 per cent during the first two decades of planned development (chart 3), which was too low to match the growth in human population during the period. The per capita availability of milk has also declined during the period (chart 3), compelling Government to resort to import of milk powder to protect consumers’ interest. Import of milk powders, which was highly subsidized, has further deteriorated the price incentive for domestic milk production in the country. This policy orientation continued, till the Third Five Year Plan.

Chart 3 : Trends in Dairy Development Indicators

Though the government’s efforts to expand organized dairying, in India, did not meet with requisite success, a vertically integrated cooperative structure involving farmers in managing its affair’s, became popular, in western part of India. This movement, though commenced, in 1946, received due acknowledgement, only subsequent to continuous failures of government dairy progammes. With its popularity, the cooperative movement, which originated in a town called ‘Anand’ in the state of Gujarat, became known as ‘Anand Pattern’ of dairy development. Later on with its replication, under the Operation Flood Progamme (OFP), it became known as the ‘Anand Model’ of Cooperative Dairy Development (Kuriën, 2004). The second phase of dairy development can be distinguished from the earlier plans with a high allocation for OFP in the fourth Five
Year Plan (GOI, 2009). The programme aimed at replicating Amul type milk cooperatives, which essentially provide a favourable price to milk producers. The OF programme and similar other dairy development programmes to strengthen cooperative networks remained important throughout the planned development. The spread of the cooperative network is apparent with the growth in both milk production and per capita availability of milk (chart 3). The role of Government in milk collection and processing was restricted during the period; import of low cost milk powder was also restricted. As a result of these policies, the growth in milk production has experienced a structural break in its trend during the year 1973-74 (chart 3). The exponential trend in growth is visible during the later period. The per capita availability of milk, which started declining during the first two decades of the plan period, has shown an increasing tendency after the mid-70s (chart 3).

The basic unit in ANAND pattern cooperatives is the village level milk producers' cooperative society - a voluntary association of milk producers who wish to market their milk collectively. All the dairy cooperative societies in a milk-shed are affiliated to an apex organization - The District Cooperative Milk Producers Union (IDC, 1983). The milk union procures milk collected by the member dairy cooperative societies, processes the same and arranges marketing of liquid milk and milk products. With the growth of 'Anand Pattern' district level cooperatives; it was federated into a state level cooperative federation. Besides paying to the member dairy cooperative societies for the milk supply, the milk union provides inputs for productivity enhancement for the animals of the members of these dairy cooperatives societies.

The salient features of ANAND pattern dairy cooperatives are:

- Effective governance by elected representative of farmers
- Effective professional management
- Availability of round the year market to the milk producers
- Sharing of profits by members of the dairy cooperatives on equitable basis
- Availability of inputs for enhancing milk production of milch animals of the members of dairy cooperatives.
Since the ‘Anand Pattern’, successfully demonstrated how the small holders can be brought into the organized dairying, ‘Operation Flood Programme’ (OFP) was evolved to replicate the system, in the different milk potential states, in India, using food aid as a tool for socio-economic development. The National Dairy Development Board (NDDB) of India launched this programme in 1970 (Kurien, 1997). In this programme, surplus commodities from developed countries were given as aid, which generated additional funds over and above the planned funds of the Govt. of India. The initial donor was the World Food Programme (WFP) and subsequently European Economic Community (EEC) and World Bank joined the programme. While the EEC provided food aid, the World Bank extended financial assistance. The FAO/World Bank provided technical/managerial expertise. The OFP during its three phases of implementation between 1970 and 1996 established cooperative institution based on the ‘Anand Model’, in 170 milk sheds, spread over the different states of India (Kurien, 2004). Processing and marketing infrastructures were created in metro and major cities as well as rural dairies and chilling centers. The programme also covered up-gradation of milch animals, veterinary and health care, provision of balanced nutritional feed, etc. to enhance milk production, etc. in the project area. The success of OFP has demonstrated how food aid can be used to act as a catalyst to enhance domestic production, if administered with care. This programme ushered in the ‘White Revolution’, in India. The OFP taught, how the stakeholders, who are primarily small, marginal and landless could become self-reliant. Consequent to the successful implementation of the OFP the cooperative dairying commanded the milk scenario, in India. Its visible impact on the milk production is presented in chart 4.

The third phase of shift in policy environment was more mandatory in a globalizing world. The Government of India, as per its commitment to the World Trade Organization (WTO), had introduced liberalization policy, in June 1991, when the Indian dairy industry too was opened for private/foreign investments. As cost efficiency and quality was perceived as important for an economy, dairy sector was delicensed, that is, it was
removed as a scheduled industry under the Industrial Development Regulation Act of 1951 (Jha and Debroy, 2000).

**Chart 4: Impact of OFP – Growth of Dairy Cooperatives in India**

<table>
<thead>
<tr>
<th>Year</th>
<th>No. of Farmer Families Covered (in '000)</th>
<th>Milk Procurement (TKGPD)</th>
<th>DCS (No.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970</td>
<td>278</td>
<td>521</td>
<td>1588</td>
</tr>
<tr>
<td>1980</td>
<td>1747.4</td>
<td>2562.12</td>
<td>13284</td>
</tr>
<tr>
<td>1990</td>
<td>7481.63</td>
<td>9702.15</td>
<td>63415</td>
</tr>
<tr>
<td>2000</td>
<td>10827.4</td>
<td>16546.7</td>
<td>97989</td>
</tr>
</tbody>
</table>

Source: NDDB Annual Report, 2001-02

However, milk being an essential item, was declared “sensitive”. Therefore, while on one hand certain restrictions were removed to enable Private Corporate both Indian and multinational, to invest in the Indian dairy sector, certain regulatory mechanism was also introduced by the promulgation of a central government order, called Milk & Milk Product Order (MMPO), 1992. One of the conditions of the order was to restrict the new entrepreneurs to enter into the milk sheds which were already reserved for the existing dairy organizations, especially dairy cooperatives, thereby providing a certain level of protection to the cooperative institutions. The MMPO was however perceived as an entry barrier for private sector investments, and in March 2002, the government made some important amendments so that the MMPO would basically regulate food safety, quality, sanitary and hygiene conditions of all registered units. The cooperative processing units unlike their corporate counterparts were governed by the registrar state cooperatives; in order to unshackle the cooperatives the Companies (Amendment) Act 2002, were amended to incorporate producer companies based on the principle of cooperation into its coverage (Singh, 2008).
With the growth of the dairy sector in India, the government created two separate ministries, one is the Ministry of Food Processing Industries (MoFPI) and the other is the Department of Animal Husbandry and Dairying (DAHDF), in 1991. The MoFPI deals with policies concerning milk products such as value addition, whereas the DAHDF deals with milk production and processing. Also, there are multi-institutional involvements under the domain of center and state governments. These institutions are either part of the government or financially supported by them. These institutions deal with dairy education and research, dairy development; milk products export promotion, inspection, quality testing, certifications, etc.

3.1.3 Present Status of Indian Dairy Industry

India is undergoing transformations in its economy, changes in tastes and lifestyles, urbanization, and rising income levels. All of which are likely to have significant influences on food demand. With rapid increase in income and urbanization, food consumption in India has shown a pattern of change over the past three decades. From a diet primarily characterized by cereal staple foods; mainly rice and wheat, to one that includes a larger share of milk and dairy products, fruit, eggs, fish, meat, as well as processed foods. As expected, there has been a continuous shift of food expenditure in favour of high value foods (Sharma, 2004).

Consumption pattern trends during the last three decades indicate that food continues to dominate consumption expenditure. The share of food expenditure is nearly 55 per cent in 2004-05 (Sharma and Singh, 2007). The share of cereals within food expenditure has declined from 55.7 per cent in 1972-73 to 32.8 per cent in 2004-05 in rural areas, whereas milk and milk products is the second most important in food expenditure, having a share of 15.3 per cent in food expenditure in 2004-05 (up from 10 per cent in 1972-73). The results for urban areas show almost the similar trends. The share of food expenditure in the total expenditure is about 42.5 per cent in 2004-05. Expenditure on milk and milk products is the second important item with a share of about 18.6 per cent in 2004-05.
Presently, among crop and livestock products, the milk group remains the number one farm commodity in terms of its contribution to the gross value of output from agriculture. The value of the milk group was Indian Rs. 108,839 crore in 2005-06 at 1999-2000 constant prices, which was much higher than the value of output from rice (Indian Rs. 71,595 crore), the second largest contributor to the agricultural sector (CSO, 2007).

3.1.3.1 Production of Milk and Milk Products

Dairying has become an important secondary source of income for millions of rural families and has assumed a most important role in providing employment and income generating opportunity. Indian Dairying is unique in more than one ways. It ranks first with its 185.2 million cattle and 97.9 million buffaloes accounting for about 51 per cent of Asia’s and about 19 per cent of world’s bovine population. It also ranks first in milk production, which has increased more than four folds from a mere 17 million tonnes during 1950-51 to 104.8 million tonnes in 2007-08 (DAHDF, 2009). Although, the country’s per capita availability is still lower than the world’s daily average of about 285 g though it has doubled from 124 g in 1950-51 to 256 g per day in 2007-08. Contributing about 5.3 per cent to India’s agricultural GDP, milk is a leading agricultural produce. The value output from milk at current prices during 2006-07 has been over Rs.144386 crores which is higher than the output from paddy (Rs.85032 crores) alone and is also higher than the value output from Wheat (Rs.66721 crores) and sugarcane (Rs.28488 crores), put together. The unique feature of the system is that about 120 million rural families are engaged in milk production activities, mostly smallholding producers with 1-3 animals.

Another notable feature of Indian dairying sector is that buffaloes contribute more than 53 per cent of the country’s total milk production. Buffaloes are known for their efficiency as converter of coarse feeds into rich milk. Similarly about 45 per cent of total cow milk produced is contributed by crossbred cows. In spite of India’s position as highest producer of milk, productivity per animal is very poor. It is only about 987 kg/lactation as against world average of 2,038 kg/lactation. Dairying is based on family labour, crop residues and natural grasses and is mostly a supplementary source of income.
to producers (Gupta, 2007). Milk production in India is largely based on the utilization of crop residues like wheat/paddy straw, green fodder etc. Since Indian agriculture continues to depend largely on the monsoon rains, the availability of crop residues is highly seasonal. Milk production in India is therefore concentrated between November - February, generally referred to as the flush season. April – September (summer season) are the lean months for milk production. Two thirds of the annual milk production takes place during the four-month flush season.

It is observed that 14 major dairying States viz. Uttar Pradesh, Punjab, Andhra Pradesh, Gujarat, Maharashtra, Madhya Pradesh, Karnataka, Haryana, Tamil Nadu, West Bengal, Bihar, Kerala and Orissa accounts for 92 per cent of India’s milk production, 93% of the rural marketable surplus (i.e. the milk that flows from rural to urban areas, estimated by deducting rural consumption from rural milk production) (DAHDF, 2009). Consequently, dairying potential is also in variance from district to district. It is estimated that about 325 districts in the country are situated in 14 major dairying states and account for around 90 per cent of India’s milk production. The remaining 275 districts account for only 10 per cent of total milk production.

Following Operation Flood, the Government of India had been implementing various dairy development schemes since 1993-94. In the current plan period, it is implementing Centrally Sponsored schemes "Intensive Dairy Development Programme", "Strengthening Infrastructure of Quality & Clean Milk Production", Central Sector schemes “Assistance to Cooperatives” and “Dairy/Poultry Venture Capital Fund” with focused objectives. Government is also examining launching of a National Dairy Plan (NDP) drawn up by NDDB, with an outlay of more than Rs 17000 crores spread for over a period of 15 years to enhance average incremental production of milk from 2.5 million tonnes to 5 million tonnes annually to meet the projected demand of 180 MT by 2021-22 (Patel, 2007). This is being envisaged through increasing productivity, expanding infrastructure for procurement, processing, marketing and quality assurance. The NDP would cover the entire country. By 2021-22 it is expected that at least another 140 lakh milk producers would get regular incomes from milk.
Consequent to the opening up of the Indian Dairy Sector, the number of processing facilities has taken a quantum jump. As per the Annual Report 2006-2007 of Department of Animal Husbandry, Dairying and Fisheries, Ministry of Agriculture, Government of India, on 31st March 2006, there were 789 dairy processing units in India registered under MMPO, which had a total milk processing capacity of 31.38 million metric tonnes per year (DAHDF Annual Report, 2006-07). Out of the total number of dairy processing units registered under MMPO, 493 are private dairies having around 14.75 million metric tonnes per year processing capacity, whereas cooperative dairies numbering 246 having around 11.70 million metric tonnes per year processing capacity. The remaining 50 government plants have the processing capacity of around 4.93 million metric tonnes per year.

3.1.3.2 Consumption of Milk and Milk Products

Milk and milk products are an important food for households, both in rural and urban areas, even though the consumption levels vary across income classes and regions. It was reported that during 2005-06, about 50 per cent of the total milk production is consumed in liquid form and 50 per cent is converted to various dairy products. However, only 5 per cent of our total milk production is converted into the western products, such as milk powder, butter, cheese and ice cream, and interestingly, 45 per cent of our milk production is actually converted into various traditional dairy products, such as dahi, paneer, khoa and chhana based sweets (Gupta, 2007).

During 2005-06, smallholding rural households of India engaged in dairying activities account for about 98 per cent of the milk production and only about 2 per cent of the milk production is in urban areas (FSSAI, 2009). Of the total milk produced, about 45 per cent is consumed as liquid milk or used for preparation of traditional dairy products by producer households and the balance 55 per cent is traded. The dairy industry handling the marketable surplus of the milk can be broadly divided into the organized sector and the unorganized sector. The organized dairy sector refers to the dairy units registered under the Milk and Milk Products Order, 1992, rev. 2002 (MMPO). These dairies have
each capacity of handling over 10,000 litres of milk per day. These organized dairies are under co-operative, private or other (like government dairies) sector. The organized dairy sector procures around 33 per cent of the marketable surplus (around 18 per cent of national milk production) while the unorganized sector handles about 67 per cent of the marketable milk (around 37 per cent of national milk production). In the organized dairy sector, the co-operative and government dairies account for about 60 per cent share while private dairies’ share is about 40 per cent. The schematic presentation of milk flow from producers to consumers is depicted in chart 5.

The organized sector, especially co-operative dairy sector, disposes large portion of milk as processed and packaged liquid milk and only surplus is converted into products. About 10 per cent of country’s total milk production is sold by organized dairy sector as liquid milk, about 5 per cent as western milk products and about 3 per cent as various indigenous milk products (Gupta, 2007).

The organized dairy sector has a 100 per cent share in western milk products market. Though the organized sector has entered the market of indigenous milk products like dahi, paneer, shrikhand and gulabjamun, these markets are mostly controlled by un-organized sector. The unorganized dairy sector comprises numerous, small and/or seasonal milk producers/traders (popularly known as ‘halwai’) that are not registered under the MMPO. They are involved in selling raw liquid milk, boiled liquid milk as well as manufacturing and selling mainly indigenous milk products like peda, barfi, rasgolla, khoa, paneer, dahi etc., usually at the local level, but have a major share in these milk products. There are no official records on number of such unorganized dairy units. However, industry estimates have been reported regarding their milk utilization pattern, which suggests that about 22 per cent of country’s total milk production is sold by unorganized dairy sector as liquid milk and about 15 per cent as various traditional dairy products (Banerjee, 2007; Gupta, 2007; Sharma and Singh, 2007).

India is a small player in the world dairy markets. Milk production in India, by and large, meets its demand, and hence exports and imports of dairy products are on a small scale.
India's exports of dairy products were less than 0.5 per cent of the domestic milk production and world exports (Sharma and Singh, 2007).

Chart 5: Milk Flow from Producer to Consumer during 2005-06 (in per cent)

India's major exports are milk powders to Bangladesh, UAE, Philippines and Sri Lanka, and ghee/butter to UAE, Oman, Nepal, Hong Kong, and Singapore. Subsequent to OFP implementation, the import dependence for the urban milk supply almost came to a halt. For last several years India has been a net exporter (Jha, 2007). India's export and import of milk and milk products during 2003-04 to 2007-08 are presented in table 3.
Table 3: India’s Export and Import of Milk and Milk Products

<table>
<thead>
<tr>
<th>Year</th>
<th>Export</th>
<th></th>
<th>Import</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Quantity (Thousand kg)</td>
<td>Value (Lakh Rs.)</td>
<td>Quantity (Thousand kg)</td>
<td>Value (Lakh Rs.)</td>
</tr>
<tr>
<td>2003-04</td>
<td>13813.7</td>
<td>17023.9</td>
<td>17166.8</td>
<td>13389.0</td>
</tr>
<tr>
<td>2004-05</td>
<td>55597.0</td>
<td>62353.2</td>
<td>6932.5</td>
<td>5691.2</td>
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<tr>
<td>2005-06</td>
<td>86454.4</td>
<td>95855.7</td>
<td>3204.0</td>
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<td>2006-07</td>
<td>54028.3</td>
<td>64172.9</td>
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<td>11142.9</td>
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<td>2007-08</td>
<td>84621.8</td>
<td>101862.7</td>
<td>3684.8</td>
<td>6144.9</td>
</tr>
</tbody>
</table>

Source: DAHDF, 2009; MFPI, 2009

Exports of milk and milk products from India are likely to grow over the next decade, which would include various kinds of milk powders, and milk protein and butterfat products. The demand of traditional products among the Indian diaspora in various foreign countries will also increase. Imports of bulk commodities are likely to vary, with higher amounts during certain years when there is a shortage in local availability on account of climatic conditions. While the import demand for consumer items would grow, volumes are likely to be limited to the aggregate consumption of high-income households.

3.1.3.3 Marketing Channels of Milk and Milk Products

Three types of supply chain models have evolved in organized Indian dairy sector. These are consisting of cooperative, private and government (Banerjee, 2007). The prevailing supply chain models of Indian organized dairy sector are schematically presented in chart 6.

In the cooperative supply chain milk producers supply their raw milk to village dairy cooperative societies; from there the milk goes to district milk union. Sometimes bulk of village milk gets chilled in a chilling centre or in bulk cooler tank, before supplying to district milk union dairy. District milk union either processes the raw and/or chilled milk or converts it into various value added milk products. The processed milk and/or milk products are directly sold to the consumer either through dairy union’s own milk parlours or through marketing channels in the local markets.
In cases, district union forward the processed milk and/or milk products to state level dairy cooperative federation for selling to domestic market or for exporting to foreign countries. In certain states, village dairy cooperative or district milk union supplies raw or chilled milk to various government dairies for further processing.

For procurement of raw milk, private dairy plants mainly rely on the milkmen or milk contractors. Sometimes they receive milk directly from producers or through producers’ associations engaged in collecting raw milk from producers. Private dairies after processing and value addition sell the products to consumers using various marketing channels. In recent years, certain big private dairy corporate are using own outlets or other modern format stores for retailing (Sharma and Singh, 2007).
Though the share of government dairies in Indian dairy sector is diminishing, it is still important in certain city milk supplies (Goswami, 2007). Few government dairies still maintain their own dairy farms for supply of raw milk; others collect milk from various sources, such as cooperatives, private dairies. After value addition, it reaches consumers through the marketing channels.

As stated earlier, organized dairy sector handles only 33 per cent of the country’s total marketable surplus milk. Rest of the milk is handled by the unorganized or traditional or informal sector. In this sector, milk is ultimately sold to the consumer either as milk or in the form of various traditional dairy products after passing through different supply chains, which are schematically depicted in chart 7.

**Chart 7 : Supply Chain Models of Indian Unorganized Dairy Sector**

![Supply Chain Models of Indian Unorganized Dairy Sector](chart.png)

RM: Raw Milk; TDP: Traditional Dairy Products

Source: Sharma and Singh, 2007
In the unorganized dairy sector, the loose raw milk is sold directly to the consumers by the small milk producers either directly or through the milkmen or contractors who act as middlemen (Sharma and Singh, 2007). These middlemen also supply raw milk to the sweetshops and local creameries and to the manufacturers of traditional dairy products, who in turn convert the same to value added traditional dairy products and sell to the consumers in local markets, mostly through the traditional retail outlets. In cases, milk producers supply milk to sweetshops and traditional dairy product manufacturers.

3.2 Traditional Dairy Products in Indian Dairying

Historically, dairying has been an unorganized activity in India. Starting from the early twentieth century, with the policy and institutional support from the subsequent governments, the organized dairy sector has been evolved in India providing sustenance to millions of small and marginal farmers. However, this sector is still handling only one third of the country’s total marketable surplus milk. Rest is handled by the unorganized sector and in this sector 40 per cent milk is converted into various traditional dairy products.

According to the International Dairy Federation, India is the country where the number of traditional dairy products produced and consumed is the highest and the demand for these products is continually growing (IDF, 2007a). So traditional dairy products are a great opportunity for the modern dairy sector of India to scale up their production and improve product quality. Since time immemorial traditional Indian milk products have been an inseparable part of the socio-cultural life of India. Be it childbirth, wedding ceremony, getting a new job, inauguration of new house, feasts, festivals, social or religious occasions, milk sweets are always offered. The mass appeal enjoyed by the indigenous sweets and other traditional dairy products is underlined by the fact that about half of country’s total milk production is utilized for making these products.
3.2.1 Product Profile

Under tropical weather conditions, milk belongs to those foodstuffs that can easily spoil, so for thousands of years, people in India have mastered methods that enable them to process milk, yet maintain its healthful attributes in dairy products. At present, there are around one hundred and fifty milk based indigenous products available in India. Milk produced in excess of the daily requirements for direct consumption was traditionally converted into various dairy products with a longer shelf life and thus the different methods of preservation of milk began. The products developed, have followed age-old methods of preservation and conservation through heat desiccation, fermentation, coagulation and clarification. The aim is to recover the maximum output through tiny scale or household level processes and technologies that are adequate and appropriate to local situations, resources and food habits.

In chart 8, major variants of traditional dairy products have been classified on the basis of their manufacturing methods. The three main unit operations used for conversion of milk into traditional dairy products are fermentation of milk using bacterial culture, condensation of milk by heating and coagulation or acid precipitation of milk. Apart from these three, churning, separation, mixing, freezing, frying etc. are also used to prepare the whole range of indigenous milk products. Several authors have discussed various aspects of traditional dairy products in their books (Rangappa and Acháya, 1974; De, 1980; FAO, 1990; Aneja et al., 2002). On the basis of their work, a brief outline on the important variants of traditional dairy products are compiled:

Dahi: It is the most important fermented milk product used in India from times immemorial. Cow or buffalo milk or a mixture of the two is used. It is boiled and sometimes concentrated before addition of the starter culture which is usually a portion of the previous day's dahi. Dahi has a pleasant flavour and a clean acid taste. It has a yellowish creamy-white colour when made from cow milk and a creamy-white colour when made from buffalo milk. It has a smooth and glossy surface. The body is firm but not hard and free from gas holes. Dahi is widely consumed all over India.
Chart 8: Flow Chart of Conversion of Milk into Indian Traditional Dairy Products

**Milk**

- **Culture**
  - Dahi
  - Churn
  - Stir
  - Makhan Chhas Lassi
  - Kadhi
  - Mishti Doi
  - Drain whey
  - Heat clarify
  - Chakka Ghee
  - Mix sugar
  - Shrikhand
  - Concentrate
  - Shrikhand Vadi

- **Condensed**
  - 1:1.5 → Concentrate Paneer & boil with rice & sugar
  - 1:1.5 → Press → Drain whey

- **Acid precipitation**
  - Concentrate Paneer
  - Chhana
  - Sugar coat pieces
  - Kheer
  - Chhana Murki
  - Concentrate and 1:4 → Concentrate partially heat clotted & sugar
  - Rabri
  - Heat & mix with sugar
  - Barfi
  - Peda
  - Kalakand
  - Mix with wheat flour & deep fry portions
  - Boil portions in sugar syrup
  - Gulab Jamun portions
  - Pantooa → Mix with wheat flour deep fry portions
  - Rasogolla → Serve in sugar syrup
  - Rasmalai → Serve in condensed milk

Source: FAO (1990); Aneja et al. (2002)
**Lassi : Dahi** is converted into this refreshing beverage by stirring and adding a small quantity of water. It is best consumed chilled, and either sweetened or salted. It is a preferred drink in the northern parts of the country particularly the Punjab and Haryana. It is known to induce sleep particularly after consumption during the summer afternoons.

**Shrikhand : Shrikhand** is made from concentrated dahi with a sweet and sour taste. It is a semi-soft whole milk product. Shrikhand is traditionally made at home in western India. Dahi is placed in a muslin cloth and drained for 4–8 hours to reduce the whey content and produce a solid mass called chakka or maska. Chakka is mixed with the required amount of sugar, condiments and flavour to produce shrikhand.

**Shrikhand Wadi :** This product is obtained by further concentration of shrikhand as prepared above by heating in an open pan over a direct fire until it forms a hard mass.

**Makkhan :** Makkhan is the traditional unsalted butter made by hand churning whole milk dahi. Beginning from the vedic times (3000 to 2000 BC) there is recorded evidence to show that makkhan was extensively used by the early inhabitants of India; both in dietary and religious practices. The milk of the buffalo, by virtue of its higher fat content and larger fat globules gives higher yields and is preferred. White makkhan from buffalo milk is generally preferred to the yellower product from cow milk. The dahi is set in an earthenware pot. Churning is done with indigenous wooden churning devices at ambient temperatures. The cooler morning hours are preferred for churning. The product made from buffalo milk has a harder/firmer body and a more granular texture than that from cow milk. It has a pleasant mild acid flavour. The makkhan formed in the churn is hand scooped or removed with a wooden ladle or perforated scoop. Makkhan is used in small quantities for direct consumption with the traditional unleavened bread (chapati or parontha) or boiled rice and other items of food. Household surplus of makkhan is used mainly for conversion into ghee.

**Ghee :** Ghee originated in India long before recorded history. The name has its origin in the Sanskrit word meaning ‘bright’. The Vedas contain many references to ghee. Its main
use is for frying of food and its main advantage over butter from which it is traditionally prepared is its superior keeping quality derived from the almost complete removal of water during the making process. The boiling process drives off moisture and reduces the water content to well below one per cent so effectively preventing microbial growth. At the same time the boiling process destroys spoilage bacteria, all pathogens and inactivates some of the enzymes resulting from bacterial growth in the milk and butter. In India ninety per cent of the ghee is produced by the traditional method of making unsalted butter (makkhan) first and then converting it into ghee. Ghee made from makkhan has a firmer consistency, better crystalline texture and reputedly a better shelf-life than the product made in factories. Makkhan is placed in a metal vessel and heated to about 110 to 120°C with constant stirring over a low fire to evaporate the moisture. When practically all the moisture has been removed, further heating is avoided by removing the vessel from the fire. After the residue has settled down on cooling, the clear fat is decanted into suitable containers.

Chhaas (Buttermilk) : Buttermilk produced by the churning of soured milk (dahi) is known as chhaas or chhach. The fat content is usually from 1–2 per cent and it is rich in protein and lactose. Chhaas is mostly consumed in the household and surplus is fed to cattle.

Kadhi : This product is made from chhaas by a recipe which varies from region to region. A blend of spices, of which the common ingredients are salt, black pepper, green chillies, turmeric, coconut, and ground cumin are added with a small amount of Bengal gram flour to an appropriate quantity of chhaas and the mixture is brought to boiling point. It is then served hot with rice. In some regions of the country, small balls made out of besan (Bengal gram flour) dough and fried in oil are added to kadhi and served as a curry.

Mishti doi : The sweetened concentrated form of dahi consumed in Bengal is known as mishti doi i.e. sweet dahi. A sweetened variety of dahi known as mishti doi, mishti dahi, lal dahi (red dahi) or payodhi in the eastern region of the India is very popular. Cane
sugar is added to the milk before boiling. Artificial colour, caramel and jaggery may also be added. The milk is cooled to 40–45°C and incubated for 12–15 hours.

**Kheer** : It is a sweetened product of thick consistency resembling rice pudding commonly consumed in the West. The product is prepared for immediate consumption. It is produced in northern, western and central regions of the India. This product is widely consumed in the regions mentioned above. *Kheer* is prepared by concentrating whole milk in open pans with the addition of sugar, rice, *ghee*, cashew nuts, cardamon and other spices. A sweetened product, similar to *kheer*, produced in Southern India is called as palpayasam. Vermicelli or semolina may be substituted for rice, fruits like jack fruit are optional.

**Basundi** : A concentrated milk to which sugar, flavours and nuts are added. The product is served chilled as a dessert. The origin of the product is not known but it has been traditionally prepared for centuries in the western part of India as a dessert, served on special occasions such as weddings. Milk, in a shallow pan is boiled on a low flame. The heat coagulated film that appears on the surface of the milk is collected and spread on the sides of the vessel. The volume of milk is reduced to 50 per cent of it's original volume. The pan is removed from the fire and sugar is added along with nuts and flavours. The mass is mixed until the sugar is dissolved. The product is cooled and served chilled. *Basundi* looks like condensed milk with flakes. It has a light brown colour with thin flakes in a thick fluid. It has a pleasant flavour similar to condensed milk. The cooked flavour is relished by the consumer.

**Rabri** : A specially prepared concentrated and sweetened whole milk product containing several layers of clotted cream. It is a sweet by itself and is not much used as a component of other sweets. It is produced in Northern and eastern regions of India normally from buffalo milk. Buffalo milk is normally used since it produces a more creamy and chewy consistency. In comparison to cow milk the higher fat and casein contents of buffalo milk contribute to the formation of a greater volume of creamy layer early in the evaporation process. Milk (3–4 kg) is heated in a fairly shallow pan over an
open fire and allowed to simmer; sugar is added and evaporated to one eighth of the original volume. The preparation time is about 30 minutes depending on the rate of boiling. The finished product consists of non homogeneous flakes partly covered by and partly floating in sweetened condensed milk. By heating the concentrate slightly at the end, a more homogeneous chewy-textured mass is obtained.

**Kulfi** : This indigenous ice cream is based on milk and is popular in the hot summer. It is frozen in small containers. The preparation of *kulfi* involves concentration of a milk and sugar mixture to 50 per cent volume. It is cooled before addition of cooled cream, crushed nuts and selected flavourings. The milk is added to moulds and frozen in a vessel containing an ice and salt mixture with a 1:1 ratio.

**Khoa** : This product is obtained from cow, buffalo or mixed milk by thermal evaporation of milk to 65–70 per cent solids in an open pan. A five times concentration of milk is normally required for the production of *khoa*. *Khoa*, also khawa or mawa, is used as a base material for a variety of Indian sweets. Its origin is not known but it has been prepared for centuries in India as the base material for sweets. It is made by the traditional method by milk traders and *halwais*. *Khoa* preparation has been the easiest way of preserving rurally-produced milk in the flush season. In many places *khoa* manufactured in January - February is cold-stored for use in the summer season. Such *khoa* acquires a green colour due to mould growth on the surface. It is therefore known as hariyali (green *khoa*). This *khoa* is preferred for the preparation of *gulabjamun* as it gives a grainier texture to the product. *Khoa* is classified in 3 major types depending upon the specific uses. Types of *khoa*, their composition and uses have been described in table 4.

**Table 4 : Composition and Uses of Different Types of Khoa**

<table>
<thead>
<tr>
<th>Types</th>
<th>Fat (%)</th>
<th>Total Solid (%)</th>
<th>Specific Sweets Prepared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pindi</td>
<td>21-26</td>
<td>67-69</td>
<td><em>Burfi, Peda</em></td>
</tr>
<tr>
<td>Dhap</td>
<td>20-23</td>
<td>56-63</td>
<td><em>Gulabjamun, Pantooa</em></td>
</tr>
<tr>
<td>Danedar</td>
<td>20-25</td>
<td>60-65</td>
<td><em>Kalakand</em></td>
</tr>
</tbody>
</table>

Source: Aneja et al., 2002
Milk of high acidity produces a granular khoa known as danedar. Khoa has a uniform whitish colour with just a tinge of brown, a slightly oily or granular texture, and a rich nutty flavour which is associated with a mildly cooked and sweet taste due to the high concentration of lactose. Buffalo milk is preferred for khoa making because it yields a whiter product with a soft, loose body and a smooth granular texture which makes it suitable for the preparation of high-grade khoa sweets. A minimum of 4 per cent fat for cow milk and 5 per cent fat for buffalo milk is necessary to obtain a desirable body and texture in khoa. Lower levels of fat result in undesirable hard body and coarse texture. The traditional trade usually pays for milk on the basis of the yield of khoa. Cow milk usually yields 18 per cent of khoa. The yield from buffalo milk is usually 20 per cent.

**Peda:** It is a sweet delicacy prepared from khoa and sugar. Its colour is whitish to yellow and it has a coarse, grainy texture. The quantity of peda produced in India exceeds any other indigenous milk-based sweet using khoa as the raw material. Peda or doodh peda is prepared on a small scale by halwais using khoa as the base material mixed with sugar and flavourings. Khoa and sugar are mixed in the ratio of 3:1. The khoa and sugar mixture is warmed and mixed in a pan on a gentle fire until firm balls are formed. The pan is removed from the fire; nuts and flavouring materials are added, if desired. Some traders use permitted colours to obtain peda of different colours and in particular saffron to obtain kesar peda, one of the preferred types of peda. The contents are mixed thoroughly and made into balls of 15–20 g size by rolling them between the palms of the hands after having rubbed the hands with little ghee. The product may also be formed into different shapes and sizes using different dies and moulds. Peda is usually packed in paperboard cartons with a parchment paper of grease proof paper liner. It is usually sold through confectionery shops.

**Burfi:** Burfi is another khoa-based sweet. Khoa is put to an open pan over a low fire. Sugar is added and vigorously mixed to dissolve the sugar and form a smooth mass. Nuts and flavourings may be added during heating to produce different types of burfi. The mixture is poured into a tray greased with ghee, spread uniformly and allowed to cool. The mixture is poured into a tray greased with ghee, spread uniformly and allowed to
cool. On cooling the mass sets into a firm product which is cut by knife into the desired shapes and sizes and decorated with foils to increase the appeal. *Burfi* is packed in paper board cartons linked with parchment or greaseproof paper. The product is white to light cream in colour and smooth to granular texture.

*Kalakand*: This is another popular *khoa*-based sweet. *Kalakand* is made from *danedar* (granular) *khoa*. Citric acid is added to *khoa* during the heating process to form well-defined grains. When a semisolid stage is reached, sugar is added and mixed in. Flavourings and nuts may also be added at this stage. After five minutes the heated mixture is transferred to a tray greased with *ghee* for cooling and setting. When cooled to room temperature the firmly set product is cut to the required shape and size. The sweet has light caramel colour and a granular texture and firm body.

*Gulabjamun*: It is a *khoa*-based sweet soaked in a thick sugar syrup, generally served warm as a dessert. It is very popular in across the country, especially in northern and western part of the country. *Khoa* is mixed with wheat flour and baking powder and kneaded into an uniform dough. The dough is rolled into small balls and deep fried in *ghee* in a shallow pan until the balls acquire a golden brown colour. The balls are then removed and placed in sugar solution and allowed to soak for a few hours before being served. The product is round or cylindrical in shape, dark brown in colour and has firm body and smooth texture soaked in thick sugar syrup.

*Paneer*: *Paneer* is also the Hindu name of the seeds of Withania coagulans, the basis of a vegetable coagulant that yields a bitter curd. Curdled milk products obtained by the admixture with sour milk, pieces of a creeper called Putika, the bark of Palasa trees or Kuyala (Jukuke) was known to the ancient Indians. However the curdled milk product, *paneer*, seems to have been introduced into India from the Middle East perhaps by Persian and Afghan invaders.

It is only in the past four decades that consumption of *paneer* has spread to other parts of
India. It enjoys the status of haute cuisine amongst Indian vegetarian cooking. *Paneer* consists mainly of acid-coagulated milk solids and is used extensively as an ingredient in many cooked vegetable preparations in Northern India. It is produced at small scale in *halwai* shops. Cow, buffalo or mixed milk may be used but buffalo milk is preferred.

In the traditional technology, first, milk is heated to boiling point. Coagulation is obtained by adding the required amount of acid coagulant to the milk which is kept under stirring. The coagulant must be added in a thin jet in not more than a minute. When the whey is clear, it is drained off by hanging the curd in a cloth and later by pressing the *paneer* into blocks in hoops. Thereafter, *paneer* is removed, cut into pieces of suitable sizes and dipped in chilled water for 3–4 hours to increase its firmness. *Paneer* is usually not packed and is sold after cutting.

*Chhana*: It is a product obtained by thermal and acid coagulation of milk, and is a base for many traditional sweets, such as *sandesh, rasogolla, rasamalai*. Traditionally, hot milk coagulation is carried out by addition of sour whey. It differs from *Paneer* in that no pressure is applied to remove the whey. *Chhana* is widely used in the eastern parts of India. Chhanna is also produced in rural milk sheds and transported by road and rail to larger urban conglomerates in wicker baskets which allow further drainage of whey.

*Chhana* from cow milk is light yellow in colour, has a moist surface, soft body and smooth texture. *Chhana* derived from buffalo milk is whitish in colour. Both have a pleasant sweetish, mildly acid taste. Buffalo milk yields a larger amount of chhanna. Cow milk is preferred since it yields a soft bodied and smooth textured product. Both these characteristics are suitable for the production of high grade *chhana* sweets. Buffalo milk produces a *chhana* with a slightly hard body, a greasy and coarse texture, and does not produce certain varieties of *chhana* sweets. The legal requirements of *Chhana* requires a maximum moisture content of 70 per cent and a minimum content of milk fat in dry matter of 50 per cent (PFA, 2006).
**Chhana Murki** : Prepared from chhana, this sweet is in the shape of cubes coated with sugar. It is produced in the northern and eastern regions of India. Chhana is kneaded and cut into small cubes of about 1 cm. The cubes of chhana are then cooked in boiling sugar syrup until firm. Cooked cubes are then removed from the syrup and after cooling are coated with sugar. They are sometimes flavoured and coloured. This sweet has a firm body and a close texture.

**Sandesh** : It is one of the most popular and oldest Bengali sweet forms. Boxes of sandesh (message) are a harbinger of good news. A box of it accompanies the good news that a family wishes to announce in its social circle. It is a chhana based sweet with a somewhat firm body and a smooth texture. As per the estimate of IDF (2007a), utilization of chhana for sandesh making is greater than that for all other Indian traditional sweets. Chhana and sugar are mixed and kneaded together and heated in a shallow vessel after addition of colour and flavour. The heated mass is removed directly into moulds to give fancy shapes, viz., shell, flower, fish etc. The sweets are now ready for eating. Alternatively, the processed mass is put into a tray, cooled and set. It can then be cut into desired shapes or moulded into required forms.

There are two types of sandesh available. One is a drier variety made from old chhana. This is normal quality sandesh and has a longer shelf-life than the second type which is softer and is more expensive. It is made from fresh chhanna. A third type of sandesh, known as nalen gurher sandesh, is prepared from date jaggery (date gur) between November and February, when dates are plentiful. This product is considered a delicacy and commands a much higher price.

**Rasogolla** : This sweet is of comparatively recent origin having been developed in 1868 by an enterprising Calcutta sweetmeat maker Nobin Chandra Das. It is prepared using fresh and soft chhanna. This sweet is in the form of balls 30 mm in diameter with a typical spongy body and smooth texture, which is stored and served in sugar syrup. Freshly made chhanna is squeezed by hand in a muslin cloth to remove as much whey as possible. The chhanna is kneaded thoroughly by hand to make dough. The dough is portioned and rolled

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66
into balls of about 15 mm diameter having a smooth surface with no cracks. The dough balls are cooked in specially prepared whey based medium for about 15 minutes. For chhana made from cow milk, cooking medium with sugar is preferred, and for all other types of chhana, cooking medium without sugar is preferred. After the cooking is complete, the balls are transferred to a container with water at 30–35°C for texture stabilization and colour improvement of the balls. After 5–10 min of texture stabilization in water, the texture stabilized balls are transferred to sugar syrup. The product finally acquires the desired sugar concentration after equilibration between the sugar syrup inside and outside the balls is achieved.

Rasmalai: It is a sweet based on chhana and stored in thickened milk with added sugar. The product is popular in eastern and northern India. Chhana with 1 to 4 per cent of added wheat flour is kneaded into a smooth dough, portioned and rolled into balls having a smooth texture free from cracks. The balls are processed like rasogolla and subsequently stored in thickened milk (to a quarter of its volume by heating) with added sugar.

Pantooa: This is another chhana based sweet, similar to gulabjamun which is prepared from khoa. It is also very popular product in eastern India. The mass is kneaded into in to an uniform dough, portioned and rolled into balls by hand. The balls are fried in a shallow pan using ghee or edible oil till the balls are deep brown in colour. The balls are removed from the pan and placed in sugar syrup and soaked for a few hours before being served.

3.2.2 Practice and Problems of Traditional Dairy Products Manufacturing

The collection, transport and distribution of fluid milk under the tropical conditions prevailing in India present many difficult problems. The production of milk in villages takes place on a very small scale in numerous scattered holdings, which makes the task of collection difficult. Many villages are not connected by good roads, and many more are inaccessible during the monsoon rains. There are no facilities for cooling or refrigeration
of milk on receipt at a village collection centre and rapid transport to a processing centre is hampered by lack of facilities and infrastructure. Under these conditions, procurement of milk of suitable quality in a condition fit for processing into marketable products is a formidable organizational task which has been performed well by many dairy cooperatives on a fairly large scale. However, they presently handle only about 16 per cent of our country’s marketable milk surplus and reach out to only 15 per cent of milch animal households in just about 20 per cent of our villages (Patel, 2007). This necessitates the conversion of large chunk of surplus milk into various indigenous dairy products in small scale for extending the shelf life of this highly perishable and nutritious commodity. Due to this, a big unorganized sector has emerged in traditional dairy product manufacturing, which caters products of regional preferences in the local markets.

Traditional dairy products are produced using simple manufacturing technologies, which are well established for small scale operations. Traditional dairy products require low infrastructure and operational overhead cost. Manpower with the required skill is also available in plenty. This sector is helping in upliftment of rural people through creation of mass employment, and improvement in the economical and nutritional status. Conversion of milk into various indigenous products enables in significant value addition, unparalleled by other dairy products. Cost of production is low and profit margin is high for traditional dairy products. The operating margins in traditional products are also much higher than those for the western dairy products as is evident from table 5.

According to Gupta, 2007, the market size of Indian traditional dairy products exceeded Rs 1000 billion in 2003-04 (table 6). Of this, the share of organized sector was just over 10 per cent. However, the size of the market speaks volumes about the tremendous potential of this product category. In spite of the fact that the traditional milk products have very high palatable characteristics and nutritional profile, their manufacturing has remained largely confined to small level operations, which is manual. Uniformity of quality of product in such operations is dependent solely on the skill of the *halwais*. Quality control measures are seldom exercised and the keeping quality of the product is
generally poor. The small-scale operations are associated with inefficient use of energy, fatigue of operators, poor hygiene and sanitation and non-uniform product quality, little or no packaging and labelling for protection and communication of nutritional quality and shelf life. The equipments used in traditional methods of manufacturing indigenous dairy products have poor hygienic design and labour intensive.

Table 5: Raw Material Cost as a Percentage of Sale Price

<table>
<thead>
<tr>
<th>Product</th>
<th>Raw material cost as percentage of sale price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market milk (bulk vended)</td>
<td>90</td>
</tr>
<tr>
<td>Market milk (packaged)</td>
<td>80</td>
</tr>
<tr>
<td>Milk powder/butter</td>
<td>70</td>
</tr>
<tr>
<td>Paneer</td>
<td>65</td>
</tr>
<tr>
<td>Peda/burfi/kalakand</td>
<td>35</td>
</tr>
<tr>
<td>Rasogolla</td>
<td>33</td>
</tr>
<tr>
<td>Sandesh</td>
<td>39</td>
</tr>
<tr>
<td>Gulabjamun</td>
<td>34</td>
</tr>
<tr>
<td>Shrikhand</td>
<td>29</td>
</tr>
</tbody>
</table>

Source: FAO, 2002

Table 6: Market Size of Traditional Dairy Products, 2002-03 (Rs. Billion)

<table>
<thead>
<tr>
<th>Type of products</th>
<th>Intermediate products</th>
<th>End products</th>
<th>Estimated market size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acid heat coagulated</td>
<td></td>
<td>Paneer</td>
<td>20</td>
</tr>
<tr>
<td>products</td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Heat desiccated products</td>
<td>Chhana</td>
<td>Rasogolla, Sandesh, Pantoa, Rasmalai etc.</td>
<td>80</td>
</tr>
<tr>
<td>Fat rich products</td>
<td>Khoa</td>
<td>Peda, Burfi, Gulabjamun, Kalakand, Rabri, Basundi, Kheer, Kulfi etc.</td>
<td>375</td>
</tr>
<tr>
<td>Fermented milk products</td>
<td>Dahi, Chakka</td>
<td>Ghee, Butter/Makkhan etc.</td>
<td>270</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>40</td>
</tr>
</tbody>
</table>

Source: Gupta, 2007
But the main problem in the unorganized sector is the quality, which creates a serious threat to the health of consumers. Unhygienic production conditions, substandard processing equipment, improper use of veterinary drugs, and the improper handling, storage and transport of milk contribute to the poor quality of traditional milk products in the unorganized sector. The large informal sector exists partly because consumers are not willing to pay the additional costs of processing and packaging, which can raise retail prices of products by 50 to 100 per cent (Banerjee, 2007). Moreover, consumers often consider the products obtained from reliable vendors as fresh and of better quality than processed dairy products (Sharma et al., 2003).

Another major problem encountered in traditional dairy product is rampant adulteration, especially during the festive seasons. During festive seasons the demand for milk and milk based sweets increase dramatically creating a huge supply demand gap. The festival season sales in many areas account for 30 to 40 per cent of the annual sales of traditional milk based sweets (DTSI, 2005). In order to meet the increased demand, traditional product manufacturers often resort to addition of cheaper and inferior quality ingredients as substitute for milk solids. The problem also aggravates due to the dominance of middlemen, who supply raw milk to the traditional product manufacturers. Due to absence of formal quality control system in the whole chain, the adulteration goes unchecked. In recent past, considerable media attention has generated lot of consumer awareness on this issue and a gradual shift in consumer preference towards branded packaged product has been noticed.

The organized dairy sector has been paying increasing attention, though not adequate, on improving quality of products. Enforcement of rules is also concentrated mostly on this sector, while the unorganized dairy sector largely remains unattended. As a result business operators in the unorganized sector pay little importance to quality, except some reputed sweetmeat shop owners who maintain relatively good quality standards. There are no institutional supports similar to cooperative and private dairies, provided by the governments, both at the Central and State level, for development of dairying in the unorganized sectors. Besides, the government is neither funding nor giving any policy
support to the unorganized (informal) sector for their sustenance. Nonetheless, the unorganized sector do derive lateral benefits of the government policies, time to time initiated towards the overall growth of the country’s dairy sector.

3.2.3 Current Trends in Modernization of Traditional Dairy Products Manufacturing

Of late Indian organized sector has put efforts towards modernization of traditional dairy products. Last decade has seen the mechanized production and organized marketing of several popular dairy products, which were earlier in the domain of unorganized sector. As per the National Dairy Plan (DAHDF, 2009), the one third share of organized dairy is projected to be increased to more than two third of marketable surplus of milk production of the country in 2021-22. This clearly indicates the bigger involvement of organized sector in manufacturing of traditional dairy products. Already, products like dahi, paneer, shrikhand, few khoa and chhana based sweets, lassi, chhas etc. are sold by national and regional players. The research and development activities of National Dairy Development Board has helped the cooperative dairies, which virtually represent the organized sector in the country, in mechanized production and organized retailing of traditional products. According to NDDB Annual Report (2004-05) the production of paneer and dahi and dahi based products by cooperative dairies of the country showed an average growth of 20 to 25 per cent during 1999-2000 to 2003-04. The product profile of cooperatives indicates relatively higher success in the marketing of peda (southern unions), shrikhand (western unions), dahi (across the country) and paneer (northern and western unions). Other products, which show high seasonal sales, include buttermilk, curds and lassi.

Research efforts of National Dairy Research Institutes have also helped the organized players in scaling up the production of traditional dairy products with improvement in quality of products (NDRI, 2009). It seems that such developments in production, packaging and distribution are driving the shift from the non-organized to organised commercial business in the traditional milk product market. Above all, these trends have also opened up opportunities for branding and regional and national marketing of
traditional milk products. The packaging developments will continue to play an important role in favourably influencing consumer preferences and achieving greater market penetration. *Shrikhand* is an example, where packaging has helped in enhancing the shelf life and achieves a higher market penetration. The enhancement of shelf life of vacuum-packed tinned *rasogolla* to six months and its availability in many brands have facilitated its further market penetration.

The most modern plant manufacturing traditional dairy products is the Sugam cooperative dairy at Baroda marketing its products through a large network of 150 retail outlets in the city. The Sugam Dairy uses the traditional grocery/general stores that have a refrigerator to market its products. The product range includes *shrikhand*, *gulabjamuns*, *peda* and *lassi*. The dairy has the highest turnover of a single unit marketing traditional dairy products (Gupta, 2007).

Improvements in the hygiene levels will also help meet the sanitary and phyto-sanitary requirements under the World Trade Organization regimen, which are essential for their export. A major market for Indian milk based sweets is developing overseas. In North America alone, this market is estimated at US $500 million. Some 20 million Indians, over half of them living in the West, are part of the upper income group. The highly successful Indian community is reported to have an annual income of US $300 billion—almost three times India's GDP. Amul is successfully exporting *shrikhand* and *paneer* to all over the world. The Indian diaspora presents an exciting avenue for globalization of mithais. Entrepreneurs in Europe, North America and Australia are looking into the prospects of manufacturing them, as is evident from an increasing number of enquiries received in India for equipment to manufacture *paneer, khoa, shrikhand, gulabjamun*, etc. A Canadian initiative, IDP Foods, Inc, to produce Indian milk products in North America, has gone on stream in June 2002. It is the largest attempt outside India to make ethnic Indian dairy products on an industrial scale (Aneja *et al.*, 2002). Indian mithais have good commercial market in developed countries where the share of food in the overall household expenditure is small.
3.3 Summary

Operation Flood programme has made India self sufficient in milk production. India today is the world’s largest and fastest growing market for milk and milk products. Indian dairying is maturing to a vibrant industry to face future challenges. Various aspects of organized dairying have been studied in great details. However, there is a general lack of literature and secondary data on production and marketing of traditional dairy products.

The major strength of traditional dairy product sector is mass appeal of such a wide variety of products. The market for these products far exceeds the market for western dairy products like milk powder, table butter and cheese. It can be safely stated that increased demand for these products by consumers, presents a great opportunity for the dairyman.

The traditional dairy products industry in India, like its agricultural economy, is grossly under managed. The major weakness of this sector is lack of hygiene in the preparation and handling of traditional products and their short shelf-life. The preparation and marketing of these products is generally done by *halwais* and that limits the expansion of this industry. Some of these products are very fragile and delicate to process and handle, their preparation requires a great deal of manual skills. Lack of suitable packaging materials and techniques for packaging of these products, is another constraint that needs to be overcome. The phenomena are very significant for ethnic milk based sweets, specially their base products, namely, *khoa* and *chhana*.

A very large part of country’s milk production is converted into these two intermediate products. The business opportunities provided by these products call for a thorough study with a view to exploit these opportunities for increasing incomes of milk producers. It also provides a great opportunity for marketing of hygienically prepared and properly packed products to a large population that has so far been used to unhygienically produced products. The method of preparation of these products by traditional methods needs to be studied and well documented on a scientific basis. The technological
parameters as well as their economics, distribution and marketing should be further researched, with a view to developing a system required for large scale manufacture of these products.

After studying the traditional dairy products in context of Indian dairying, dairying in West Bengal has been studied and discussed in Chapter 4.