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DAIRYING IN INDIA

- A SUCCESS STORY

BY

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FOREWORD

Asia Pacific Association of Agricultural Research Institutions (APAARI) has recently started a series, in which success stories based on realized gains through adoption of specific new technologies are being published for the benefit of others in the region. Earlier, three success stories have been published. These are:

1. Baby corn production in Thailand
2. Tilapia farming in the Philippines
3. Hybrid Rice in China

In this publication, details relating to dairy development in India are given. Dairy movement in India led to spectacular increases in milk production since independence. From 17 m. tonnes in 1950, it has touched 61 m. tonnes mark during 1993-94. These developments are known world over as "White Revolution". Many countries could learn from the experiences gained in India and improve their milk production capabilities. Efforts made by Dr. R.P. Aneja in getting this information compiled are indeed commendable. I am sure the readers would find this publication both interesting as well as informative.



(R.S. Paroda)
Executive Secretary
APAARI

3 December, 1994

DAIRYING IN INDIA

- A SUCCESS STORY

I. IMPORTANCE OF DAIRYING IN INDIA

India is the world's second most populous country having a population density of 230 persons per sq km. The current population is over 900 million. Most of the rural population is still dependent on agriculture. Agriculture which used to account for as much as 54.6 per cent of the gross domestic product now accounts for around 32 per cent of the GDP as shown in Table 1:

Agricultural prices have remained more or less stagnant in the global markets for a long long time adversely affecting the prices of agricultural produce in India and reducing the share of agriculture in the country's Gross Domestic Product. Agriculture seems to have



Murrah Buffalo - a National Pride

Table 1: Sectoral Shares of Gross Domestic Product

Year	(Percentage)			
	Agriculture	Industry	Services	Total
1951-52	54.60	16.10	29.30	100
1961-62	45.00	21.40	33.60	100
1971-72	43.40	22.70	33.90	100
1981-82	36.70	26.70	36.60	100
1991-92	32.10	27.30	40.60	100

become the root cause of Indian poverty. India's rural economy has so far been unable to absorb the increasing rural populations in productive activities. This has resulted into large scale migration of people from rural areas to urban areas. The rural poverty, is therefore, transmitting itself into urban slums as people are moving into cities looking for jobs that are non-existent and further stretching the urban infrastructure like housing, water supply, drainage, etc.

**Village Milk Collection Centre**

Milk production which is a very labour intensive occupation has provided a silver lining to the otherwise grim scenario where almost 40 per cent of people in India live under the poverty line. India's milk production has nearly tripled over the past two decades and milk has now become the largest single agricultural crop (by value). Milk in India, is a by-product of its agriculture. Most of the milk production comes from crop residues like wheat straw, paddy straw, maize, sorghum and millets stalks. Dairy farming in India is characterized by the conversion of crop residues and agricultural by-products which cannot be consumed by human beings into the nature's most perfect food. It is converting agricultural products of low economic value into a highly valued food.

Milk production in India had more or less remained stagnant from 1950 to 1970 resulting into the lowering of per capita consumption from 132 gms per day in 1951 to 107 gms per day in 1970. The near tripling of milk production over the past two decades has reversed this trend and the average per caput consumption of milk is now 193 gms per day as shown in Figures 1 and 2.

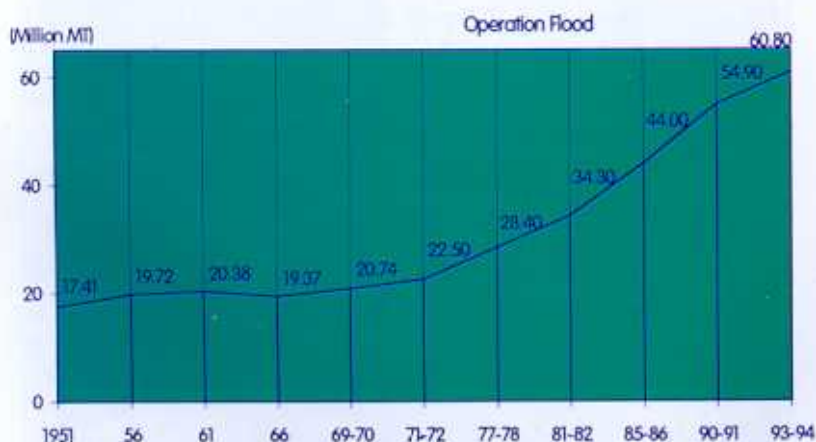


Fig. 1: Milk Production in India

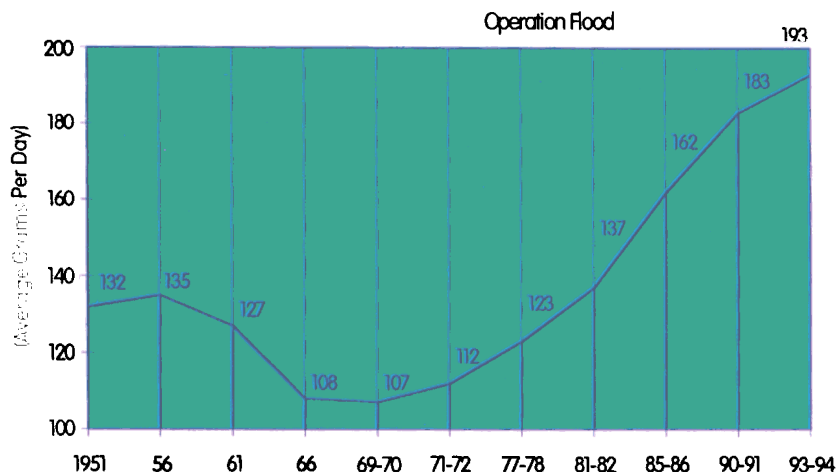


Fig. 2: Per Caput Milk Consumption in India

Milk production in India is also characterized by the fact that almost every farmer and a large proportion of landless agricultural workers in India are milk producers. An average Indian farmer has just about 1 hectare of land of which only about 30% is irrigated and the crop intensity is only 1.3. A typical farming household has a family of 6 members and 3 cows or buffaloes of which only one is usually in milk. India has 100 million farming families, about 100 million hectares of cropped land, a bovine population of 250 million of which only 80 million are milch animals (females over 3 years). A farming family produces about 500 kgs of milk per year.

Nearly 2/3 of the milk producers in India are small and marginal farmers and landless agricultural workers, while 73% of the land is held by some 25% of the "large" farmers who own more than 2 hectares of irrigated land.

The "large" farmers own only about 35% of the cattle and buffalo population. Milk production in India is, therefore essentially a small

farmer activity based on family labour and a long tradition of keeping milch animals as a part of the household.

Table 2: India's Land and Animal Holding Patterns

	% of farmers	% of land owned	% of milch animals	% of milk Production
Landless farmers	26.0	-	22.5	27.6
Small and Marginal Farmers	49.3	27.0	41.8	41.9
Medium farmers & Large farmers	24.7	73.0	35.7	35.5

Milk is also a very highly valued food in India and the income elasticity of expenditure on milk is 1.5. This figure is even larger in the rural areas and as incomes rise, the population tries to reach out for more milk and milk products. The rich urban milk markets in India



Immediate Payment to Producers

have, therefore, provided a stimulus to produce more milk in the rural areas, which in turn is substantially improving rural incomes.



Village Cattle Feed Shop

Milk production in India is also a highly seasonal activity which is largely dependent on the monsoon rains for crop production and the feed resources. Production of milk in the winter months from October to February is nearly twice the production in the remaining months of the year. This used to result in significant surpluses and drastic reduction in the producer's price during the flush period. This left very little incentive for the farmers to look at the dairying as a significant source of raising farm incomes. All this has changed over the past 20 years through a major programme of increasing milk production, processing and marketing called Operation Flood. India which became dependent on imports of milk powder to feed its growing urban demand for milk has now become self-sufficient in milk production and has even started exporting some milk powder.

II. ROLE OF DAIRYING IN THE INDIAN ECONOMY

As India's population increased, the size of farm holdings came down significantly. To supplement household incomes in the rural areas, increased number of animals were deployed in the farming system to maximize on farmer's resources of land, water, sunshine and family labour. Since land is a limiting factor additional milch animals enhanced the productivity of the Indian farming system. It also provided productive year round employment, since farming was largely limited to raising a single crop. It also helped to mop up natural herbage that is available on common lands and roadside during and immediately after the monsoons. It also provided productive jobs to all the members of the family, particularly the women who share the bulk of the burden of rearing milch animals. Traditionally - until the marketing systems evolved, the farmers consumed as much milk as they could and converted the surplus into Dahi (a form of yogurt). Dahi was also consumed as an integral part of the traditional meal and surplus Dahi



Analysis of Milk Fat at Dairy Plant

was converted into country butter. Surplus butter was melted into ghee (clarified butter fat) which was the most favoured cooking medium. Surplus ghee was sold to traditional trade as there were no problems in marketing it as it had a long shelf life of nearly one year.

With urbanization, cattle moved into the cities to meet the urban demand for milk and milk products. As the urban areas in the country started growing, the city cattle population became a nuisance. Large quantities of feed and fodder had to be brought into the cities. Urban milk production was also more expensive as it meant purchasing fodder, hiring labour and producing milk on some very expensive land. It also strained the water supply and sewer systems in the cities and significantly contributed to the unhygienic conditions in the urban areas.

Milk production in the rural areas not only helped in efficiently using the crop residues and agricultural by-products, but also provided farm power and fertilizers to till and enrich the soil. Milk production



Women in Dairy Farming - Education Programme

in the rural areas is also carried out through un-organised labour, which really has to work hard to earn its livelihood. Economically, such deployment of labour is far more efficient than the highly unionised urban work force.

Dairying now contributes to 20% of the agricultural economy and 70% of the rural population is actively engaged in milk production. While it takes about Rs 100,000 to create a job in the urban area, a small investment of about Rs 2,000 in the marketing infrastructure creates a part-time rural job in the field of dairying. Dairying in India has, therefore, created a tremendous potential for productive employment.

III. DAIRY MOVEMENT IN INDIA

The dairy movement in India started just before Independence in 1947 and the first attempt was to provide good clean milk to the growing population in Bombay. The large cattle population in Bombay was creating great stress on the civic resources and it was decided to move the cattle out of the city centre. A cattle colony was set up in the suburbs to decongest the city. The quality of milk in Bombay City was compared with the sewer water in London by the British experts and something had to be done to improve the quality of milk. The Bombay Milk Scheme was set up to provide pasteurized milk to the urban elite and the cattle colony was to become the major source of milk supply. While the Bombay Milk Scheme was being set up, a private dairy offered to supply pasteurized chilled milk from Anand, 460 kms north of Bombay transporting it overnight through an express train. This private dairy had been set up in 1929 to make table butter. The quality of milk supplied from Anand to Bombay was reasonably good and the then British Government issued an order enabling the private dairy to get monopoly rights on milk procurement in and around Anand. This infuriated the farmers as they were now being paid the low winter



Artificial Insemination Service at Door

prices even for the summer milk. The farmers organised an agitation which forced the then British Government to allow the farmers to form a Cooperative and the Bombay Milk Scheme agreed to take milk directly from the Cooperative.

The Cooperative soon found that there was too much milk during the winter and too little in summer and the demand for milk in Bombay was more or less constant throughout the year. The Cooperative then put in a milk drier to conserve the seasonal surpluses in to milk powder which enabled the farmers to get nearly 80% of the summer price in winter. This was nearly one and a half times of what they were earlier getting for their milk. This provided an incentive to produce more milk.

The Anand Cooperative responding to the needs of the farmers started providing artificial insemination services and veterinary care. The Cooperative was also fortunate in having top professionals work for it in the field of milk production, processing and marketing. Real-

izing that 80% of the out of pocket expenditure on milk production was spent on buying traditional feed concentrates, the cooperative set up a balanced cattlefeed compounding factory which provided to the farmers feed concentrates that were significantly cheaper than traditional feeds like oil cakes, cotton seed etc. and were nutritionally balanced. These feed concentrates were pre-cooked and, therefore, did not need further "cooking" at home. The farmers were now able to get better prices for their milk and were also able to reduce their monetary cost of production. These interventions made dairying a profitable activity. The profitability was further enhanced by the Cooperative, marketing value added products like baby food, cheese, chocolates, etc. The Cooperative's brand name "AMUL" has become an household name in the country and is generally recognized as the biggest marketing success since Independence. The Anand Cooperative was then requested by the nearby districts to promote similar cooperatives in the districts of Mehsana and Baroda.

While the farmers in Gujarat had started a movement to own and operate their own milk production enhancement, milk procurement, processing and marketing systems in Gujarat, the State Governments of Madras and West Bengal following the example of the Aarey Milk colony in Bombay set up cattle colonies in Madras and Calcutta. Bombay, madras and Calcutta are coastal cities, Delhi is surrounded by good milksheds all around it. The Government of India set up the Delhi Milk Scheme in 1959 starting a new pattern for dairy development. This pattern was based on the Government milk plants collecting milk at its chilling centres through traditional middlemen, pasteurizing it and marketing it in glass bottles through specially set up milk booths all over the city. This pattern was followed during the 60's in almost 100 cities of the country where similar "Milk Schemes" were set up under state dairy development programmes. During this period, the Government also started Intensive Cattle Development Projects



Urea Straw Treatment Stack





Varietal Fodder Demonstration

(ICDP) which focused on providing artificial insemination and veterinary services to the milk producers. Such programmes were further supported with credit to the farmers through Small Farmer Development Agencies (SFDA).

The Government milk schemes ran into serious problems. When a milk scheme was started, it paid a reasonable price to the farmer, charged its overheads to the consumers and the consumer was provided with good quality milk at reasonable prices. However, during the summer months, when the supplies dwindle and the prices go up, the milk schemes were unable to raise the producer prices and their supplies dwindled. The milk schemes then resorted to the import of milk powder to augment their meagre supplies. Since the imported powder was rather cheap, the milk supply schemes were able to maintain low prices in the cities. This removed the incentive of the urban markets for rurally produced milk and India's milk production remained stagnant and its dependency on imports gradually increased.

Providing credit for the purchase of milch animals also did not work as it did not contribute to bringing in any additional milch animals to the production system and was merely a transfer of resources -- many a times only on paper. This, however, brought a bad name to the dairy cooperative movement in many parts of the country as the loans were provided through cooperatives who were supposed to recover the loans through milk money. Many of those who took loans did not bring their milk to the cooperatives and instead sold it directly to the traditional traders. Large amount of loans had, therefore, to be written off. The mid 60's was a trying period in the history of the Indian dairying as the dairy development schemes of the Government did not seem to work, milk supply to the cities had to be rationed, imports of as much as 60,000 tonnes per year had to be resorted to, to feed the milk supply schemes which were handling less than 1 million

litres of milk per day. Above all, the dumping of cheap imported milk powder was working against the interest of the indigenous milk producers. The late 60's also saw a build up of milk powder and butter "mountains" in Europe, which was a potential threat to Indian dairying.

In the mid 60's, recognizing the significant impact that the Anand Cooperative had made in increasing rural incomes, the then Prime Minister of India desired that the Anand Pattern of Cooperative Dairying should be replicated throughout the country and the National Dairy Development Board (NDDB) was set up in 1965. The NDDB formulated a plan to use imported dairy commodities for generating funds and implementing a major dairy programme called "Operation Flood". Under the first phase of the programme, skim milk powder and butter oil were made available to the metro cities at prices equivalent to producer prices for milk in India. The programme generated over 1000 million rupees which financed the setting up of additional milk mar-

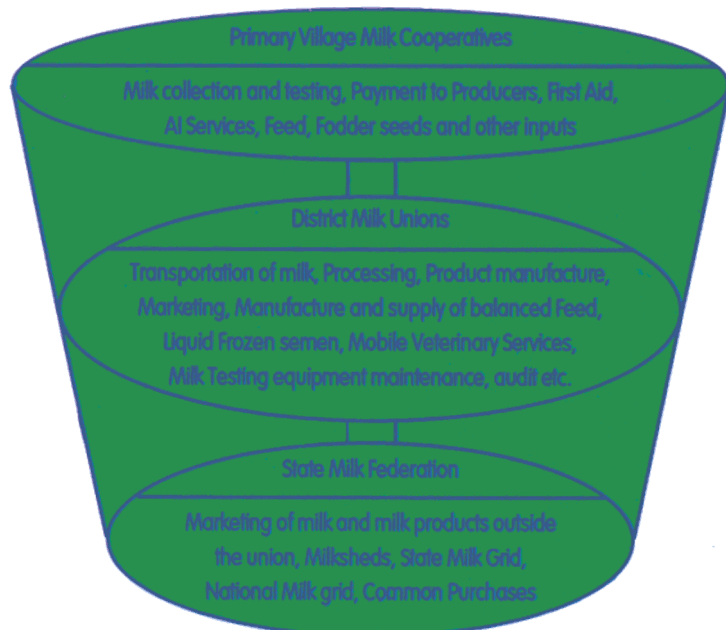


Milk Tank for Transportation

keting dairies in the metro cities and setting up of 18 Anand Pattern district dairy cooperatives which were linked through a network of rail/road milk transportation system. The rural feeder balancing dairies converted the seasonal surpluses into milk powder which was recombined in the cities during the summer months. Imported milk powder was thus used to set up milk powder plants in India eliminating the need to import.

The rural dairy plants were supported with a milk procurement and dairy extension system which also provided inputs to the milk producers to increase milk production and productivity of their live-stock. Figure 3 shows the structure of the dairy cooperatives in India.

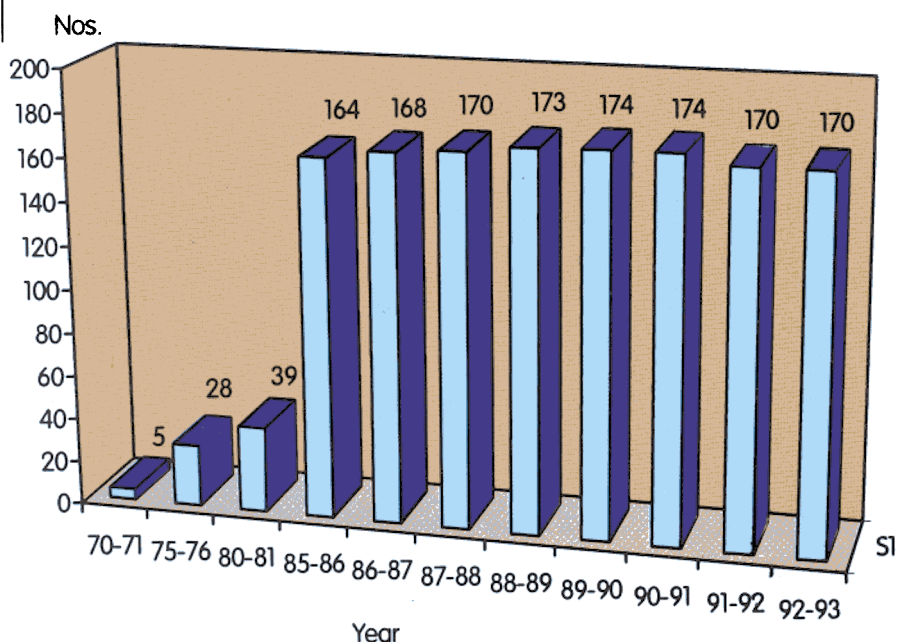
Fig. 3: Tasks performed by village level cooperatives, district milk unions and the state level milk marketing federation



IV. PROGRESS OF OPERATION FLOOD

A. Milkshed coverage:

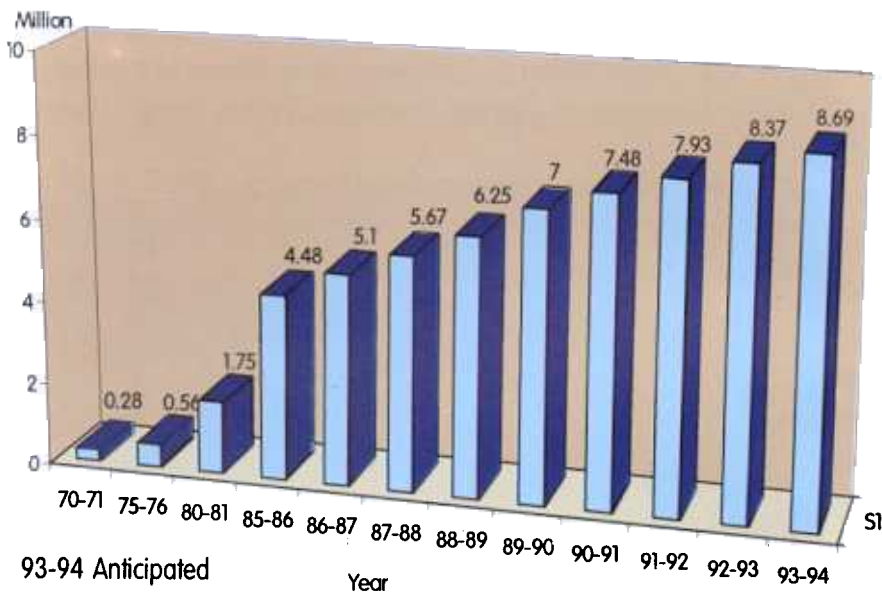
The first phase of Operation flood covered 18 milksheds. These formed the 'catchment areas' from which milk was drawn into the four metro cities, namely, Delhi, Calcutta, Madras and Bombay. Operation Flood has extended the organized marketing of milk to some 525 towns, which involves development of procurement, processing and transport facilities in 170 milksheds. Figure 4 indicates the progress in the coverage of milksheds.



**Fig. 4: Operation Flood
Milk Shed**

B. Farmer Members

Increasing participation by the farmers has been a key factor in the success of Operation Flood. While in 1970-71, there were about 278 thousand members, today there are more than 8.7 million members who own, manage and conduct nearly 66,900 cooperatives throughout the country. The growth in farmer membership is highlighted in Figure 5.

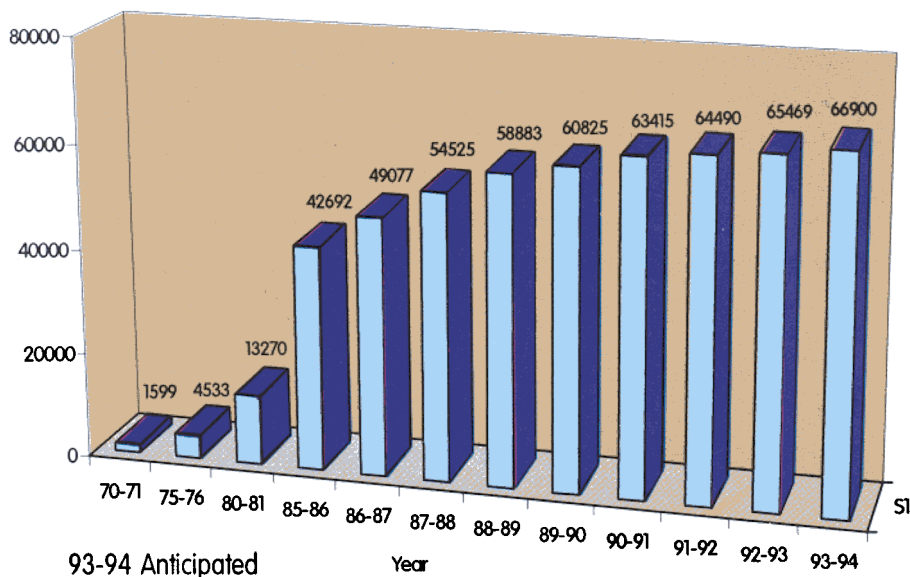


**Fig. 5: Operation Flood
Farmers Members**

C. Milk Cooperatives

Operation Flood seeks to place the instruments of progress in the hands of the farmers themselves. Milk producers' cooperatives are organized in villages towards this end. Since the inception of Opera-

tion Flood Programme, there has been rapid multiplication in their number, which presently stands at 66.9 thousand. The growth in village milk producers' societies, organised through the Operation Flood Programme is revealed in Figure 6.



**Fig. 6: Operation Flood
Anand Pattern Village Milk Cooperatives**

D. The Three-tier Cooperative Structure

The three-tier cooperative structure followed under the Operation Flood Programme in India consists of almost 70 thousand primary milk producers societies at the village level, as the basic unit of the dairy programme. In a large district nearly one thousand of these village level cooperatives federate into a district level union or a milkshed union which owns and operates the local dairy plant, and in most cases,

a balanced cattlefeed factory. While the task of the primary milk producer society is to collect milk from its producer members and sell it to the district level unions, the society also provides inputs like veterinary first-aid, artificial insemination and markets cattlefeed produced by the factory, owned and operated by the district union.

The State Cooperative Federation in many cases runs the district level dairies. In such cases, the district level unions have very little function to perform. However, in most cases, state level dairy federations limit their role to the marketing of milk and milk products outside the jurisdiction of the district milk unions. The functions of the three-tier dairy cooperative system are summarized in Figure 3 and explained in the following paragraphs.

E. Village Milk Cooperatives

The strength of any cooperative dairy programme depends on the viability of the primary milk cooperative societies. Usually, the village society consists of 100-400 members supplying about 200 to 1000 litres of milk per day. Milk is collected twice a day, measured volumetrically and usually tested for its fat contents. Payment for morning milk is made in the evening and the payment for evening milk is made the next morning. Viability of the primary cooperatives depends on the strength of its membership, volume of milk handled, commission offered to the village cooperatives by the district union, net weight/volume difference, difference in mathematical average of fat contents in milk purchased by the cooperative and the pooled fat/SNF at the district dairy, milk sourage, local sale of milk, staff structure and salaries paid to its employees, cost of testing and the method of testing, inputs provided by the village society and charges made for such inputs, commission on sale of inputs like fodder seeds, cattlefeed etc.

The village level societies receive, from the union, a year-end

price differential payment which is distributed to its members as annual bonus. The Indian Tax laws exempt primary milk producer societies from payment of income tax. The district level unions, therefore, distribute their profits to the village level milk societies as a price differential. The price difference received by the society is distributed to the members as a bonus proportionate to the business of the society. Usually, a significant portion of the price difference is used for common facilities in the village like drinking water supply, link road, school building, etc. It is not un-common for primary village milk producer's cooperatives to pay 12-15% bonus to the farmers. While the cooperatives usually provide a competitive price for the producers' milk, the lure of the year end bonus contributes to the membership which looks at the amount of bonus as an index of the efficiency of the society management.

Overbearing society secretaries are also known to resort to under-measurement of the quantity of the milk, lowering down of the fat test



Gulab Jamun Plant

and overpricing of milk for local consumption in the village. This is, however, minimized by proper supervision and control by the society/union management. The society's performance is also judged by the members, by the quality of inputs provided by the village level workers for artificial insemination and first-aid.

F. District Milk Unions

The district milk unions have been the major catalysts of the dairy cooperative movement in India. Under the Operation Flood programme, once a district is identified as a potential milkshed, a district cooperative union is registered as soon as the minimum number of primary village cooperative societies have organised. The General Body of the district union consists of Chairman of the primary milk producer cooperative societies in the district. The concept of a viable milkshed district has been accepted for setting up a district union. A milkshed district could be half a revenue district or two or even three districts combined to form a viable milkshed for setting up a dairy of a minimum viable size, which is usually not less than 60,000 litres of milk per day. The General Body elects the board of the district union which in turn elects its Chairman. Usually, the Managing Director of the district union is the Chief Executive and it is a good example of farmers and professionals working together for the benefit of the rural poor. The functions of the milk unions are to fix the producer price, processing and product manufacture and marketing of milk and milk products. The Union also makes arrangement for transportation of milk, usually through transport contractors. For this purpose, a periodical tender is floated to minimize transportation cost. Usually the contract for transporting milk from village to the unions dairy and the contract for transporting balanced cattlefeed to the villages goes to the same transporter. This ensures full utilization of transport travels and minimizes costs.

The unions also provide mobile services and supply liquid/frozen semen to the village cooperative societies. For this purpose, the unions either maintain their own bulls or buy frozen semen from a frozen semen station. Similarly, fodder seeds are provided by the union to the village cooperatives at reasonable prices.

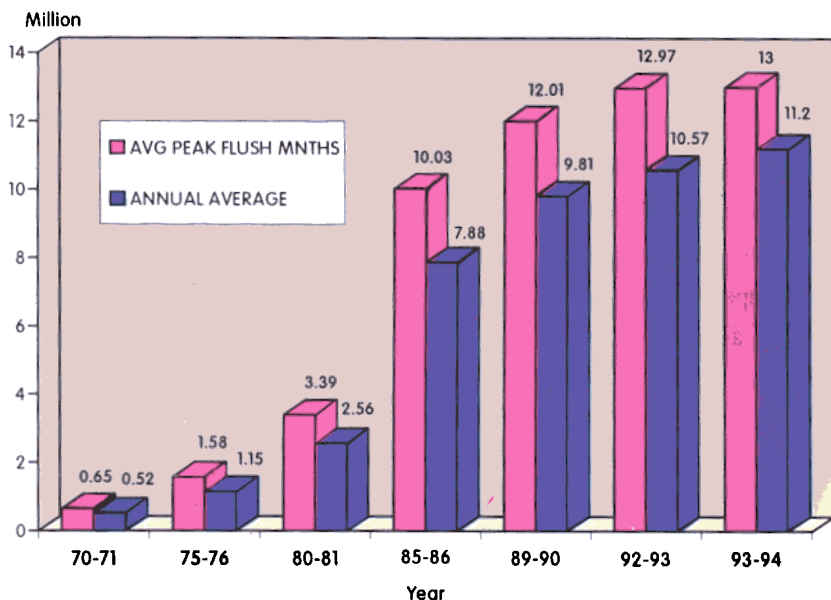
Testing materials and maintenance of milk testing machines is also usually provided by the union. The union interacts with the state federations on product planning and marketing of milk and milk products outside the milkshed area. It also interacts with other unions within a federation for the smooth operation of the state milk grid.

The auditing of the primary milk cooperatives, though done by the department of cooperatives, is coordinated by the milk union. The union also provides extension services to the milk producers. Most milk unions would meet the local, urban requirements of milk within the milkshed, and usually no milk leaves a village until its own requirements have been met. No milk leaves the district until the district's requirement of milk has been met, and similarly no milk leaves a state until the requirement of the state has been met. The dairy unions also interact with the state governments and other state agencies for the protection of cattle against communicable diseases and participate in animal vaccination programme of the state. The unions interact with the state agencies in the district for improving rural communication and other infrastructural development programmes in the district apart from health, family welfare and family planning programmes. Many village cooperatives and district unions are actively participating in these programmes.

G. Milk Procurement

Milk production shows a seasonal pattern in India, with yields almost doubling in winter months. Milk procurement, which is related

to milk production, follows a similar trend. Over the years, there has been significant increase in milk procurement, as indicated in Figure 7. From a level of 0.52 million litres per day, average milk procurement has currently touched 11.2 million litres, through Operation Flood.

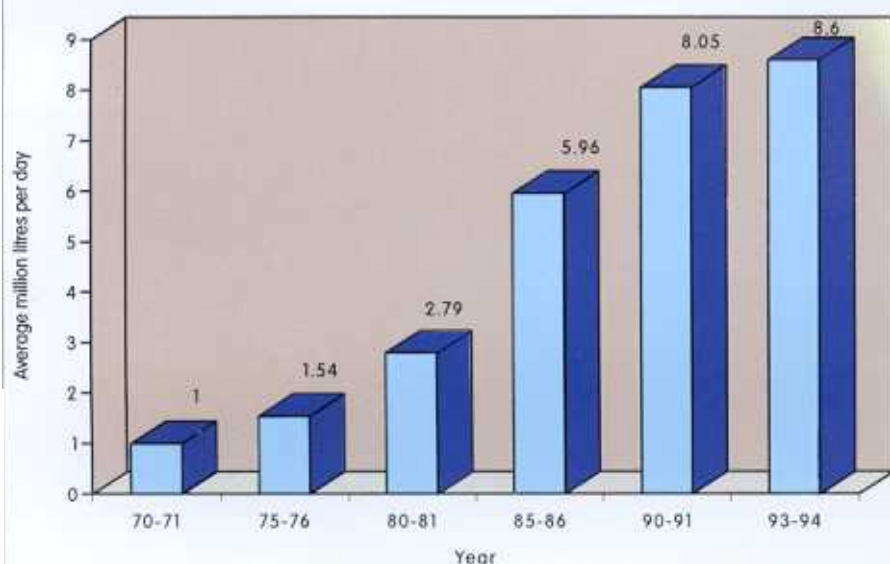


**Fig. 7: Operation Flood
AVG Rural Milk Procurement
(Million Kg per day)**

H. Milk Marketing

In the first phase of Operation Flood, the Metro city dairies captured a commanding share of their milk markets becoming price/quality leaders. In the second and third phase of the programme, most of the cities and even smaller towns have been covered under the programme. Milk marketed under the Operation Flood programme has

increased from around 1 million litres in 1971 to 8.6 million litres in 1993-94. The total throughput of the cooperative dairies in India has gone up to 13 million litres of milk per day. Indigenous milk powder production has increased from 20,000 tonnes before the start of the programme to nearly 200,000 tonnes now. The milk marketed by metro and rural dairies, through Operation Flood, is indicated in Figure 8.



**Fig. 8: Operation Flood
Milk Marketed
(Average million litres per day)**

V. ROLE OF THE PRIVATE SECTOR

The private sector has largely confined itself to the production of value-added milk products like infant milk food, milk powder, dairy whiteners, malted milk foods, chocolates, etc. The Dairy Industry in

Amul Dairy - Anand





An Inside View

India was de-licensed in 1990 which has enabled the private sector to expand its share of the organized milk and milk product market from 20 per cent to 35 per cent. The organized sector in India both in the private and cooperative sector handles only about 10 per cent of all the milk produced in India, which is equivalent to about 25 per cent of all the milk marketed as a very large number of producers are also milk consumers. Around 75 per cent of the milk marketed in India, even today is through traditional trade. However, the organized sector has now become the price/quality leader and the cooperative sector ensures that milk producer prices, even for non-members, are pitched at reasonable levels. The cooperatives also ensured that no milk is turned away during the winter months and the producer prices in the winter months are now only about 10-20 per cent lower than the summer prices. The Dairy Industry in India is now facing a marketing challenge as some surpluses are building up and some milk powder has been exported out of India during the past 2 years. From dependence on imports to self sufficiency is a success story that is being watched with interest by many other developing countries.

VI. TECHNOLOGICAL ADVANCEMENTS

The most important technical intervention made in the Indian Dairy Industry was to convert a highly perishable product like milk into a commodity that can be stored over for long periods and traded all across the country through a national network of storage and transportation through rail/road linking deficit areas with major milk markets and minimizing seasonal disparities in production and consumption. Figure 9 shows all the National Milk Grid as it is now operating in India. The figure indicates how milk moves well over 1500 kilometers right across the country to meet urban demand and directly link producers with consumers.



Fig. 9: National Milk Grid

The major technological advances made in India in the field of dairying can be summarized as follows:

A. Milk Production

Artificial insemination and use of frozen semen is now very widely practiced in India and the productivity of milch animals in India has more or less tripled over the past two decades. Veterinary services are now available not only through the Government network of veterinary dispensaries and hospitals but also through mobile veterinary services provided by the Cooperatives and farmers have access to such services.

B. Advances in Feeding Dairy Cattle

Very large number of cattlefeed plants have come up in India which provide nutritionally balanced cattlefeed, which is highly valued by the milk producers. A large number of these plants are now providing feed which is high in by-pass protein. Use of urea and molasses has been successfully tried out in reducing feeding cost. Similarly, straw is also being treated with ammonia/urea/molasses to increase its nutritional value.

C Milk Processing

Bulk of the milk processing equipment conforming to the international specification is now being used in the country. This includes milk pasteurizers, homogenizers, cream separators, storage tanks, silos, milk tankers, service equipment for steam raising, air compressors, refrigeration equipment, effluent treatment plants, etc. Milk evaporation and drying plants are also now being made in the country along with process controllers and other ancillary equipment. India, however, continues to import sophisticated packaging equipment as it is not worthwhile producing the small number needed in the country. The export of dairy equipment from India more than placed for the small imports of packaging machines and other specialized equipments.

D. Milk Packaging and Marketing

Most of the milk marketed through the organized sector is packed in plastic sachets. The packaging machines for packing milk in sachets are now produced indigenously. The plastic granules and film needed for packaging of milk is also produced indigenously. India developed its own system of marketing milk through automatic bulk vending machines which eliminates the need for packaging. The system is based on chilled milk being moved in tankers from a dairy

plant to a storage tank usually of 1,000 litres capacity at a specially constructed automatic bulk vending milk booth. Milk distributed under the system is usually homogenized as it is stored in tanks which do not have stirrers. The tanks are kept in a small cold room, which maintains the temperature of milk at 4° C through the use of packaged refrigeration units. The customers bring their own containers to the vending booths, where they purchase tokens which are inserted into slot machines for vending milk. The system is extremely cost efficient and eco-friendly.

UHT milk would have been ideally suited to the hot climatic conditions in India as it can be stored without refrigeration. It would have also enabled a rural dairy plant to market its milk directly to the milk consumers in far off cities. This has however, not happened in India as the marketing of milk through plastic pouches and bulk vending has enabled the dairy plants in India to pay nearly 2/3 of the consumer price to the producers. In case of UHT milk, the producer generally winds up getting only 1/3 of what the consumer pays for such milk. The price of milk in India does not seem to support the use of expensive packages that are usually associated with the marketing of UHT milk.

VII. SECRETS OF SUCCESS

A. Efficient Milk Production System

The basic secret of success of India's Dairy Development Programme is the efficient milk production system. Milk production is highly integrated into the farming system of the country. The crop farming system provides residues and by-products as feed and fodder into the milk production system and the Dairy system in turn provides farm power and fertilizer into the farming system. The production system of milk in India is based on improving the conversion efficiency

of indigenous cattle and buffaloes through cross-breeding and genetic upgrading rather than the introduction of exotic dairy animals into the system. The efficiency of the system is reflected in producer prices which are only 2/3 of what the milk producers in the EEC countries and North America are being paid.

B. Cooperatization of the Dairy Industry

The major secret of success of the dairy programme in India is the involvement of milk producers in setting up their own organizations for milk production enhancement, milk procurement, processing and marketing. The dairy cooperatives in India have also engaged top professionals in the management of their dairy plants, cattlefeed plants and the veterinary health systems. The dairy industry has, therefore, combined the strength of the farmers with the skills of the professionals to ensure that the milk producers get the lion's share of the consumers rupee.

C. Remunerative prices to the Milk Producers

The milk producers in India are now generally assured of a guaranteed market at remunerative prices even during the flush period when production exceeds the demand for milk and milk products. Milk producers in India receive almost 2/3rd of what the consumers pay for their milk. This has resulted in better prices to the milk producers and consequent increases in milk production. A low margin between the producers price and the consumers price has also resulted in reasonable prices to the consumers expanding the market for milk and milk products.

D. Cheap Imports not used Against Local Producers

Imports of dairy commodities in India were canalized through a farmer friendly National Dairy Development Board which ensured that

imported commodities are not made available to the processing plants at prices lower than locally produced milk.

E. Strong linkage between Milk Production Enhancement and Milk Procurement Agencies

The privilege of collecting milk from the milk producers in India now carries the responsibility of supplying inputs to increase milk production. This linkage also optimizes on the transportation of feed to the milk producers and transportation of milk from the milk producers to the processing plant.

F. Efficient Organization of Milk Collection

Bulk of the milk procured by the processing plants in India is brought to the plant within 3-4 hours of milking avoiding intermediate



Skimmed Milk Powder being Packed

chilling and reducing costs. This has also resulted in reducing the price band between the producer and the consumer.

G. Efficient Policy Making, Planning and Implementation Infrastructure

The Government of India -National Dairy Development Board-Dairy Cooperative linkage in India has provided an efficient framework for policy making, planning and programme implementation.

H. Establishment of a National Milk Grid

Milk in India now moves right across the length and the breadth of the country linking milk producers with the consumers and evening out the regional and seasonal disparities in production and consumption. This also enables the farmers in India to get best possible prices



Milk Booth for Distribution

for their milk. The consumers are ensured of regular supplies at reasonable prices.

Efficient Supply of Cattlefeed Concentrates

Cattlefeed concentrates account for the bulk of the out of pocket expenditures on milk production. Balanced cattlefeed concentrates are now being made available to the milk producers right at the village level, at prices that provide good value for money spent on cattlefeed. Milk trucks that bring milk from the villages also carry cattlefeed optimising on the transportation cost.

J. Improving the Efficiency of indigenous Milch Animals

India has achieved bulk of the increases in milk production through significant improvements in the conversion efficiency of dairy animals through genetic upgradation of the local stock rather than importing milch cattle. Only a limited number of exotic cattle were imported in the country for the production of exotic bulls needed for the upgradation of local stock.

K. A Long Tradition of Milk Production and Consumption

India has a long tradition of keeping milch animals as a part of the farming household. The animals are cared for and greatly valued. The entire farming family devotes some time to the upkeep of dairy animals. Also milk and milk products are highly valued in the Indian society as a source of good nutrition.

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