

CHAPTER 1

Dairy Scenario

1.1 History of Dairy Industry

The domestication of cattle and the use of their milk for human food began somewhere in Asia and North East Africa between 6000 B.C. and 8000 B.C. and before its domestication, probably it was hunted by the primitive man. Over the years the cow has been used as a source of food, an object of worship, a source of sacrificial offering a subject of mythology and as a beast of burden. Cows milk and its products have been used for food, sacrificial offerings, cosmetics and medicants.

The oldest written records of man are believed to go back to the Sumerians of Mesopotonia in approximately 6000 B.C. Dairying was highly developed at that time. A mosaic frieze of one of the oldest buildings unearthed in the Euphrates valley, dates back to at least 3100 B.C. shows the milking of cow from behind, the pouring of milk through a strainer into the vessel and the presence of two attendants wearing fleece petticoats that are believed to have been the dress of priests and priest kings. Egyptian records dates back nearly to 3000 B.C. indicate that milk, butter and cheese were used extensively.

Greek and Roman records go back to approximately 1550 BC and 750 B.C. respectively, and in both areas milk and cheese were important parts of the human diet. In ancient Greece most of the milk came from the goats, where as in Rome it came from sheep. Butter was used as food by some people in Europe, but it was not used extensively until the Eighth Century, when it became an important food in Norway.

References to cattle and milk have been made frequently in the Old Testament and the New Testament alike. The old testament has 40 references to cattle, milk and milk products are mentioned at least 50 times as desirable foods. Palastine is referred to approximately 20 times as a land flowing with milk and honey. Frequent references are found to cattle and their products, as more and more records became available to the historians. Gibbons, records "The Tartars (376 AD) took cattle with them and their compaings for milk and meat supplies. Each caravan of Tartars consisted about 20 to 30 oxen and planned to pasture them as they moved from one section of the country to the other."Gibbons" further states that the number of cattle owned by a ruler or person was indicative of his power and influence. Marcopolo during his travels over portions of Asia about the middle of the 13th century reported that he found cattle and their products being used by the people of these regions.

The people of India were raizers of cattle as early as 2000 BC. Butter was used as a holy offering to the gods. The butter was converted into ghee (butter oil or clarified butter) and the cow was considered as "holy" at that time. References have also been made in holy "Vedas" as well as in the great epic "Mahabhogavatham" pertaining to the usage of milk (ksheera) curd (dahi) and ghee (Aajya or Ghritam) in the performance of special rituals or "holy yagna or havan" by the saints. The Vedic hymns written about 3000 BC potrays the home life and the occupations of the early Hindu people. The sanskrit writings of India tell of milk and its value as food dating back to 6000 BC. Cattle constituted an integral part of India's Vedic culture (1800 - 600 BC), which is full of references to the milk of the cow.

The Indus valley civilization of the Harappa Mohanjodaro period and the recent archeological excavations at 'Mehrgarh' (Placed around 6500 BC) located about 150 miles to north west of Mohanjodaro at the foot of 'Bolan' pass in Beluchistan, have revealed signs of domestication of cattle earlier than other settlements of western Asia. Moreover, there is evidence to indicate that cattle were more significant to Mehrgarh's inhabitants than any other large domesticated animals a cultural trait that has been preserved over thousands of years down to the present day suggesting that the animal wealth as an indicator of the status and wealth of the people.

The traditional Indian dairy products reflect the intimate relationship that our ancestors established with the farm and animal. It has been stated that the five products from the cow either singly or in combination which are commonly called "Panchgavya" are necessary to maintain the ritual purity which is so important to the Hindus. These products are milk (Ksheera) curd (Dahi) ghee (Aajya or Ghritam) urine and dung. In the rituals carried

out by the 'Purohits' or 'Archakas' in the temples, milk products were regularly used. The worship included 'Abhisheka' a ritual for the deity, on special occasions with milk, curds, ghee, banana, sugar, honey, tender coconut water and scented water. This kind of ceremony was called "Panchamritha Abhisheka" after which the deity was bathed with sanctified water. The mixture of the washed ingredients treated as 'teertha' or holyprasad will be consumed by the devotees.

The progress in the dairy industry was made possible by the use of science in dairy practices. This date marks the change from the art of dairying to the science of dairying. The great landmarks in the history and the development of the dairy industry in U.S.A., U.K., Australia as well as in India has been enumerated briefly hereunder.

1.2 Dairy Industry in U.S.A.

Cattle were first imported into the western hemisphere with Columbus's second voyage which were taken to either Cuba or South America. Prior to this there were no cattle in North America. The Spanish expedition headed by Coronado brought approximately 150 head of cattle to North America. The first importation of cattle by the settlers of the present U.S.A. occurred in the James town colony in 1611. Cattle were not brought over by the pilgrims on the May flower, but the cattle arrived in Plymouth colony in 1624. Later on many cattle importations have taken place.

The dairy industry from colonial times to the mid 1850's was based primarily on family cows, most of the families having one or two cows, supplying milk for the family need. The major developments in the dairy industry from the beginning of the Christian era to the middle of 1850's occurred in Europe. Most of the currently important dairy cattle breeds in the U.S.A. and Europe originated there. Animals representing various improved breeds were well established during 1820 from the importations that were made from time to time either of an individual or a small group of animals. The first railshipment of milk by rail occurred in 1841 between Orange county New York and New York city allowing the farmers to ship fluid milk and cream as much as 80 miles to market. Initially the farmers shipped their own milk to the city where it was received and distributed by the dealers. Later on the milk receiving/collecting centres have been established in rural areas either by the dealers, independent shippers or co-operative groups of farmers.

Establishment of a dairy industry in any country depends mainly on three major factors.

1. A suitable market for milk and milk products.

2. Facilities and trained personnel to collect, process and distribute the milk and
3. A continuing supply of milk with satisfactory quality.

The factory system of dairy manufacture was introduced in 1851 which had the wide spread influence. The first cheese factory was established at Oneida, County New York, USA during this period by Williams.

1856 - Gail Borden received the first patent on condensed milk and the first successful condensary was built in 1857.

1860 - Formation of breeders associations for owners of purebred cattle were established.

1875 - Establishment of State Dairy Associations.

1880 - Introduction of artificial refrigeration and cold storage.

1890 - Co-operative dairy manufacturing and marketing of dairy products.

1895 - Expansion and strengthening of the State Dairy Associations.

1900 - Strengthening and expansion of the Co-op. movement for the manufacture and marketing of dairy products.

1905 - Organization of the first Cow test association in America.

The land grant Act 1862 established colleges of Agriculture in every state. However, the first college of agriculture had been established in Michigan in 1855. The colleges were strengthened by the Hatch Act 1887 empowering them to establish the Experimental Research Stations. The establishment of the extension services by the Smith-lever Act in 1914 resulted in creating more vistas/avenues for direct contact with the dairy farmers for passing the information collected by the scientists and the researchers accumulated in the scientific laboratories/research stations.

The centrifugal separator was invented almost simultaneously in 1871 by De level and by Winstrup and Nielson, providing a mechanical means for the separation of cream from milk. The first creamery was established in Iowa state by Stewart producing other dairy products in addition to cheese.

Development of a chemical test for the determination of fat in milk was perfected by S.M. Babcock and by Gerber simultaneously in 1890. The dairy industry has changed dramatically since 1900 and many developments/inventions and discoveries have helped to promote the growth of industry more viable. These developments include, refrigeration, milking machines, and related equipment, homogenisation, pasteurization, churns, clarifiers, ice cream freezers, and bulk milk coolers etc.

1.3 Dairy Industry in U.K.

Man has consumed milk and milk products from the time immemorial, throughout the ages and the demand for these products, played a biggest role in the domestication of the animals without any doubt. Much importance has been attached to the cattle as the status and wealth of the man by the number of cattle he possess in biblical days. A careful survey of history shows quite clearly that not only milk has been consumed by man for the past 5-6 thousand years, but that cheese and butter have also been made and consumed for a similar period. The biggest development in the liquid milk trade came gradually from 1850 onwards, with the application of transport of milk through the railways. By 1945, it is correct to state that in Great Britan thousands of farmers merely put their milk in stands on the roads at their respective farm entrances, where it is collected by the lorries once a day in winter and twice daily in summer and taken to the creameries or the dairy plants.

1.4 Dairy Industry in Australia

In accordance with the available records, the first cargo fleet which reached Australia under Governor Philip consisted of four cows, which were intended to supply milk and to serve as the foundation stock for the future herds of cattle at Port-Jackson, the Rose hill. The foundations of the dairy industry were laid in the Illawara districts in New South Wales about 1820. The settlers of Richmond River district shifted to dairying in about 1890 and the industry was firmly established in that district within few years and extended to Northern River areas in Queens land to the Victorian border. In general, dairy farming has been confined to the coastal and near coastal regions, where the rainfall and topography are favourable. By 1936 dairying has been consolidated as one of the Australia's principal rural industries.

1.5 Dairy Industry in New-Zealand

Dairy farming in New-Zealand began from small beginings during the days of colonization by the Europeans. In 1814 the missionary Samuel Mars den introduced the dairy cows to the Bay of Islands from New South wales for the first time. From 1840's majority of the settlements had dairy farms with the short 'Horn' dairy cattle and these herds tended to be larger near the urban areas. In the year 1871 the first dairy cooperative was established at Otago peninsula. William Brown in 1881 has advocated and was instrumental in the establishment of the cheese and Butter factory at Flemington which was a great success. By 1920 there were 600 dairy processing factories 85% of which were generally owned by the Cooperatives and there are only 500 cooperatives by 1930. However, after world War II and with the improved processing technology, transportation and energy systems led to the trend of consolidation where the cooperatives merged together and became larger and fewer in number and by the year 1990 there were only four cooperatives.

Newzealand is the world's eighth largest milk producer with about 2.2% of world production. Traditional dairy production areas were confined to Waikato, Tazaanaki south and north islands and west land. The dairy production was entirely for local consumption before the advent of refrigerated shipping in 1880.

1.6 Dairy Farming in Canada

It is one of the largest agricultural sector and it has a significant presence in all the provinces and is one of the two agricultural commodities in seven out of 10 provinces. Dairy farming is still prominent in Canadian Society though the rate of dairy farmers have been dropping significantly since 1971 while making the average dairy farmer significantly wealthier than the average Canadian family. On an average two-thirds of Canadian dairy produced is sold as raw milk whereas the remaining one-third (1/3) is refined into other dairy products such as milk, cheese and butter.

In Canada dairy farming is subject to the system of supply management. In this system the farmers manage their production such that it coincides with the forecasts of demands for their products over a predetermined period while taking into account certain imports that enter into Canada as well as some production which is shipped to export markets. The Canadian dairy farmers federation was founded in 1934 which later became Dairy Farmers of Canada in 1942. With its mandate to stabilize the dairy market and increase the revenue to the dairy farmer. Between 1950's and 1960's there was significant volatility in the dairy prices and the U.K was poised to enter the European common markets thus resulting in the loss of Canada's largest dairy partner. These challenges led to the creation of Canadian Dairy Commission whose mandate was to ensure the quality and supply of milk and that producers receive a fair return on investment.

The federal and provincial governments have a common interest in sharing the supply management jurisdiction. The basic idea is to manage the production so that the supply is in balance coping up with the demand. The National milk marketing plan envisaged came into effect in 1983 to control the supply by setting up some guidelines for calculating the market sharing quota. Organic dairy farming is less prevalent even though both conventional and organic dairies exist across Canada because of the fact that due to the widely held misconceptions that organic farming is un-profitable and risky. On the contrary the costs are substantially lower with organic farming than the costs incurred by the conventional dairy farming. In contrast the lower economic supply is often off set by extra costs that are associated with the importing of fertilizers etc., making the conventional farming is no more economically profitable when compared with organic farming.

1.7 Global Dairy Scenario – Overview

Commercial dairy farms are typically one species enterprises even though any mammal can produce milk. All the dairy farms in almost all the developed

and to some extent in the developing countries consists of high producing dairy cows followed by buffaloes, goats, sheep and camels. Milk will likely become one of the most volatile agricultural commodities in future. This is because of the fact that (a) small changes in the qualities available internationally have strong influence on world market prices (b) the length of time before there are increases in milk production as a result of price change and (c) delayed reaction of the demand to changing dairy commodity price.

The global dairy sector is currently going through a period of turbulence—slowing demand from China and Russia’s trade embargo and the removal of E.U. milk quotas resulted in a period of excess supply and low prices. The key changes to making a reliable forecast of world market prices for milk are the nature of consumer reaction to rising prices of milk and the response of the dairy farmer with regard to the supply specially in low cost dairy regions. Another key determinant of milk price is feed which directly affects milk production through increased costs and indirectly higher land prices. Despite this the long term outlook for the sector remains positive. Rising populations and changing diets are increasing the demand for dairy products. As there is an increase in the income and nations become increasingly urbanised individuals tend to receive more of their calories from proteins including dairy as opposed to basic carbohydrates mostly the grains. Global demand for dairy is expected to increase by 2.5 percent per annum to 2020. Largely driven by increasing urbanisation and rising incomes in emerging markets.

The milk production levels in different parts of the world and the recent trends based on the surveys and on the secondary data from the F.A.O. The milk production volumes of all animals species have been standardised to “Energy Collected Milk” (E.C.M-4.0 percent and 3.3 percent protein). China, India and Pakistan alone are accounted for about 2/3 of all volume growth and most of the remaining growth was by eight countries approximately accounting for 85 percent of all milk volume growth. World milk production is set to reach 833.3 million tonnes in the year 2017 which is 1.4 percent more than in 2016. Much of the anticipated size is expected in Asia and America. While the sector might be stagnated in Europe and Africa and possibly face a decline in Oceania.

World trade in dairy products is forecast to increase by 1.3% in the year 2017 to 71.6 million tonnes making a modest growth for the second year in succession. On the demand side Asia is anticipated to drive the expansion with the imports by the region predicted at around 41 million tonnes by an increase of about 1.5 percent more than in the year 2016. Among the various products world trade in Cheese and S.M.P is expected to increase in 2017 while trade in butter and W.M.P may contract or show a decline. The major policy developments that took place in the year 2017 have been presented in the Table 1.1 and the milk and milk products statistics indicating the production, imports and exports globally have been presented in Table 1.2. The milk production trend across the countries globally has been presented in the Table 1.3 for information and to have a comparative study.

Table 1.1 Major policy developments

Country	Product	Data	Policy category/ Instrument	Description
Canada	Cheese	Aug-17	Tariff rate quota	Announced a new tariff rate quota (TRQ) administration policy applicable to the 16 000 metric tonnes (MT) of cheese that will be allowed to be imported under the Canada-EU Comprehensive Economic and Trade Agreement (CETA). Of the total TRQ, 60 percent will be allocated to small and medium-sized enterprises with the remaining 40 percent allocated to large companies. In both cases, 50 percent will be allocated to manufacturers and the balance to distributors and retailers. The 1700 MT of bulk EU industrial cheese TRQ will be allocated entirely to manufacturers of further processed food products.
	Cheese	Oct-17	Import ban	Banned, temporarily, imports of soft cheese products from the EU.
China (main land)	Dairy products	Oct-17	Food safety standards	Applied the Administrative Measures for the Registration of Recipes for Formula Powder Products for infants and Young Children, which mandate domestic and overseas producers to: (i) register their facilities with the China Food and Drug Administration (CFDA) and the Certification and Accreditation of the People's Republic of China (CNCA); and (ii) Limit the number of products and brands produced.
European Union	Dairy products	Sep-17	Free trade agreement	Approved the free trade agreement with Canada, which entered into force 21 September 2017, after its approval by EU Member States, expressed in the Council, and by the European Parliament.

Table 1.1 Contd...

Country	Product	Data	Policy category/ Instrument	Description
India	Dairy Products	Jun-17	Import ban extended	Extended the prohibition on import of milk and milk products (including chocolates and chocolate products, and candies/confectionary/food preparations with milk or milk solids as an ingredient) effective until 23 June 2018 or until further orders. The prohibition has been in place since 2008.
Indonesia	Dairy Products	Aug-17	Import policy	Introduced a requirement that US dairy-product establishments must pay a fee to undergo the review process to export dairy products to Indonesia. The review process consists of three phases: document review, onsite review and evaluation of onsite audits.
Mexico	Dairy products	Jul-17	Import ban	Suspended all dairy imports from Colombia after new outbreaks of foot-and-mouth disease were detected in the Andean country.
	Dairy products	Jun-17	Import ban extended	Extended until the end of 2018 the ban on the import of agricultural products including milk and milk products from the countries that applied economic sanctions against the Russian Federation.
Russian Federation	Dairy products	Aug-17	Tariff rate quota	Established tariff-rate quotas (TRQs) and respective volumes for 2018 imports of a number of products, such as whey, into the Eurasian Economic Union (EAEU). The volume of whey and modified whey products that will be allowed to enter into the Russian Federation is set at 15 metric 0.100 tonnes.

*A collection of major dairy policy developments starting in January 2012 is available at: <http://www.fao.org/economic/est/est-commodities/commodity-policy-archives/en/?groupANDcommodity=Milk,%20Dairy%20products>

Source: food.outlook. Milk and Milk Products Nov. 17 Internet

Table 1.2 Milk and Milk Products (thousand tonnes, milk equivalent)

	Production			Imports			Exports		
	2013-2015 average	2016 estim.	2017 f'cast	2013-2015 Average	2016 estim.	2017 f'cast	2013-2015	2016 estim.	2017 f'cast
Asia	316 603	337 466	344 433	39 480	40294	40 908	6 709	6 658	6 554
China	41 976	40 936	40 531	12063	11 998	12 500	75	52	49
India	146 501	162 964	169 320	89	124	136	706	276	213
Indonesia	1 265	1 230	1 250	2 573	2 839	2 863	87	55	50
Iran, Islamic Republic of	6 344	6 440	6 530	490	416	401	478	542	704
Japan	7 407	7 420	7 400	1 845	1 909	1 997	6	8	8
Korea, Republic of	2 159	2 126	2 083	922	1 022	1 115	21	23	25
Malaysia	84	86	87	2 061	2 169	2 137	612	693	689
Pakistan	50 233	53 000	53 700	484	638	717	66	35	33
Philippines	20	21	22	1 650	2 518	2 456	119	211	46
Saudi Arabia	2359	2 410	2 450	2 942	3 015	2 880	1 393	1 447	1 460
Singapore	-	-	-	1 787	1 576	1 585	629	573	531
Thailand	1 071	1 080	1 110	1 500	1 490	1 570	198	253	252
Turkey	18 719	19 900	19 980	214	160	115	541	930	873
Africa	46 610	46737	46 833	10 234	10 098	10 451	1 151	993	979
Algeria	4 206	4 612	4 700	2 776	2 895	3 265	3	-	-
Egypt	5 580	5 630	5 650	1 683	1 612	1 562	473	363	361
Kenya	4 882	4 830	4 820	61	69	103	14	8	10
South Africa	3 299	3 180	3 280	244	265	279	337	342	346
Sudan	7 616	7 540	7 440	231	258	247	-	-	-
Tunisia	1 222	1 235	1 265	95	80	85	47	31	29
Central America	16 937	17 299	17 598	5 012	5 718	5 801	703	849	931
Costa Rica	1 081	1 120	1 140	55	64	66	162	160	161
Mexico	11 321	11 780	12 027	3 048	3 693	3 789	186	326	387

Table 1.2 Contd...

	Production			Imports			Exports		
	2013-2015 average	2016 estim.	2017 f'cast	2013-2015 Average	2016 estim.	2017 f'cast	2013-2015 Average	2016 estim.	2017 f'cast
South America	64 720	61 179	63 253	3 174	3 634	3 508	4 457	4 063	3 607
Argentina	11 466	10 191	10 232	41	22	25	2 236	1 817	1 496
Brazil	34 810	32 725	34 427	854	1 659	1 462	293	180	194
Colombia	6 848	7 000	7 100	182	431	392	39	3	14
Uruguay	2 218	1 954	2 030	24	31	34	1 286	1 472	1 308
Venezuela	2 008	2 100	2 120	1 210	502	563	-	-	-
North America	101 680	105 444	107 551	2 386	2 806	2 689	10 603	10 585	11 629
Canada	8 551	9 100	9 450	661	666	640	530	613	895
United States of America	93 127	96 343	98 100	1 710	2 124	2 032	10 071	9 971	10 733
Europe	217 471	222 070	223 103	7 366	6 669	6 727	23 262	24 788	25 369
Belarus	6 824	7 169	7 290	170	204	128	3 634	3 930	3 722
European Union	158 867	163 800	164 500	1 427	1 310	1 247	17 347	18 480	19 348
Russian Federation	30 527	30 350	30 563	4 833	4 271	4 438	247	302	270
Ukraine	11 069	10 407	10 334	144	50	52	663	650	713
Oceania	30 655	31 629	30 712	1 116	1 340	1 515	21 922	22 719	22 491
Australia	96 68	9 991	9 301	720	889	1 098	3 274	3 341	3 280
New Zealand	20 897	21 568	21 341	201	281	245	18 645	19 374	19 208
World	794 676	821 824	833 483	68 769	70 559	71 599	68 807	70 655	71 561
Developing countries	411 533	428 668	438 163	55 160	56 890	57 671	12 598	12 140	11 639
Developed countries	383 143	393 156	395 795	13 609	13 670	13 928	56 208	58 516	59 921
LIFDC	247 389	267 126	274 090	5 958	6 219	6 398	1 381	875	827
LDC	33 448	33 784	33 671	3 990	4 016	4 055	174	138	136

¹For production, the annual dairy cycle starting in April is applied

²For production, the annual dairy cycle starting in June is applied

³For production, the annual dairy cycle starting in May is applied

Note: Trade values that refer to milk equivalents were derived by applying the following weights: butter (6.60), cheese (4.40), skim/whole milk powder (7.60), skim condensed/evaporated milk (1.90), whole condensed/evaporated milk (2.10), yoghurt (1.0), cream (3.60), casein (7.40), skim milk (0.70), liquid milk (1.0), whey dry (7.6). The conversion factors cited refer to the solids content method. Refer to IDF Bulletin No. 390 (March 2004).

Source: food.outlook. Milk and Milk Products. Nov 17 Internet

Table 1.3 Global milk production across countries

Country	1970	1975	1980	1985	1990	1995	2000	2005	2010	2015
India	20.80	25.60	31.56	44.02	53.68	65.37	79.66	95.62	121.85	155.49
Afghanistan	0.75	0.85	0.84	0.72	0.83	1.37	1.66	1.73	1.72	1.62
Argentina	4.19	5.65	5.31	5.64	6.28	8.77	10.12	9.91	10.63	11.31
Australia	7.76	6.70	5.57	6.23	6.46	8.46	10.85	10.13	9.02	9.49
Bangladesh	1.07	1.18	1.16	1.31	1.59	1.99	2.14	2.62	2.02	2.09
Brazil	7.42	10.05	12.06	12.57	15.08	17.13	20.53	25.53	30.96	34.86
Canada	8.31	7.75	7.41	7.48	7.98	7.92	8.16	7.81	8.24	7.45
Chile	1.12	1.00	1.12	1.05	1.39	1.90	2.00	2.31	2.54	2.04
China	1.96	2.37	2.93	4.76	7.04	9.48	12.37	32.02	41.16	42.67
Denmark	4.48	4.92	5.12	5.10	4.74	4.68	4.72	4.58	4.91	5.36
Finland	3.31	3.16	3.28	3.08	2.82	2.47	2.45	2.43	2.34	2.44
France	22.85	24.72	27.89	28.40	26.81	26.09	25.74	25.71	24.21	25.93
Germany	28.18	28.75	32.10	33.63	31.34	28.63	28.35	28.49	29.65	32.71
Indonesia	0.17	0.19	0.25	0.40	0.60	0.73	0.79	0.85	1.48	1.46
Ireland	3.08	3.59	4.72	5.83	5.40	5.35	5.16	5.38	5.33	6.59
Mauritania	0.24	0.18	0.23	0.22	0.27	0.28	0.32	0.37	0.69	0.75
Mexico	4.11	6.24	7.23	7.47	6.27	7.54	9.44	10.03	10.89	11.61
Nepal	0.63	0.71	0.75	0.81	0.92	1.01	1.17	1.35	1.62	1.86
Netherlands	8.24	10.22	11.79	12.53	11.23	11.32	11.23	10.98	11.81	13.55
New Zealand	5.99	6.10	6.70	7.88	7.51	9.29	12.24	14.64	17.01	21.94
Norway	1.73	1.84	1.97	1.98	1.99	1.93	1.74	1.59	1.58	1.61
Pakistan	7.45	8.19	9.01	10.86	14.72	19.01	25.57	29.44	35.49	41.59
Poland	14.96	16.38	16.49	16.44	15.84	11.64	11.89	11.95	12.30	13.25
Romania	3.12	3.81	4.34	4.32	3.81	5.02	4.62	5.55	4.62	4.68
Russian Federation	0.00	0.00	0.00	0.00	0.00	39.31	32.28	31.15	31.84	30.79
South Africa	2.91	2.50	2.58	2.20	2.48	2.79	2.54	2.87	3.12	3.54
Sri Lanka	0.14	0.19	0.24	0.29	0.25	0.29	0.16	0.17	0.23	0.23
Sweden	2.93	3.17	3.47	3.67	3.51	3.30	3.35	3.21	2.90	2.93
Switzerland	3.20	3.40	3.68	3.87	3.88	3.93	3.91	3.96	4.11	4.07
Thailand	0.00	0.01	0.03	0.06	0.13	0.31	0.52	0.89	0.91	1.10
United Kingdom	12.97	13.93	15.97	16.02	15.25	14.84	14.49	14.47	14.07	15.45
United States of America	53.07	52.34	58.24	64.93	67.01	70.44	76.02	80.25	87.52	94.64
Viet Nam	0.02	0.03	0.04	0.05	0.06	0.07	0.10	0.23	0.34	0.75
World	391.95	424.73	465.82	512.98	542.53	540.07	579.31	648.22	724.45	806.70

Source: FAOSTAT

The dairy sector is currently dealing with a number of challenges favourable long-term consumer trends and developing technologies provide a number of opportunities. Looking at these challenges and opportunities at the producer, processor and the retailer levels suggesting some of the themes, how the dairy industry needs to adopt as a whole emerging technologies and datafication of agriculture and providing the farmers with the potential to obtain quantifiable information to continuously measure and monitor farm operations and react or take steps accordingly. The increasing demand for the clean label products and functional foods and the growth of protein consumption during the innovation in the sector. The ability to identify and exploit the consumer insights from local markets is also vital in generating increased value for consumers and higher margin products for producers.

The global dairy sector continues to face challenging trends. Milk prices have been on the decline most parts of the world and are currently rather low, while some degree of price recovery in the medium to long is expected. A considerable level of uncertainty remains due to the increased production recently witnessed in the E.U and U.S.A as well as the state of global economy and geographical landscape. Whereas the longterm global demand for dairy products continues to increase primarily as a result of population growth as well as the growth in the consumption of dairy products. The world wide increase in milk production is currently not matched by corresponding demand the overall demand for solids not fat is not increasing at the same rate as that of butter fat resulting in the growth of inventories of several dairy products especially the milk powder in particular. The global dairy trade followed suit growing significantly the equivalent of nearly 9% global milk output is currently traded internationally. However, demand from importing countries could not absorb the additional output on the market thus resulting in a sustained drop/decline in the prices of dairy products throughout the year mergers and acquisitions continue to intensity and are becoming increasingly global. International projections show a population of nearly 10 billion in 2050 which means increased demand for food in the coming decades. In 2015 the global per capita consumption of dairy products was estimated at 111.3 Kg. According to the OECD and FAO this number should increase to 12.5% by 2025. Consumption in developing countries should increase further. These trends are confirmed by the National experts who completed the “Global Marketing Trends” survey on predicted household dairy consumption in the coming decade.

Summing up the both traditional and evolving technical demands, the producers, processors and the retailers need to provide the consumers with

nutritious, safe, convenient and value for money options which are required in the dairy context. Running dairy farms on professional basis has been a common place for some time in a number of countries. Regardless the scale of evolving technologies and improved farm management practices will play a greater role on dairy farms globally in the coming years. Successive farmers will need to focus on the key aspects to grow their enterprise in a sustainable and profitable manner.

Dairying plays an important role in agriculture in many countries globally across the world. The most important in some refers to milk production and processing industry. The future trends in the dairying can be split into three different areas and their interaction depending on each other influencing the future developments. The three different areas are namely the milk production, processing industry and the trade including the consumption of dairy products. Thus explaining their interdependency in the present situation and the likely tendencies in future such as the manufacture of equipment packaging, cleaning and sanitising agents of the industry which are different in different regions throughout the world. Milk is not only a valuable natural food but has become primarily an agropolitical and social problem, whether as surplus or scarcity.

Due to the surplus of milk and dairy products resulted in the Quota system in Western Europe whereas on the other hand the developing countries are lacking in milk and are trying with more or less success to alternate the situation by increasing their milk production. However, due to the increase in the population growth, the per capita milk production more or less stagnated, because, the increase in milk production is mainly due to the increase in the number of milk cattle and not due to the higher milk yield per cow since the feeding resources have not been improved correspondingly. The countries in transition will recover faster in milk production and will become an important factor in the world dairy market provided they will compete both with improved quality and price of the milk.

There is a great difference in milk production between the regions of the world to demonstrate how it is unjustified to generalize the situation in milk production and accordingly the future trends. They have to be estimated for different regions in the world separately for each country and even smaller areas. Milk yield will continue to increase upto the genetic potential of the breeds and the physiological capacity of the individual cows which is stimulated by favourable growth in prices and consequently higher concentrate input. In some countries showing lately an un-visual increase of the average milk yield the improvement is not due to the result of better

feeding, genetic improvement, better management and care etc but simply caused by the replacement of the low yielding cows with high yielding variety of cows.

Depending on the conditions and the situation present/prevalent in each county area an alternative must be found for the farmers who for economical reasons have been forced out of dairy business. The worse situation would be to abandon agricultural production or activity on farms for which generations were working very hard. The policy and the solutions are in the hands of the government agencies and their services as well as in the hands of the farmers themselves. The sooner the better they find the other alternatives. Direct sale of milk from farms or investments in very small dairies that are occurring already in some areas which is a short term measure and a doubtful solution.

Payment of milk according to quality had a double effect and consequently the improvements obtained in a very short period of time are clearly demonstrating that only the strict and stringent policy of the dairies. Permanent advisory activities and control can lead to success. In the absence of any clear cut agricultural policy defining with regard to the alternatives to the farmers learning milk production will inflict difficulties to the governments respectively it would be pity to lose the high yielding herds of cows which are excellent nucleus for the general improvement of milk production solutions must be found in new ownership and management.

Trends in other countries in transition varies differently from country to country. In spite of the latest improvements it will take time and great effort is needed to find a solution for the future. Obviously there are different conditions problems, solutions and trends. Milk is not only the most perfect food but it became primary on a geopolitical and social problem regardless if it appears as a surplus or scarcity commodity. The future international trade will be influenced by the GATT agreement which is implementing the reduction of export subsidies and giving access to the imports. In the dairy industry the trend is and will be the concentration of few processing centres in each country which will cover not only the home market but aggressively invade the worldwide market. Careful studies will be necessary to foresee the trends in different markets keeping in mind that markets are not given but made and fought for concentration of experts from different fields of activities will result in greater efficiency provided they are integrated in the top management and their competence is equal to their responsibility. The trend goes toward high quality products with long shelf life. Packaging and wrapping material of high quality will be accepted only if recyclable low weight and efficiently cleanable with low concentration of cleaning and sanitizing agents.

There are tendencies to establish new small dairies by individual or group of farmers in which liquid milk and/or other dairy products are produced. The small entrepreneurs must be aware of the fact that small dairies have to meet the same regulatory and hygiene requirements as those prescribed for the large dairies. In addition these small units might have difficulties in marketing their products especially in case they are situated in the remote areas far from the markets. Same general trend which can be foreseen is in the consumption of the dairy products which is very variable. It is most cynical to launch a general campaign against milk consumption as even in the developed countries there are so many under nourished people who would be only too happy to get a glass of milk per day. Does the advocated danger from the dairy products apply to millions of starving people in different parts of the world among them are so many children. The dairy industry will certainly take part in the emerging market of nutraceutical foods in order to sell profitable intermediary products to dietetic and pharmaceutical industries. The consumption of dairy products in developing and under developed country will differ which will be further influenced by poverty, possibly to produce milk in unfavorable conditions health reasons etc., where generalization is not possible.

The food and Agriculture organization of the United Nations in their report on the global dairy sector on sustainable production, processing and consumption of milk and milk products outlined some facts which may benefit people and the planet that can help to achieve the sustainable development growth (SDG). An attempt has been made to summarise and reproduce the facts for the benefit and better understanding of the entrepreneurs, dairy farmers as well as the students of the dairy science here under briefly.

1. Milk is one of the most produced and valuable agricultural commodities world wide milk ranked third by production tonnage and was the top agricultural commodity in value terms the world over. Milk contributes 27% to the global value added to livestock and 10% to that of agriculture.
2. Milk is a local as well as a global commodity. Basically milk is produced locally and consumed globally in almost all over the world and ranks among the top five agricultural commodities interms of both quantity and value. The milk and dairy products account for about 14% of the global annual trade with particular reference to the whole milk powder (WMP) and skim milk powder (SMP) as percentage production whereas the fresh dairy products with less than 1% are the less traded commodity on the basis of production.
3. The dairy sector is growing fast with the projected world milk production to increase by 177 million tonnes by 2025 at an average

growth rate of about 1.8% per annum. This is because of the sheer size of the dairy industry, the growth rates can produce big development pay offs for peoples livelihood, for the environment as well as to the public health also.

4. The dairy sector is heterogonous because of the fact that global milk production largely derives from cattle representing 82.7% followed by buffaloes 13.3%, goats 2.3%, sheep 1.3% and camels 0.4%. Milch animals are raised in a multitude production systems whose main objective is the production of milk.
5. Dairy animals are a popular asset in the rural areas. Globally there are more than 150 million farmers who are keeping atleast one milch animal including cows, buffaloes, goats and sheep farmers often keep mixed herds with more than one species of dairy animal and the most common dairy animal being the cow in developing countries.
6. Dairy animals support livelihood because of the fact that those animals are a regular source of food and cash for the farmers who either consume or sell milk and milk products every day. Dairy animals are a store of wealth and enhances the resilience by selling them for cash in needy times. The animals also contribute to crop productivity through animal traction/power and also provide social status and social capital thus facilitating a network system which is at the core of the effective market and supply chain of relations and alliances.
7. Dairy products are key to nutrition and health of the human beings. Milk and dairy products are dense nutrient foods supplying energy, protein and micro nutrients including calcium, magnesium, selenium riboflavin and vitamins B₅ and B₁₂ which are essential to reduce the hunger and mal nutrition amongst the most vulnerable especially the pregnant women and children.
8. Milk production supports women empowerment where in majority of the developing countries the most popular asset among the rural women is the dairy animal which can be acquired very easily. Women however regardless their owning the milch animals play a major role in the dairy production system by their multiple activities in the care and management of these animals. Dairy often serves as the first stepping stone for the rural women to start a consolidating better place for themselves in the society.
9. The dairy industry creates jobs since the dairy producers are very often organised in cooperatives or in liasion with other valued chain of actors to process and sell their products to the consumers. Employment is a major pathway out of poverty and job creation is a global challenger

with an estimated 150 million dairy farmers globally it is likely that the dairy sector supports the livelihoods of about one billion people world wide.

10. The dairy industry has a keynote in the public health. Consumption of dairy products even though is considered as a part of the healthy diet, the consumer must be aware of the zoonotic and food borne diseases which are originating from the dairy animals that are harmful to the public at large. The consumption of raw milk and other unpasteurized dairy products can result in the occurrence of the food borne diseases. Excess intake of antibiotics by the milch animals can also contribute to anti microbial resistance in human beings.
11. The dairy industry relies on natural resources such as land, water, nutrients and energy. In order to feed the dairy animals which includes all species of a milch animals requires around 1 (one) billion ha of land or 7% of the total land on the planet earth. The global dairy herd consumes about 2.5 billion tonnes of dry matter feed annually. About 40% of the global livestock feed intake as around 77% constituting grass and straws suggesting that the global dairy herd is converting the materials which are not edible to human population into high quality protein and other essential micro nutrients.
12. The dairy herd contributes to green house gas emissions especially through rumination. Dairy animals produce around 3.1 giga tonnes of CO₂ equivalent per year or 40% of global livestock emissions with dairy cattle responsible and accounting for 75% of the same. Depending on the species and the production system that is being followed or adopted the enteric methane production represents 51 to 67% of the herd emissions. Compared with CO₂ which is a longlived climate pollutant methane even though is short lived but traps 84 times more heat than CO₂ over the first two decades after it is released into the air. Therefore the potential of reducing the negative impacts on climate through the increased productivity of ruminants is most important. Options aiming to reduce the emissions mainly dependent on target feed efficiency manure management and herd performances through improved animal health and husbandry practices.

The linkages between the dairy sector, people and the planet are multiple and all encompassing investments that promise and promote a sustainable development of the livestock industry can contribute to achieve these objectives which include:

Full productive employment and decent work for all reducing the inequality and to end poverty, hunger in order to achieve food security contributing to healthy lives. Achieve gender equality and partnerships for the goals by promoting sustainable consumption and production patterns to combat climate change. Protect and restore terrestrial eco-systems including biodiversity and sustainable management of water and sanitation.

1.8 Dairy Industry in India

Dairying is practiced in the villages as a cottage industry meeting the household requirements which is scattered throughout the length and breadth of the country. There is no organised dairy industry. Semi commercial dairying has started with the establishment of the military dairy farms by the colonial British rule in order to meet the requirement of their personnel.

The first cooperative activity in dairy enterprise started in Uttar Pradesh with the organisation of "Katra" cooperative milk society (1913, 1917) at Allahabad, Lucknow (1938), Varanasi (1947), Kanpur (1948) and Meerut (1950). Presently about 55 districts of the state are covered under dairy development programmes in cooperative sector.

1.9 Mile Stones in Dairy Development

- 1862 - First veterinary school was opened at Poona in order to meet the requirement of the Remount and veterinary corps in the Army.
- 1886 - First military dairy farm was set up at Allahabad.
- 1889 - Establishment of Imperial Bacteriological Laboratory at Poona, which became the forerunner of Imperial Indian Veterinary Research Institute, Izatnagar, Bareilly, UP
- 1891 - Establishment of Indian Civil Veterinary Department later named differently as Animal Husbandry and Veterinary Services Department including the dairy development.
- 1907 - First importation of Ayrshire stock.
- 1914 - Studies were initiated on the milk production and composition of Indigenous cattle and attempts were made to establish pedigree herds of Indian Breeds.
- 1916 - Appointment of Imperial Dairy expert.
- 1920 - William Smith the imperial dairy expert recommended
 - (1) Scientific feeding, breeding and management
 - (2) Establishment of a training centre to meet the manpower.
- 1923 - Establishment of Imperial Institute of Animal Husbandry and Dairying at Bangalore. The institute was renamed as Imperial Dairy Institute in 1941 which was shifted to Karnal in 1955 and renamed as NDRI. In 1923 two years diploma course (I DD) was started at Bangalore and Allahabad.
- 1928 - Appointment of Royal Commission Agriculture.

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- 1929 - Setting up of Imperial Council of Agricultural Research which was renamed as Indian Council of Agricultural Research (ICAR) on 16th July 1929. It was reorganised twice in 1965 and 1973.
 - 1930 - Shri Pestonji Edulji Polson established Polson Model Dairy at Anand for the Polson butter etc.
 - 1936 - Dr. N.C. Wright, Director Hannah, Dairy Research Institute, U.K. suggested various methods for the improvement of dairying in India.
 - 1937 - The Lucknow Milk Producers Co-operative Union Limited was established followed by the organisation of such unions in other districts and states.
 - 1938 - Agmark act was enacted which laid down the standards for the grading of ghee and butter.
 - 1944 - Establishment of Central Livestock and Research cum breeding station at Harringhata with an intention to supply processed milk to Calcutta.
 - 1945 - Inauguration of Government Bombay Milk Scheme (GBMS) and setting up of the Aaray milk colony.
 - 1948 - Establishment of Kaira District Co-op. milk producers union at Anand, which came to be known as AMUL - After independence both AMUL and GBMS set together a faster pace of dairy development with emphasis on developing techniques of processing and marketing under Indian conditions.
 - 1950 - Pasteurised and bottled milk was sold for the first time to the common man in India in Bombay.
 - 1955 - NDRI was shifted to Karnal at the central cattle breeding farm.
 - 1956-61- During the second five year plan, seven liquid milk plants were completed. Eight pilot milk schemes, three creameries and two milk product factories have been started.
 - 1957 - Establishment of dairy science college at NDRI Karnal offering the B.Sc Dairying Degree.
 - 1960 - Production of baby food and milk powder by Amul from buffalo milk for the first time in the world and of course in India with the help of CFTRI, Mysore.
 - 1961-66 - During third five year plan 23 liquid milk plants, 27 Pilot milk schemes were in operation, 2 cheese factories and 4 cattle feed factories have been established and another 37 liquid milk plants have been started.

- 1965 - National Dairy Development Board was set up.
- 1970 - Establishment of Indian Dairy Corporation and launching of Operation Flood (OF1).
Establishment of National Co-operative Dairy Federation of India.
- 1975-76 - Evolution of National Milk Grid Marketing of Milk through rail tankers began, Anand - Delhi, Anand - Bombay, Jalgaon - Bombay, Dhule - Bombay, Erode - Madras etc.

Dairy educational and research activities in the country commenced with the establishment of the "Imperial Institute of Animal Husbandry and Dairying" on 1st July 1923 at Bangalore. William Smith, Asst. Director Military farms was appointed as the imperial dairy expert. The idea to establish the institute was conceived in 1916 when the then Govt. of India was implementing the recommendations of the Board of Agriculture. The military dairy farms at Bangalore, Karnal and Wellington (Nilgiris) were transferred to the Imperial Institute of Agriculture in 1923. During the year 1936 the military dairy farm at Karnal was handed over to the Imperial Institute of Agricultural Research at New Delhi. The Imperial dairy experts section along with the Bangalore Dairy Institute was separated and placed under the erstwhile Dept. of Education, presently Ministry of Agriculture and at the same time re-naming the institute as Imperial Dairy Institute.

After Independence in 1954 the Govt. of India has decided to establish the Imperial Dairy Institute, together with the Dairy science college shifting the head quarters from Bangalore to Karnal in the premises of the cattle cum dairy farm and renaming the institute as National Dairy Research Institute, as per the recommendations of Prof. H.D.Kay, Director, National Institute for Research in Dairying Reading, U.K. The Institute was finally shifted to Karnal in the year 1955 and the under graduate B.Sc dairying course was started at NDRI in 1957. After the successful implementation of the operation flood programme in 1971, many Dairy Science colleges were started in the country.

1.10 Educational Institutions

The list of educational institutions which are imparting training in the field of dairy science have been listed below:

1. Dairy Technology College, Tirupathi, Andhra Pradesh
2. College of Dairy Technology - Kamareddy, Andhra Pradesh
3. Sanjay Gandhi Institute of Dairy Technology - Patna, Bihar
4. Seth M.C. College of Dairy Science - Anand, Gujarat

5. Dairy Science College, Hebbal, Bangalore, Karnataka
6. College of Dairy Science & Technology, Raipur, Chattisgarh
7. College of Dairy Science & Technology, Udgir, Maharashtra
8. G.N. College of Dairy Science & Food Technology, S.D.A.U, Gujarat
9. College of Dairy Science & Technology, Mannuthy, Thrissur.
10. Sam Higgin Bottom University of Agriculture and Technology & Science, Allahabad, (previously Allahabad Agricultural Institute Naini Allahabad), Uttar Pradesh
11. College of Dairy Technology, Warud, Pusad Dist., Maharashtra.
12. College of Dairy Science, Udaipur, Rajasthan.
13. Faculty of Dairy Technology to W.B.U.A & FS Mohanpur, Calcutta.
14. Dairy Science College, Chennai
15. Dairy Science College, Ludhiana
16. Dairy Science College, NDRI, Karnal
17. Dairy Science College, Amreli, Gujarat
18. Dairy Science College, Gulbarga
19. Mansinhbhai Institute of Dairy and Food Technology, Mehsana, Gujarat

The earliest attempts of the dairy development can be traced back to the colonial British rule where they have established the military dairy farms, with an intention to ensure the supply of milk and milk products especially the butter to their army personnel. The first of these farms was set up in Allahabad in 1913, followed by Bangalore, Ootacamund (Nilgiris) and Karnal etc., in a phased manner maintaining with the improved milch animals. This approach did not have any effect/impact on the supply of milk to the urban civilian consumer as it was less important to the military authorities. With the increasing growth of the urban population, the consumer has to depend on the milk vendors who sell/supply the milk door to door either by collecting the milk from the nearby villages or by keeping the milch animals (Cattlesheds) in the close proximity of the cities/towns. To some extent the second world war gave an impetus to the private dairies with modestly modernised processing facilities like Polsons, Keventers and the Express way were some of the urban dairies supplying the processed milk table butter, and ice-cream though not on a large scale.

These dairies were not concerned with either the improvement of the breed or the milk production level of the breed/animals which are reared in the rural areas as they are interested and contended with the procurement of the milk from the producers because they are commercial in their nature.

These early modern systems did not bring about any significant changes/ shifts in the milk production and the dairying remained in an un-organised and under developed state.

1.11 Dairy Development

The milk production is predominantly the domain of small and marginal farmers and the land less, who keep 1-2 milch animals generally as a part of the mixed farming system. Small holders own about 70 percent of the milch animal population but these are widely dispersed in rural areas with poor infrastructure and limited access to services and markets. The cattle and buffaloes have a complimentary, supplementary and sustainable relationship with crops under mixed farming system prevalent in the country.

The domesticated dairy herd was of poor quality, which reflected the emphasis on draught but not on milk. Today the situation has changed dramatically with the milk-production increasing rapidly both absolutely and relative to the population. Dairy development fits most appropriately in the country's programme of increasing food production, rural development, and equitable distribution. Any effective programme for poverty alleviation would have to include dairying as its base to bring about maximum growth with minimum capital out lay. India's dairy industry is on the threshold of many good changes that would totally transform the dairy scenario and give the needed thrust for its rapid growth. Greater emphasis must be placed on the facilities in the areas of milk production, processing, marketing and research in order to meet the challenges ahead. Buffaloes constitute only one third of the total milk bovine population, but account for more than half of the total milk production. The low productivity of some 75 million non-descript cows and buffaloes is weighing down the milk enhancement programmes. The major challenge today is how to bring about even a small gain in their productivity.

The dairy development in India has been achieved through the “**Operation Flood**” programmes. Milk cooperatives in the villages are the collection points for locally produced milk. The main objective of dairy development programme is to increase the milk production level of the native non-descript cow/buffaloe which have been scattered in the rural areas for which the following steps/considerations are to be followed.

1. The availability of good quality and quantity of feed must be increased.

2. Improvement of management, housing, husbandry methods and veterinary care.
3. Genetic improvement, production and reproductive capacity of the cattle.

After Independence, the Govt. of India has launched its 1st Five year plan in the year 1951 giving the priority to the dairy industry with an intention to supply/provide hygienic milk to the urban population by organising/strengthening the milk schemes in the large cities. In order to stimulate the milk production levels of the animals the Govt of India has launched and implemented the Integrated Cattle Development Programme (ICDP) and the Key Village Scheme (KVS). In the absence of stable and remunerative prices as well as good marketing facilities for the milk producers the milk production remained more or less stagnant.

Dairy development is conceived as a major development programme not only in the context of poverty mitigation plan but also as a measure to augment the milk production to meet the increased demand for milk from urban consumers. Distribution of milch animals and encouragement of milk production is one of the popular action programmes under the Integrated Rural Development Programme (IRDP) for alleviating the poverty in India.

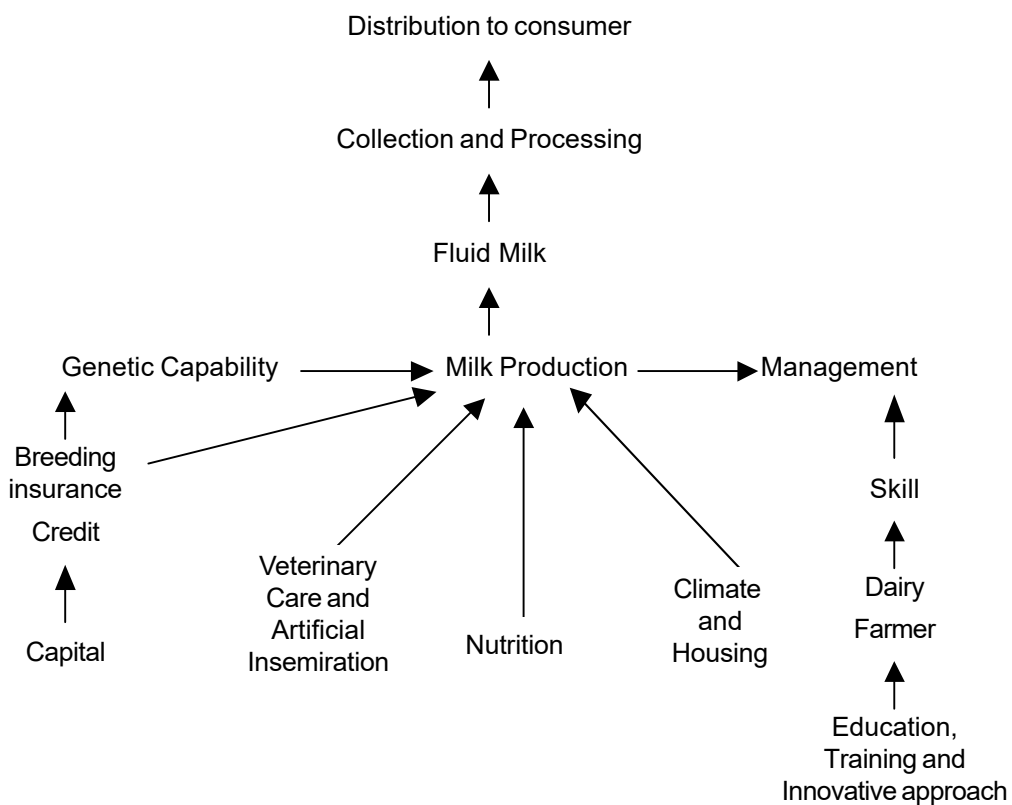
In the early sixties (1960) the State Governments have adopted and tried different strategies for the development of the dairying as an industry by establishing the modernised milk/dairy plants and run by their own (trained staff) departments organising the various milk schemes. The Urban orientation of milk production lead to the establishment of cattle colonies at Mumbai - Aarey Milk Colony, Kolkata - Harringhatta and Chennai - Madhavaram Milk Colony. In the early stages, these government programmes had to face extreme difficulties in organising the procurement of milk from rural areas in order to run the milk schemes/plants economically because they failed to create an organised milk procurement system which the middle man and the contractors took advantage due to the perishable nature of the milk. The queue of the consumers were larger because the govt. dairies were not able to meet the urban demand while the rural milk producers were left at the mercy of the trader and the money lender.

Dairying shall continue to be a subsidiary occupation, and major source of income for the small, marginal farmers and landless labourers. In any scenario, the non-descript cows and buffaloes will remain as the back bone of tomorrow's dairying. The most significant contribution of the cooperative dairying is to bridge the rural producer and the urban consumer through a national milk grid. It has been able to bring to the door step of the dairy

farmer, the lucrative urban market which is otherwise inaccessible to him. To ensure the orderly dairy development including the dairy equipment industry, which is relatively young in order to give a momentum of growth it is essential to identify the future needs, the technology gaps and priorities in the years ahead.

An effort has been made to present all the aspects pertaining to milk production which needs a careful consideration in a schematic manner for better understanding.

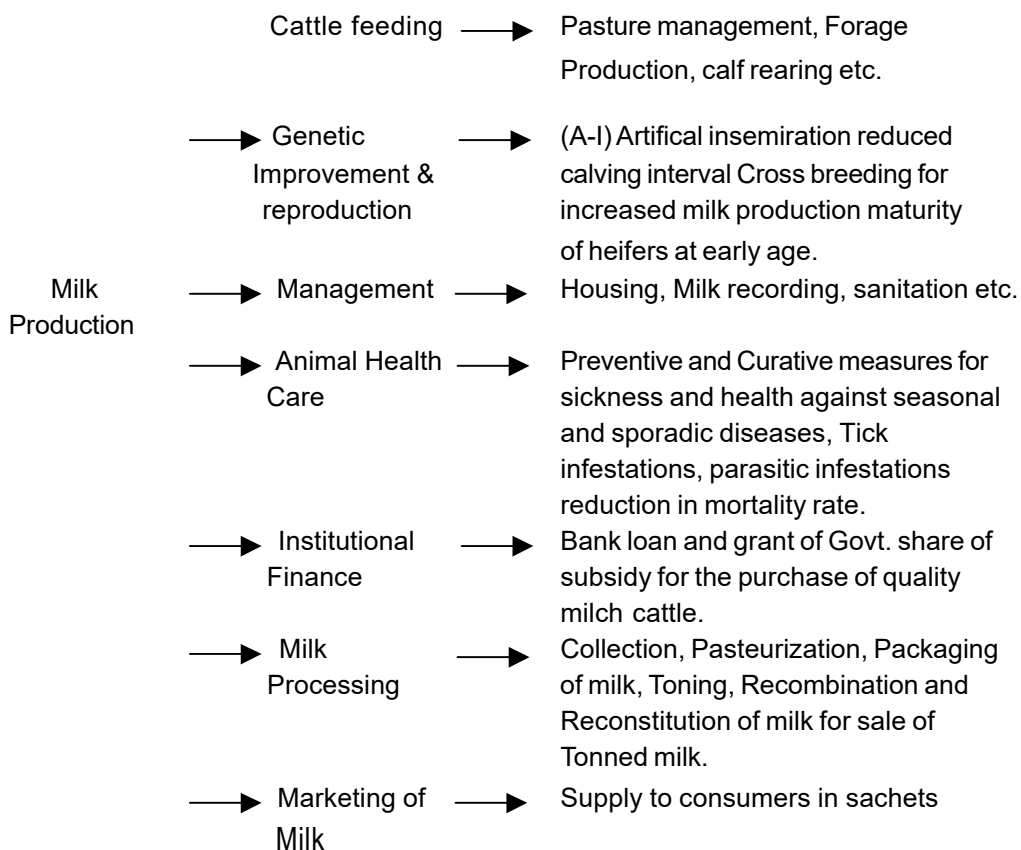
A concrete example of the services has been seen through the Integrated Dairy Development Programme (IDDP) or the Integrated Rural Development Programme (IRDP) launched by the National Dairy Development Board (NDDB) and the National Bank for Agriculture and Rural Development (NABARD) respectively. They provide various types of services to the cattle owners as well as to the consumers.



Source: M. Perumal, P.S. Mohan and M. Suresh

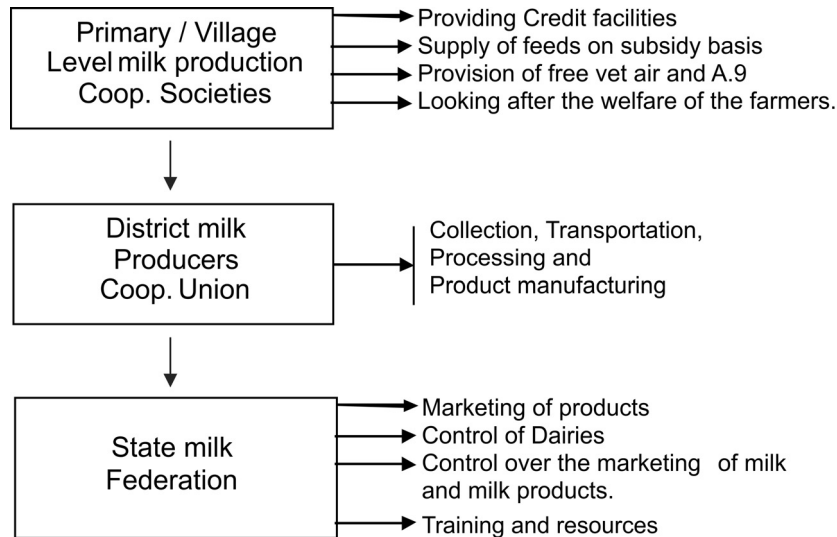
1.12 Evolution of Anand Model/Pattern

The major problem that is faced by the Indian Dairy Industry since Independence to till date is the procurement of milk and its marketing from the scattered rural villages due to lack of proper road and communication facility. Polson's - a private dairy which was established at Anand in the erstwhile Bombay state and present Gujarat State used to procure the milk from the milk producers of the nearby villages through the middle man/contractors and the milk after processing was sent to Mumbai which is about 425 km away. In mid 40's the milk producers of Kaira Dist. who are supplying the milk to the Polson's Dairy plant demanded for a proportionate share of the trade margin and a modest increase in the procurement rate of the milk which was denied by the Polson's Management. Thereafter the milk producers refused to supply the milk and on the advise given by late Dy. Prime Minister Sardar Vallabhbhai Patel and formed milk producers society which is registered as the "Kaira Dist. Co-operative Milk Producers Union" which is now popularly known as "AMUL" (Anand Milk Union Ltd) in the year 1946 thus laying a foundation for the organised milk marketing in India.



Source: M. Perumal, P.S. Mohan and M. Suresh

The three tier structure of Anand Pattern Cooperatives



Source: M. Perumal, P.S. Mohan and M. Suresh

The Govt. of erstwhile Bombay state has cancelled the contract with the Polson's dairy and entered into a new agreement and handed over the entire business of supplying the milk to the AMUL in the year 1952. However, the AMUL has faced a major problem and difficulty in the disposal of the surplus milk in the flush/peak season. In order to overcome this problem the "Kaira Dist., Co-operative Milk Producers Union" has established the first and a new dairy plant at Anand for producing the milk products such as Butter, Ghee and Milk Powder in the year 1955. To cope up with the ever increasing demand of milk procurement the AMUL dairy has set up a second dairy plant and a product manufacturing unit in the year 1965 and 1971 respectively finally leading to the establishment of a fully automatic modern dairy in the year 1993 adjacent to the original dairy plant.

Thus the AMUL provided the basis for the Anand Model of Dairying the primary or the basic unit being the Milk Producers Co-operative Society at the village level. The village co-op. societies in the district combined together forming the district union which ideally has its own processing facilities. All the milk unions representing the different districts of the state are normally members of the State Federation whose prime responsibility is to provide the marketing facilities for the milk and milk products that are produced by

the respective milk unions within the state as well as outside the state. There is also another organization at the national level - the National Co-op Dairy Federation (NCDF) which formulates the policies and programmes designed to safe guard the interest of all the milk producers of the country.

1.13 Role of NDDB in Dairy Development

The Prime Minister of India Late Lal Bahadur Sastry visited Anand to inaugurate the cattle feed plant in Oct. 1964 and spent a night as the guest of the Anand Milk Union Ltd. He was very much impressed by the socio-economic changes that were brought about by the milk co-operatives and expressed his desire to replicate the “**Anand Model**” through the national level organization throughout the country making available a multi-disciplinary professional expertise to the dairies in the public and co-operative sector. In the year 1965 the National Dairy Development Board (NDDB) was constituted which was registered under the Societies Registration Act, the Charitable Trust Act and Public Trust Act and located at Anand considering its model and mandate.

In the initial stages, the NDDB was supported and assisted financially by the Govt. of India, the Danish Govt. as well as by the Amul. NDDB also received some financial assistance and funds from UNICEF. NDDB was not equipped with any monitory powers to handle the government funds. Therefore, in the year 1970 the Govt. of India has established the Indian Dairy Corpn. (IDC) which was later merged with the newly constituted NDDB by an act of parliament passed in the October 1987.

NDDB began its operations with the mission of making dairying a vehicle to a better future for millions of grass root milk producers. Since its inception, the dairy board has planned and spear headed India's dairy programmes by placing dairy development in the hands of milk producers and the professionals they employ to manage their co-operatives. In addition NDDB also promotes their commodity based co-operatives, allied industries and veterinary biologicals in an intensive and nation wide basis.

1.14 Operation Flood (OF) 1970 - White Revolution OF - I

The strategy for the organised dairy development in India has actually been conceived in the early 60's which was strengthened with the establishment of the National Dairy Devt. Board (NDDB) in 1965. The operation flood (OF) is an unique approach conceived by Dr. V. Kurein, the founder Chairman of NDDB whose vision saw an opportunity to utilise the surplus milk products namely the milk powder and the butter oil that have been accumulated in the European Markets and have posed a major threat and a death knell for the developing dairy industry in India. The operation flood designed basically as a marketing project revolutionized the Indian Dairy Industry recognising

the potential of the European surpluses as an investment in the modernisation of the Indian Dairy Industry with the assistance of the World Food Programme (WFP), Food Aid in the form of milk powder and butter oil obtained from the countries of European Economic Commission (EEC). The funds to the tune of 116.54 crores have been generated by the sale of 1,26,000 tons of skim milk powder (SMP) and 42,000 tons of butter oil for the implementation of the operation flood (OF). During this first phase of Operation Flood (OF) which was launched in 1970, and was popularly known as “**White Revolution**”. The funds generated through the sale of WFP gifted commodities were utilised to develop 27 rural milk sheds covering 10 states and setup dairies called as “**Mother Dairies**” in the four metropolitan cities. Thus it laid the foundation to the modern dairy industry ultimately to meet the needs of the milk and milk products of the country. The commercial imports of milk powder which were around 60,000 mt prior to the launching of OF have shown a declining trend and were almost ceased completely by the year 1975-76 except for a couple of years, where the milk powder was imported commercially during the period of extreme drought conditions to meet the liquid milk demand.

OF - II (1981-85)

The second phase of OF was commenced in the year 1981 with an aim to build up a National Milk Grid (NMG) linking 136 rural milk sheds in 21 states and union territories, with the urban demand thus creating the necessary infrastructure to support the viable dairy industry.

It was started in April 1981 with an intention of creating a viable dairy industry in order to meet the India's need for the milk and milk products. The world bank has provided about 150 million US \$ in the form of commodity assistance from the EEC. The OF-2 integrated the Indian Dairy Association and all the dairy development projects that are being implemented in some of the Indian States and it was closed in March 1985.

OF - III (1985-96)

The third phase of OF which was commenced in 1985 aimed at the consolidation of the gains made under the earlier two phases thus achieving the self sustainability of the milk unions.

This project/programme aims at ensuring that the co-operative institutions become self-sustainable with an investment of US \$ from world bank in the form of commodity and cash assistance from the EEC and NDDBs own internal resources.

India's white revolution has not only received support from the European community and the world bank but also from a number of Western Govt's, the United Nations (UN), Food and Agrl Organisation (FAO), the United

Nations Children's Educational Fund (UNICEF) and European Non-Government Organisations (NGOs) such as British Relief Agency etc.

Operation Flood (OF) IV - 1996-2006

This fourth phase of operation was aimed at the strengthening of the following objectives.

1. To create infrastructure and strengthening democratic values.
2. Strengthening the cooperatives by providing funds on 50:50 basis from central and state governments and
3. To increase the extension work in the fields of cooperative education, personnel training, marketing support, product development and improving the standards.

Efforts have been made to summarise the overall achievements of the OF Programmes of OF-1 to OF-4 and the achievements made by the Dairy Co-operatives state-wise upto 2009-10 during the OF Programmes in the Tables 1.4 and 1.5.

Table 1.4 Overall achievements under OF Programme

Item	Years				
	1971	1981	1985	1990	1996
1. No.of milk shed areas	5	39	136	170	170
2. No.of DCS	1600	13,300	34,500	60,800	70,000
3. Farmer membership	2811	7751	7361	701	93141
4. Average milk Procured LLPD	5.2	25.6	52.6	91.5	11.5
5. Total processing LLPD	168	64.9	122.8	178.2	22.6
6. Total marketing LLPD	NA	22.9	50.1	72.5	100
7. Investments	NA	116.54	277.17	411.59	1303.5

LLPD - Lakh Litres Per day

Source : India Dairy.com

1.15 Present Dairy Scenario

Dairying in India has been an eventful journey which has come a long way from being written off as a basket case a few decades back. Today India has emerged as the largest milk producer in the world with an annual production of more than 121.8 million tonnes in 2010-11. The success of India's dairy industry is not a story of the triumph of science and technology. Over the years milk has been transformed from insufficient production to self sufficient production, from ration to plentiful availability, from loose unhygienic milk to milk that is pure from subjugation to a symbol of farmers economic independence. The requirements of our nation are on the move and must be met first with sustainable economic development. Based on the planning commissions estimates and

subsequent corrections on account of consistently higher growth in GDP, it is expected that the demand for milk is likely to be about 155 million tonnes by 2016-17 (end of 12th five year plan) and around 200 million tonnes by 2021-22. Indian dairying must address itself to issues of productivity, efficiency and response to consumer demands.

Table 1.5 Summary of (OF) Operation Flood achievements state wise by the dairy Co-operatives upto 2009 -10 *

Sl. No.	Name of the State / UT	No.of DCS Organized (Cumulative)	Farmer members ('000)	Women members ('000)	Milk Procurement (Tkg pd)	Milk Marketing @TLPD
01.	AP	4911	841	177	1443	1409
02.	Assam	66	3	0	5	12
03.	Bihar	8299	441	64	736	437
04.	Chhattisgarh	751	31	7	24	35
05.	Delhi	---	--	--	--	3047
06.	Goa	179	19	3	36	75
07.	Gujarat	13890	2809	791	9053	3164
08.	Haryana	6881	313	73	522	384
09.	Himachal Pradesh	795	33	11	55	18
10.	Jammu & Kashmir	**	**	**	**	**
11.	Jharkhand	50	1	0	5	239
12.	Karnataka	11902	2052	660	3566	2468
13.	Kerala (#)	3637	775	162	769	1067
14.	Madhya Pradesh	5729	266	50	525	447
15.	Maharashtra	22217	1845	452	3151	2807
16.	Nagaland	47	2	0	9	3
17.	Orissa	3203	181	77	241	264
18.	Pondicherry	101	39	18	48	87
19.	Punjab	6904	381	54	952	723
20.	Rajasthan	15956	670	205	1654	1365
21.	Sikkim	287	10	1	11	14
22.	Tamil Nadu	10038	2122	874	2277	1990
23.	Tripura	84	6	1	2	13
24.	Uttar Pradesh	21343	971	265	518	402
25.	West Bengal	2962	210	70	262	655
	All India	140227	14021	4015	25864	21125

Source : India Dairy.com

Note:

1. * Refers to Provisional for not reported and NA for not available.
2. # Includes conventional societies and taluka unions formed earlier.
3. @ Co-operatives (State) and metro-dairies.

The Indian dairy industry is a top ranker in the global dairy band wagon. Currently around 46% of the milk is consumed in the form of liquid milk, 47% as traditional dairy products and 7% as western dairy products. The dairy in India is currently estimated to be about 130 million tonnes and is expected to grow at 4.5% per annum.

India is among the world's largest and fastest growing markets for milk and milk products. The average annual growth rate of milk, milk production has been 4 percent during the past decade. The country's per capita availability of milk is lower than the world's daily average of 285 grams though it has doubled from 124 gm in 1966 to 258 grams per day in 2009-10 and increased from 241 gm per day in 2005-06.

The world dairy is zooming in India for its rapidly growing markets that promise the 'moon'. World production of milk is projected to rise to 665 million tonnes by 2010 representing an average annual increase of 1.5 percent compared to an annual average growth rate of one percent during the 1990's. Of the estimated 16 million tonnes increase (2.6 percent) in the global milk production in 2005 over 2004. 75 Percent accounted by three countries - China (5.4 million tonnes), India (4.1 million tonnes) and USA (2.7 million tonnes).

The dairy sector need to be encouraged in order to fully exploit the complimentary, supplementary, synergistic and symbiotic relationship of animal productivity with crop production in the coming years where the food grain production has to increase and sustain itself to meet the demand of ever growing human population in our country. Enterprenurial development programmes hither to be carried out as innovative strategies for developing human resources, skills, and technologies with larger frequency and intensive extension programmes are to be revamped. India can take its pride in some of its major achievements in the field of dairying since 1971 or after launching the 'white revolution' or the Operation Flood Programme.

1. Top milk producer yet low productivity

The total milk production of the country which was more or less stagnant around 23 million tonnes during the early sixties and seventies, has increased to about 107 million tonnes, during the year 2007-08 and is expected to reach to about 128 million tonnes during the year 2011-2012 maintaining the first rank in the world milk production. On the contrary it is very much disappointing to observe that the national

average animal productivity is 1.5 ltrs per day as against 4.2 litres per day in buffaloes and 6.4 ltrs per day in cross breed cows in the operation flood areas.

Ideal productivity and milk production has been achieved and demonstrated at the institutional levels, however the average productivity levels exhibited in the actual field conditions are much too less/low showing variations around the mean in the entire population.

2. Ranking first in world's milk production - yet low per capita availability and consumption

India's total milk production has increased from 23 million tonnes to 128 million tonnes during the year 2011-12 which is almost 4 to 4.75 times higher. In spite of the fact that India has attained the first rank in the world's milk production, the per capita availability/consumption of milk even though has increased in a significant manner from 107 gm to 291 gm per day which is marginally higher than the world's average of 285 gm during the year 2011-12.

3. High per capita availability - yet many under nourished

According to a survey conducted by the National Institute of Nutrition (NIN) the per capita availability of the milk in India is 258 gm per day which appears to be good. However, the actual intake of milk varies from a sparse or meagre 20 gm per day in many districts of Eastern Region to almost a litre per day in Punjab.

4. Low purchasing power - less Consumption

The National sample survey organisation (NSSO) has conducted a survey on all the income groups both in urban and rural areas and recorded higher expenditure on milk and milk products. They concluded that low purchasing power denies consumption as per the dietary norms to majority of the Indians.

5. Number one in Milk - but least support

Milk is India's number one farm commodity. Notwithstanding its top place in the world's milk production, dairying has not received its due attention/recognition from the national planners, economists, social scientists as well as others.

6. Having about 12% of the cattle population of the world, India contributes about 11.5% only to the annual world milk production, despite the fact that more than half of the above milk production is

contributed by an additional strength of 39 million milch buffaloes in the country. It is also a fact that despite having only 2.4% of world land and also about 6 times the pressure of the human population on it when compared with the world average.

7. India has had the privilege to operate the largest world Food Programme aided dairy development project, which is popularly known as Operation Flood/White revolution, which has brought a remarkable, multi directional progress and achievements in the dairy field in several parts of the country during the three phases of its operation. The organised dairy sector is now commanding a major substantial share of the milk market in the four metropolitan cities, 770 other cities and towns of the country, immediately benefiting over 10.1 million producers in about 77000 villages covered under the field of multitier network of village milk producers cooperatives by assisting them round the year a remunerative milk market at their door step on one hand and good quality hygienic milk at a fair price to over 350 million urban consumers on the other in the country.
8. At present some 60% of the rural house holds, 80% of the rural farmers and 36% of the rural landless labourers have already adopted dairying as their important and sustainable profession. The operation flood has exhibited a remarkable multi directional progress in the form of concrete achievements in the field of dairy development in many milk shed areas of the country.

The comprehensive role of the dairy cooperatives in this sector will be decernible if there exists a strong network of cooperatives, institutions in other sectors of economy as well. Randomly distributed patch work of these cooperatives in many states are too inadequate in the massive task of nutritional development.

9. The realistic progress has generally been confined at top percolating laterally in a slow manner in many of the dairy development programmes across the country, rather not percolating deeply, effectively and uniformly reaching right up to the bottom level of the population, thus leaving a tremendous scope to reach the optimal level of achievement.
10. Nearly 30% of the cultivated land of the country is under irrigation which probably the highest irrigated land average of the world. Most of the feed resources and roughages are available from crop residues,

byproducts of agricultural crops and agro industries including molasses, cakes and solvent extracts etc. However, in their actual utilization pattern the protein and energy deficiency does exist to the tune of 37% and 33% respectively on the animal nutrition front. Only some 10% of the required compound feed is being manufactured by the existing cattle feed factories in the organised sector. This clearly indicates the existing status of under nutrition/malnutrition prevalent in the bovine population in the country on overall basis.

11. On energy management front the dairy sector, continues to face the problem of energy shortage versus the growing demand for higher energy intensity competing with all other sectors of economy with growing industrialization and liberalisation of economic policies of the government.
12. **Large dairy industry yet most milk left un procured and processed**

Even though the dairy industry has made an enormous growth in our country, yet the dairy industry is not able to procure/collect all the milk that is being produced in the rural areas. The main difficulty in the procurement of this milk is due to the lack of proper transport and conveyance facilities as well as the scattered distribution of the villages. Further, dairy plants also have not evinced or shown any interest to reach to these areas by way of developing the infrastructure facilities such as milk cooling/chilling centres/plants etc for the collection of the milk from these distant/remote areas.

Bulk of the milk consumed in India is raw or unprocessed, which is an erroneous impression because of the fact that all the milk is boiled at house before its consumption. It is increasingly recognised that dairying could play a more constructive role promoting rural welfare and in the alleviation/mitigating the poverty.

Some of the areas which need to be focussed for more attention are :

1. The extent of collection and processing has to be enhanced. A target of enhancing milk processing from the current level of 16-17 percent to at least 25 percent.
2. Average collection of marketable surplus milk by organised dairies (both cooperative and private) is only to an extent of 30 percent except in Gujarat where it is about 85 percent. For enhancing production and

collection of liquid milk each state should create 2-3 new milk shed areas every year.

3. The national dairy plan envisages that for achieving the targeted growth in dairy sector the handling of marketable milk surplus by private and dairy co-operatives has to be increased essentially from the current 50 million kg per day to 160 million kg per day by 2020-21. To achieve this all the producers and processors should develop a good milk collection network.
4. At least 6 to 8 zones which have the potential for high milk collection and processing facilities should be identified and develop as export promotion zones.
5. Traditional Indian dairy products which have the huge potential for value addition and export, hitherto which have not been focused should be given more attention towards the creation of research and development facilities.

Rural dairying happens to be an integral and inter woven part of the traditionally diversified system of agricultural farming, which has now to stay in symbiotic, synergistic and sustainable relationship with it in the modern India. There is abundance of family labour and shortage of capital, while a declining contribution of agriculture to GDP values vis-a-vis live stock products shows a diversification trend of the agricultural base in the country. The annual value of India's anticipated milk production amounts more than Rs.1745 billion in 2009-10. Dairy Co-operatives generate employment opportunities for around 14 million farm families. Live stock contributes 22.2% to the GDP from the agriculture and allied activities. About 22.45 million people work in live stock sector which is around 5-8% of the total work force in the country. The present contribution of live stock sector to agriculture is around 25 to 30% and the dairy sector to live stock sector is around 66 to 70%. The dairy sector is the largest contributor to the agriculture GDP. In terms of output, milk is now the single largest agricultural commodity in India. The other attractions driving its growth are value added products like Ghee, Butter, Yoghurt, Paneer, Cheese, Flavoured milks, Ice creams and shredded and liquid cheese. Whereas the budget allocations to both dairy and live stock sectors by the Government in the Five year plans are proportionately less in relation to their respective contributions to the GDP.

The investment pattern on animal husbandry and dairying programme by the government shows the emphasis given to this sector for increasing the production and productivity. The total plan expenditure on agriculture and allied activities, animal husbandry and dairying and exclusively the dairy sector has been given in the Table 1.6.

Table 1.6 Investment/outlay on animal husbandry and dairying during various five year plan periods (Rs. millions)

Plans	Expenditure (Rs. in million)				Agri- culture as % of Total Plan	AH & dairy as % of Agrl. Sectors
	Total Plan	Agriculture and Allide	Animal Husbandry	Dairying		
First plan (1951-56)	19,600.0	2,900.0	160.0	77.8	14.8	5.5
Second plan (1956-61)	46,720.0	5,490.0	334.7	120.5	11.8	6.1
Third plan (1961-66)	85,770.0	10,890.0	770.0	336.0	12.7	7.1
Annual plans (1966-69)	66,254.0	11,071.0	597.0	257.0	16.7	5.4
Fourth plan (1969-74)	157,790.0	23,204.0	1,542.0	787.5	14.7	6.6
Fifth plan (1974-79)	394,262.0	48,665.0	3,189.8	944.5	12.3	6.6
Sixth plan (1980-85)	1,092,917.0	1,36,203.0	8,025.1	4,362.9	12.5	5.9
Seventh plan (1985-90)	2,202,163.0	2,79,611.0	12,033.0	5,887.9	12.7	4.3
Eighth plan (1992-97)	4,341,000.0	224,670.0	13,000.0	9,000.0	5.2	5.8
Ninth plan (1997-2002)	8,592,000.0	424,620.0	15,456.4	4,695.2	4.9	3.6
Tenth plan (2002-07)	1525639.0	58933.0	1707.7	285.8	3.86	2.90
Eleventh plan (2007-12)	3582768.0	162849.0	2907.1	576.3	4.55	1.79
Twelfth plan (2012-17) (Outlay)	7669807.0	363273.0	11610.0	4976.0	4.72	3.20

Source: Dairy India year book seventh edition

The expenditure at current prices in the dairy sector has increased from Rs.77.8 million in the first five year plan to 9,000 million in the eighth plan. However, the plan outlay for the dairying sector in the ninth and tenth five year plans has been reduced drastically from Rs. 9,000 millions to Rs.4,695.2 and Rs. 2858 millions respectively despite the fact that the contribution of the dairying sector to the annual GDP is quite significant as compared to the agricultural sector.

An attempt has been made to furnish the upto date and to update the information pertaining to the budgetary allocation of funds to the animal husbandry department/sector including the dairy and fisheries during the 11th five year plan by the Govt. of India has been presented in Table 1.7. The approach for the 11th five year plan for the livestock sector was aimed at achieving an overall growth rate of between 6 to 7 percent Res annum. An out lag of Rs. 8174 crore has been provided to the livestock sector/Animal husbandry department in the 11th five year plan. The year wise financial

achievements has been presented in Table 1.7. In addition to the outlay allotted to the department an additional amount of Rs. 5406 crores has also been made and provided under Rashtriya Krishi Vikas Yojana and National mission for protein supplement.

Table 1.7 Year-wise budgetary estimate revised estimate and actual expenditure during 11th five year plan (Rs. crores)

Year	Approved B.E.	Revised estimate R.E.	Actual expenditure	% utilisation w.r.f to R.E	% utilisation w.r.f to B.E
11th Plan 2007-12	Allocation 8174.00 (Crores)				
2007 - 08	910.00	810.00	784.00	96.80	86.16
2008 - 09	1000.00	940.00	865.00	92.05	86.53
2009 - 10	1100.00	930.00	873.38	93.91	79.40
2010 - 11	1300.00	1257.00	1104.68	87.88	84.98
2011 - 12	1600.00	1356.52	1243.11	91.64	77.70
Total	5910.00	5293.52	4870.53	92.01	82.41

Source : Annual report of A.H. Department, Govt. of India 2018-2019

The planning commission has in principle allotted an amount of Rs. 14,179 crores to the department of Animal husbandry for the 12th five year plan. This includes an amount of Rs. 7628 for AHD, Rs. 4976 crore for the dairy development and 2483 crores for the fisheries sector. The financial achievements made by the department during the 12th five year plan against amount lay of 14179 crores provided by the Govt. of India has been presented in Table 1.8.

Table 1.8 Year-wise budgetary estimate revised estimate and actual expenditure during 12th five year plan (Rs. crores)

Year	Approved B.E.	Revised estimate R.E.	Actual expenditure	% utilisation w.r.f to R.E	% utilisation w.r.f to B.E
12th Plan 2012-17	Allocation 14179 (Crores)				
2012 - 13	1910.00	1800.00	1736.37	96.47	90.91
2013 - 14	2025.00	1800.00	1748.80	97.16	86.36
2014 - 15	2174.00	1800.00	1738.07	96.56	79.94
2015 - 16	1491.14	1491.14	1418.20	95.11	95.11
2016 - 17	1600.00	1748.02	1743.12	99.71	108.94
Total	9200.14	8639.16	8384.56	97.05	91.13

Source : Annual report of A.H. Department, Govt. of India 2018-2019 (Internet)

Even though the expenditure is increased in monetary terms, the allocation to animal husbandry and dairy sector as a percentage allocation to agriculture varied from 7 percent in third plan to 4.6 percent in seventh plan. There was a gradual increase in the percentage allocation on animal husbandry and dairying sector from the first to the third plan periods and from thereafter it showed a decline except in the sixth plan which might be due to the quantum jump in the plan expenditure to the agricultural sector.

An attempt has been made to present the share of agriculture and live stock in the GDP along with the % share in the GDP for the benefit the students particularly to the better understanding by the dairy entrepreneurs in Tables 1.9 and 1.10.

Table 1.9 Share of agriculture and livestock sector in GDP
(at current prices in Rs. crores)

Year	GDP Total	GDP Agriculture		GDP Livestock sector	
		Rs.	% share	Rs	% share
2004 - 05	2971.464	476636	16.04	119333	4.02
2005 - 06	3390503	536882	15.83	127518	3.76
2006 - 07	3953276	604672	15.30	142695	3.61
2007 - 08	4582086	716276	15.63	169296	3.69
2008 - 09	5303567	806646	15.21	200.440	3.78
2009 - 10	6108903	928586	15.20	237059	3.88
2010 - 11	7266966	1132048	15.58	276105	3.80
2011 - 12	8353495	1268081	15.18	327838	3.92
2012 - 13	9388876	1417468	15.10	386246	4.11

Source : National accounts statistics 2014. Central statistics organisation Govt. of India.

Table 1.10 Share of agriculture and Allied and livestock sector in GVA
(at current prices in Rs. crores)

Year	GVA Total	GVA Agriculture and allied		GVA Livestock sector	
		Amount	% share of Total GVA	Amount	% share of Total GVA
2011 - 12	8106948	1501947	18.5	327334	4.0
2012 - 13	9202692	1675107	18.2	368823	4.0
2013 - 14	10363153	1926372	18.6	422733	4.1
2014 - 15	11504279	2093612	18.2	510411	4.4
2015 - 16	12574498	2227533	17.7	582410	4.8
2016 - 17	13935917	2496358	17.9	672829	4.8

Source : National accounts statistics 2019. Central statistics organisation Govt. of India.

India's milk production was stagnant until 1970 and began to rise crossing the 30 million tonne in 1980, 50 million tonne in 1989, 75 million tonne in 1998 and is proposed to cross 100 million tonne mark in 2007. The trends in average annual growth rate of milk production from 1950-2015 has been given in the Table 1.11.

Table 1.11 Trends in average annual growth rates of milk 1950 - 2015

Year	Average annual milk growth rate (%)
1950 - 51 ----1960 - 61	1.64
1960 - 61 ----1973 - 74	1.15
1973 - 74 ----1980 - 81	4.51
1980 - 81 ----1990 - 91	5.48
1990 - 91 ----2000 - 01	4.10
2000 - 01 ----2010 - 11	4.22
2010 - 11 ---- 2014 - 15	4.68

Source : India Dairy.com

The milk production of the major milk producing countries for the year 2003-05 indicating the percentage of growth rate for the years 05/04 has been given in table 1.12. The projected population of the country, milk production and the per-capita availability from 2005-06 to 2020 has been presented in table 1.13. Whereas the annual milk production and the per-capita availability of milk from 1950-51 to 2009-10 has been given and presented in Table 1.14 as well as graphically in the bar diagram Fig. 1.1 and 1.2.

Table 1.12 Milk production of major producing countries 2003-05

	2003	2004 (provisional)	2005 (forecast)	% growth (05/04)
WORLD	615.5	625.2	640.2	2.4
EU - 25	147.6	146.4	147.4	0.7
India	87.3	91.1	95.4	4.7
U.S.A.	77.3	77.5	80.6	4.0
Russia Fed.	33.4	32.2	32.2	0.0
Pakistan	27.8	28.6	29.5	3.2
Brazil	23.5	23.7	24.6	3.8
China	21.5	27.1	32.5	20.0
New Zealand	14.4	15.0	14.6	-2.7
Ukraine	13.7	13.6	13.6	0.0
Mexico	9.9	10.0	10.1	1.2
Argentina	8.2	9.6	10.1	4.8
Turkey	10.6	10.5	10.5	0.2
Australia	10.3	10.1	10.1	- 0.2
Japan	8.4	8.4	8.3	- 0.6
Canada	7.7	7.9	7.8	- 1.4

Source : India Dairy.com

Table 1.13 India's Projected population, milk production and per capita availability 2005-2020

Year	Population (million)	Production (million tonnes)	Per capita availability	
			(g/day)	(kg/yr)
2005 - 06	1080	94.5	240	87.5
2006 - 07	1094	97.9	243	88.6
2007 - 08	1110	100.0	247	90.1
2008 - 09	1127	103.5	252	91.8
2009 - 10	1144	107.0	256	93.5
2010	1161	111.0	263	96.0
2015	1246	134.5	296	108.0
2020	1331	165.0	340	124.0

Source : India Dairy.com

Table 1.14 Annual Milk production and per capita availability 1950-51 to 2016

Year	Production (million tonnes)	Per capita availability	
		(g/day)	(kg/yr)
1950 - 51	17.0	132	48.1
1955 - 56	19.0	130	47.4
1960 - 61	20.0	127	46.3
1968 - 69	21.2	113	41.2
1973 - 74	23.2	111	40.5
1980 - 81	31.6	128	46.7
1985 - 86	44.0	160	58.4
1990 - 91	53.9	176	64.2
1995 - 96	66.2	197	71.9
1997 - 98	72.1	207	75.6
1998 - 99	75.4	213	77.8
1999 - 2000	78.3	217	79.2
2000 - 01	80.6	220	80.3
2001 - 02	84.4	225	82.1
2002 - 03	86.2	230	83.9
2003 - 04	88.1	231	84.3
2004 - 05	92.5	283	84.7

Table 1.14 Contd...

Year	Production (million tonnes)	Per capita availability	
		(g/day)	(kg/yr)
2005 - 06	97.1	241	87.5
2006 - 07	102.6	251	88.6
2007 - 08	107.9	260	90.1
2008 - 09	112.2	266	91.8
2009 - 10	116.4	273	93.5
2010 - 11	121.8	281	102.6
2011 - 12	127.9	290	105.9
2012 - 13	132.4	299	109.1
2013 - 14	137.7	307	112.1
2014 - 15	146.3	310	113.2
2015 - 16	190.0	380	anticipated

Source : Dairy India year book seventh edition

An attempt has been made to present the projected Milk production at different rates of annual growth upto the year 2025 for the better understanding of the students in table 1.15.

Table 1.15 projected Milk production at different rates of annual growth 2014-2025 (Million tonnes)

Year	4.5	Rate of growth at percent			6.5
		5.0	5.5	6.0	
2014-15	146.3	146.3	146.3	146.3	146.3
15-16	152.9	153.6	154.3	155.1	155.8
16-17	159.8	161.3	162.8	164.4	165.9
17-18	167.0	169.4	171.8	174.2	176.7
18-19	174.5	177.8	181.2	184.7	188.2
19-20	182.3	186.7	191.2	195.8	200.4
20-21	190.5	196.1	201.7	207.5	213.5
21-22	199.1	205.9	212.8	220.0	227.3
22-23	208.1	216.2	224.5	233.2	242.1
23-24	217.4	227.0	236.9	247.2	257.9
24-25	227.2	238.3	249.9	262.0	274.6

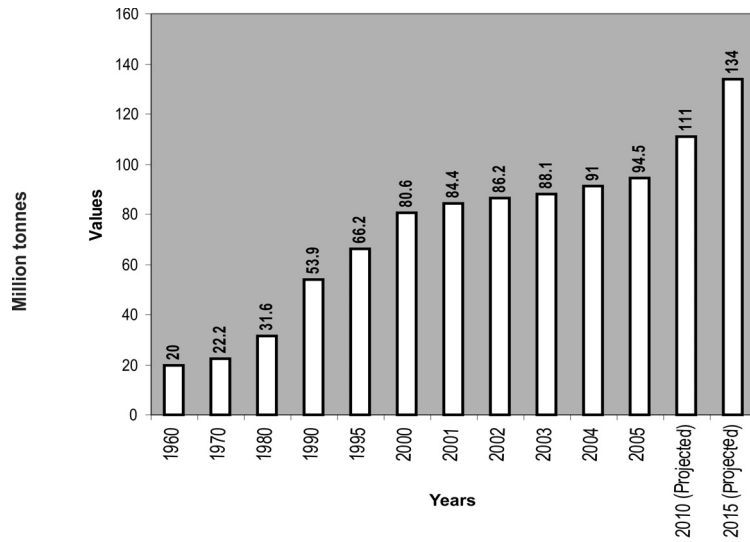


Fig. 1.1 Milk production (million tonnes)

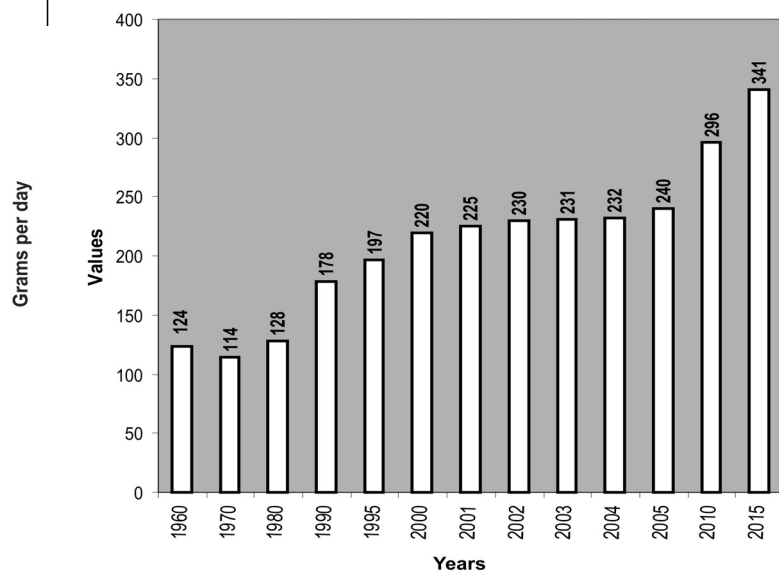


Fig. 1.2 Milk production and availability : 1960 - 2015
(Per Capita availability grams per day)

Source : Dairy India year book 2007

Some indicators of India's dairy development during/up to the year 2005 have been given hereunder :

Human population	-	1094 million (70 million dairy farmers)
Milk production	-	94.0 million tonnes/year 258 million litres/day. Cow milk - 41%, buffalo milk - 55% and Goats etc - 4%
Average annual growth rate	-	4%
Per capita milk availability	-	240 gm/day; 88 kg/year
Bovine population in milk 2003	-	Cross breed cows - 8.2 million, Indigenous cows - 27.6 million, Buffaloes - 33.0 million
Average milk yeild per day	-	Cross breed cows - 6.5 kg
Per animal 2003	-	Indigenous cows - 1.9 kg Buffaloes - 4.2 kg
Cattle feed production (Organized sector)	-	2.5 million tonnes per year
Market for veterinary Pharmaceuticals	-	Rs. 12,000 million
Dairy plants throughput	-	45 million litres/day (18%)
Dairy plants and their installed capacity	-	748 dairy plants and 81.3 million litres/ day installed capacity
Value of output of dairy industry	-	Rs. 191,000 crore

1.16 National Dairy Plan - (NDP)

As the largest milk producer in the world, India's contribution is 121.8 million tonnes in 2010-11. The national action plan for dairy development has been envisaged to double the income of the milk producers at farm level by 2021-22 by increasing the access to the organized milk processing sector. According to the planning commission estimates and subsequent corrections on account of consistantly higher growth in G.D.P. the demand for milk is expected to be about 155 million tonnes by the end of 12th five year plan period 2016-17. The milk production has been envisaged to be

254.55 million tonnes by the year 2021-22 from the existing 176.35 million tonnes requiring an annual growth rate of 8.56%. This would lead to increase the per capita availability from the current level of 375 gms/day to 515 gms/day by 2021-22. In order to achieve the desired milk production levels the average in productivity of milk by the animals would be required to grow annually at the rate of 4.7% to 6.14 kg per day by 2021-22 from the existing 4.65 kg per day. It is necessary to maintain the annual growth over 4% in the next 15 years in order to meet the ever growing demand. Therefore it is imperative that a country wide well planned scientific approach / initiative has to be launched to increase the productivity levels in the existing herds, through a programme focusing on breeding and better feeding. The National Dairy Plan (NDP) has been envisaged with a 15 year horizon, considering that 3-5 years of time is required to produce more productive animals and time required to develop and expand systems to increase milk production.

The first phase of the National Dairy Plan is to be financed largely by the world bank which will be implemented over a period of six years with the following objectives.

- To help increase the productivity of milch animals and thereby increase the milk production to meet the rapidly growing the demand for milk and
- To help provide rural milk producers with greater access to the organised milk processing sector.

The estimated project outlay for the phase-I of the NDP is about 2242 crores of which the share of the world bank is 1584 crores and that of Govt. of India is about 176 crores. The details of phase-I project outlay has been given in Table 1.16.

Table 1.16 Project Outlay Phase-I (NDP)

Component	Activity	Outlay in Rs. crores
Component-A	Breed Improvement	715.0
	Animal Nutrition	425.0
Component-B	Village based milk procurement system	488.0
Component-C	Project Management and Learning	132.0
	Sub-Total #	1760.0
	EIA Contribution	282.0
	NDDB's Contribution	200.0
	Grand Total	2242.0

Source of funds : World Bank-IDA 1584 crores, Govt. of India 176 crores

Implementation

The Phase-I of the NDP consists of a series of multi pronged approaches or initiatives that are to be implemented over a period of six years commencing from 2012-13.

1. Increasing the productivity through scientific breeding and feeding of the animals.

- A. Productivity of high genetic merit and disease free cattle and buffaloe bulls using the internationally established practise of Progeny Testing (PT), and Pedigree Selection (PS) and import of Jersey and HF bulls/embryos or semen.
- B. Strengthening A and B graded semen stations and producing high quality disease free semen.
- C. Setting up of a perfect module for AI delivery service through a professional service provider following Standard Operating Procedures (SOPs).

Milch animals produce milk which will commensurate with their genetic potential when they are fed with a balanced ration/feed leading to a significant decrease in the cost of production, because the feed accounts for about 70% of the total cost of milk production, thereby increasing the farmer's income.

- D. Education of milk producers on ration balancing and nutrients required by their milch animals by providing advisory services at the farmers door step through the trained Local Resorce Persons (LRPs).
- E. Increase fodder yield by making available quality fodder seed of high yielding improved varieties to farmers and demonstrate silage making and fodder enrichment.

2. Strengthening village based milk procurement systems

The milk production is in the hands of about 70 million rural houses holds, the majority being small and marginal farmers and landless labour. The dairy co-operative ensures inclusiveness and livelihood for small holders especially the women.

- (i) Expansion and setting up village based milk procurement systems to collect milk in a fair and a transparent manner ensuring timely payments.
- (ii) Strengthening of the existing dairy co-operatives and promote producer companies of new generation of co-operatives to put in place village level infrastructure for the weighing, testing collection and cooling of milk.
- (iii) Provide support for creating institutional structures and training.

3. Project management and Learning

- (a) Implementation of Information and Communication Technology (ICT) based information systems for integration of various activities as well as monitoring and reporting at different levels, to carry out necessary analysis and facilities necessary changes in project implementation.
- (b) Carry out base line, mid term and project completion surveys and other special surveys/studies.
- (c) Facilitate learning and documentation of learning experiences.

Benefits

In terms of overall benefits the NDP will put in place a scientific approach and systematic process which would take the country on the part to improve the genetics of milk producing animals in a consistent and continuous manner.

- (a) It will make much more prudent use of the continuous scarce natural resources.
- (b) Have an impact on reducing methane emissions.
- (c) Improve the quality of milk being marketed.
- (d) Helps in strengthening the regulatory and policy measures that will provide an enabling environment for future of dairying in the country and
- (e) Contribute for the improvement of the livelihoods of small holder milk producers who are the bed rock of India's milk production system.

1.17 Present Status of Dairy Industry

Adopting the popularly called Amul or Anand Pattern in the milk procurement, processing and marketing, almost all the state governments, have set up their dairy development co-op. federations for the development of the dairy industry in their respective states. The data of which have been summarized in the Table 1.17.

As on March 2009, India's 1,33,349 village dairy co-operative societies federated into 177 milk unions and 15 Federations procured on an average 25.1 million litre of milk per day, 13.9 million farmers are presently members of Village dairy co-op.

India's 3.7 percent annual growth of milk production in between 1999-2000 and 2009-10 surpasses the 1.8 percent growth in population, the net increase in availability is around 2 percent per year.

Table 1.17 Details of various state Dairy Federation

SI.No	Name of State Dairy Federation	Address	No.of co-op- Unions	No.of Dairy Plants	Capaci ty (TLPD)	Brand name	Products
1.	2.	3.	4.	5.	6.	7.	8.
1.	Andaman-Nicobar Islands Integrated Development Corporation Ltd., (ANIIDCO)	Port Blair Pin 744101	N.A.	N.A.	N.A.	N.A.	---
2.	Andhra Pradesh Dairy Development Co-op. Federation Ltd.,	Lalapet, Hyderabad Pin-500 017 Email: apddcf@hd 1. Vsnl.netin Website: apdairy.com	9	12	2437	Vijaya	Table butter, Ghee, Pasteurised Butter UHT Milk, flavoured milk, kulfi SMP, Khoa, Processed Cheese
3.	West Assam Milk Producers Co-op. Union Ltd.,	Guwahati	N.A.	1	60000	Purabi	Double toned milk, toned milk, paneer, Curd, Ghee, skim milk etc.
4.	Bihar State Co-op. milk Producers Fed. Ltd.,	Dairy development complex, Bihar veterinary College Patna - 800014. compled@bihnic.in	5	10	780	Sudha	Pure Ghee, Butter Ghee, Paneer, Lassi, Rasagolla, Peda, Ice Cream, Cream Milk.

Table 1.17 Cond....

1.	2.	3.	4.	5.	6.	7.	8.
5.	Goa State Co-op. milk Producers Union Ltd.,	Curti-Ponda Pin-403 401 Goa	--	--	--	Goa Dairy	--
6.	Gujarat Co-op. milk marketing Federation Ltd.,	Amul Dairy Road, Anand - 385 001 Email: gcmmf@amul.com Web: amul.com	12	19	6595	Amul Sagar	Infant milk food, Instant milk mix, ice cream, SMP, Ghee, Dairy whitener, paneer, Sweetened, Condensed milk, Malaipeda, Gulab jamun mix, Shrikhand, Pijja cheese, Butter
7.	Haryana Dairy Co-op. development Federation Ltd.,	SCO 127-128 Sector 17-C Chandigarh Pin- 160 017 Email: vita@satyam.net.in web: vitaindia.com	6	5	470	Vita	Ghee, Paneer, table Butter, WMP Dahi, Flavoured Milk, milk cake
8.	Himachal Pradesh State Co-op. milk Producers Federation Ltd.,	Tota, Simla pin 171011	3	3	370	HIM	Paneer, Ghee, Table Butter, Curd
9.	Jammu Co-op. Milk Producers Federation Ltd.,	Jammu Contt. Pin-180 003	--	--	--	Jamfed	
10.	Karnataka Co-op. milk Producers Fed. Ltd.,	KMF Complex Dr. M.H Marigowda Road D.R. College (PO) Bangalore 560 029 Web.Nandimilk.com. nandini	13	15	2130	Nandini	SMP, Paneer, Pure Ghee, Badam Berfi, Gulab Jamun, Pesterized butter, pure milk Khoa, ice cream, Toned milk, Curd.

Table 1.17 Cond....

1.	2.	3.	4.	5.	6.	7.	8.
11.	Kerala State Co-op. milk Marketing Federation Ltd.,	Milma Bhavan Pallam Thiruvananthapuram 695004 Email: milma@md2.Vsni.net.in Milma.com	3	9	300	Milma	Instant dairy whitener, Ice Cream, flavoured milk, SMP Ghee, Skimmed milk, curd, Peda, Pasteurized Butter
12.	Madhya Pradesh State Co-op. Dairy Fed. Ltd.,	19-B, Zone Maharana pratap Rananagar, Bhopal- 462 011 Email: mpcdf@bomb vsni.net.in sanchi-milk.com	5	5	1030	Sanchi Sneha	Pure Ghee, Lassi, UHT milk, SMP Pasteurized Butter, flavoured milk, Butter milk
13	Maharashtra Raiya Sahakari Dudh Mahasangh Maryadit	M.K.M. International House 3 rd Floor, 178, Back Bay Reclamation B M Chinai marg Mumbai- 400 020 Email: mahafed@am3vsni.net.in	23	29	3820	Vikas Mahanand Gokul Dhawal Dudh Panchi Warana Krishna Katnej Rajgans Koyna and Sivamrut	Pasteurized Butter, Pure ghee, Lassi, Srikhand, Butter milk, Flavoured milk, Paneer Peda
14.	Manipur State Co-op. milk processing and marketing Federation	Kesiampet Junction Imphal- 798 001					

Table 1.17 Cond....

1.	2.	3.	4.	5.	6.	7.	8.
15.	Kohima Dist. Co-op. milk Producers Union Ltd.,	Milk Chilling Plant Veterinary Compound Burma Camp Dimapur-797 112				KEVI	
16.	Orissa State Co-op. Milk Producers Fed. Ltd.,	D-2 Sahid Nagar, Bhubaneswar 751 007	5	5	135	Omfed	Pure Ghee, Butter, Sweet curd
17.	Pondicherry Co-op. milk Producers Union Ltd.,	Vazhudavar Road, Kurumampet, Pondicherry – 605 009.				Ponait	
18.	Punjab state Co-op. milk Producers Fed. Ltd.,	SCO.No. 153-155, New City Centre, Sec. 34-A, Chandigarh Email: milkhod@chd.nic.innic.inmilkfed	11	9	1550	Verka	Ghee, Panner, flavoured milk, ice cream, SMP, WMP, Lassi, Table butter, Sweets, Cheese
19.	Rajasthan Co-op. Dairy Fed. Ltd	Saras Sankal, Jawaharlal Nehru marg, P.O. Box. 1003 Jaipur – 302 017	16	15	1425	Saras	Pure Ghee. Srikhand flavoured milk, tetra pack milk, Cheese, Paneer, Dairy whitener, SMP, WMP, Lassi, Table butter, White Butter, Dahi, Ice Cream, Rasgulla, Chach, Khoas, Mawa, Peda, Kalakand
20.	Sikkim Co-op. Milk Producers Union Ltd.	Tadang (PO) Gangtok 737 102				Sikkim Milk	

Table 1.17 Cond.....

1.	2.	3.	4.	5.	6.	7.	8.
21.	Tamil Nadu Co-op. Milk Producers Fed. Led.,	Aavin Illam, Madhavaram Milk Colony, Chennai 600 051 Email: mdaacin@satyam.net inaacinmilk.com	12	15	2700	Aavin	SMP, Milk, Khoa, Peda, Pure Ghee, Butter, Cheese, Milk butter, flavoured, UHT, Yogurt, Table standardized milk curd, butter milk, Badam Powder, Dates, Khova
22.	Tripura Co-op. Milk Producers Union Ltd.,	Agarthala Dairy, Indra Nagar, Agarthala 799 006				Gomati	--
23.	Pradeshik Co-op. dairy Fed.	29 Park road, Lucknow 226 001 Email: fedf1@satyam.net Paragnmilk.com	30	16	1680	Parag	Ghee, Milk, Cake, Paneer, White Butter, Table butter, SMP
24.	West Bengal Co-op. milk Producers Fed. Ltd.,	LB-2 Sector III, Salt Lake city Kolkata 700091	14	6	1272	Ben's Bhagirathi Himul, Mid milk, mother	Table butter, Ghee, Ice Cream, Peda, Lassi, Paneer, curd, Flavoured milk, Yoghurt, mistidoi

In 2009-10 average dairy co-op. milk marketing stood at 2112 lakh litres, Annual growth has averaged about 6.2 percent compounded over the last five (5) years. Dairy Co-operatives now market milk in all metros, metro cities and more than 2000 towns/cities. During 2001-10 the daily milk supply by the co-operatives to each urban consumer has increased from 47.7 to 61.9 kg. per day.

Performance of the Co-op. at a glance

The cooperative profile of India up to 1996-97 has been presented in Table 1.18:

The dairy Co-op. network as on 2010.

- (a) Includes 177 milk unions.
- (b) Operates in over 346 districts of the country.
- (c) Covers 1,40,227 village level co-op. societies.
- (d) Owned by about 14 million farmer members of which 4 million are women.

Table 1.18 Co-op. Profile in India upto 1996-97

Item	1994-95	1996-97
Anand Pattern Co-op Milk Societies	67,770	72,740
Milk shed areas	170	170
Membership of Dairy Co-op. Societies	89.88 lacs	93.14 lacs
Milk Procurement	10.2 ml pd	11.5 ml pd

Source : India Dairy.com

There were several innovative programmes for women in dairying. Five states took up specific task of "All Women co-op. dairy societies" formation in selected milk shed areas.

	State	No.of all women co-op.dairies
1.	Andhra Pradesh	210
2.	Bihar	280
3.	Rajasthan	408
4.	Uttar Pradesh	1228
5.	Gujarat	350

1.17.1 Private Sector - Dairy Industries

In addition to the various dairy plants that have been setup under the different state governments with the help of NDDDB and dairy co-operative federations

yet many dairy plants have come up under private sector competing with the co-operative federations. Some of them have been listed below :

1. Nestle India

Brands - Nescafe, Everyday, Dairy whitener, Nestle milk maid, Dahi, Neslac, Ghee, Nesvita, Pro Heart milk.

Nestle, India's first production facility was set up in 1961 at Moga, Punjab, and it was followed by its second plant set up at Choladi, Tamil Nadu in 1967. Consequently Nestle India set up factories in Nanjangud, Karnataka in 1989. Samalkha Haryana in 1993. This was succeeded by Commissioning two more factories at Ponda and Biocholim, Goa in 1995 and 1997 respectively. The seventh factory was set up at Pantnagar in 2006 Uttarakhand. The Nestle Corporate head office is located in Gurgoan, Haryana.

2. Hindustan Milk Food Manufacturers Ltd

Brand Name - Horlicks, Boost, Maltova, Viva

The flagship product Horlicks is highly popular and respected brand since 1930 in the Indian market and it underwent a revamp in 2003 to further increase its relevance.

In 1958-60 the Hindustan milk food manufacturers (Pvt) Limited has built its factory at Nabha, Punjab to make Horlicks from buffaloe milk in India.

During 1975, the HMM (Pvt) Limited has their second factory at Rajahmundry, AP and expanded its production capacity in 1978. The company was made public in 1979 and constructed third factory at village Kherva Sonapat, Haryana which is fully automated. The full operational capacity of the plant will be 261000 tonnes of Horlicks per annum.

- 3. Glaxo:** It was founded by Bunny Thorpe Newzealand in 1904. Originally it was a baby food manufacturer, processing local milk into baby food by the same name and the product was sold in the 1930's under the slogan "Glaxo builds bonny babies". It was named as Glaxo Laboratories in 1950. The milk processing plant for the manufacture of infant foods under the brand name "Glaxo" was built in India at Aligarh in the year 1960.

4. **Modern Dairies:** It is a part of the Modern business group headquartered at Chandigarh established in 1973. It was awarded the prestigious ISO 9001-2000, HACCP (Food safety) and an ISO 1400-2004 for environment and management certification to its credit. The company manufactures a wide range of milk and milk products. They have constructed their second factory near Karnal to meet the ever increasing demand.
5. **Heritage Foods:** It was founded in the year 1992 and located near Hyderabad is one of the fastest growing private sector enterprises in India, with four business divisions namely Dairy, Retail, Agriculture and Bakery, under the flagship company Heritage foods India Limited. The annual turnover of Heritage foods crossed 900 crores in 2009-10 and 1100 crores in 2010-11. The milk and milk products are being marketed in AP, Karnataka, Kerala, Tamilnadu, Maharashtra and Orissa.
6. **Dodla Dairy:** This is the first and patent dairy plant of the company established in A.P. The original installed capacity of the plant was 60,000 litres/per day. The capacity of the plant has been increased to 4 lakh liters per day at present. The plant is equipped with excellent infrastructure and the state of art facilities for processing the milk and for the manufacture of milk by-products namely ghee, butter, paneer, flavoured milks, curd, butter milk and doodh peda. There is a separate facility in the same premises for the manufacture of skimmed milk powder with an installed capacity of 15 tons per day.
7. **Tirumala Milk and Milk Products (Pvt) Ltd.,:** It is a professionally managed company established in 1998 in AP is one of the fastest growing private sector enterprise. The company has the most modern and versatile plants with the state of art technology. The total capacity of the plant is about 7 lakh litres per day, having the market presence in A P, Karnataka and Tamilnadu. The dairy products include: sweets, flavoured milks, curd, milk powder, butter, ghee and butter oil both in bulk and consumer packs.
8. **Durga Dairy:** Although it is a public limited enterprise located in AP. The on going venture came under the mantle of Crane group in Feb. 1995. It has the goodwill of the people of all over India through the commitment to the quality. It has branches almost all over the country and produces 1500 tonnes of ghee annually.

9. **Gokul Dairy:** The Kolhapur Dist Cooperative Milk Producers Union Ltd was established on 16-03-1963 under the Co-op.act. It made a moderate beginning with 500 litres/day from 22 village co-op. societies. The milk receipts capacity at present is about 3.2 lakh litres/day raw milk and 3.8 lakh litres/day chilled milk with a total processing capacity of 7.0 lakh litres/day. The milk powder manufacturing capacity is about 40 mt/day.
10. **ABIS Dairy Pvt Ltd.:** It is a subsidiary of the Indian Broilers group. The company has its own dairy farm and milk processing industry to produce hygienic and do safe dairy food of with good quality. It is situated at Rajnandgoan in C.G. State. It was established in 1999 and an ISO 9001-2000 certified plant. The products include packaged milk, Khoa, Paneer. The capacity of the plant is about 15 mt per day.

As already stated the milk production in our country is in the hands of the small farmers who are scattered in the remote villages which do not have proper transport facilities. Most of the packed liquid milk segment in India is dominated by the Cooperative federations and the private sector dairies. The liquid milk contribution in the total revenues of the cooperatives ranges from 60-80 percent. Apart from few private organisations many individuals are mainly focussed on milk products other than packed liquid milk. There is a huge potential for processing and value addition in the organized sector particularly in the ethnic Indian sweets, and other milk based products, which are largely sold in “unbranded” form in the market. These organisations or individuals either in the organised or un-organised sector also collect the milk for the manufacture of their milk products such as ice-cream, sweets, biscuits and confectionary chocolates etc. either directly or through the contractors/middleman engaged by them. The key differences between the organised and the unorganised sectors concern the level of investment in presenting quality of milk, the technology used for processing and the compliance with the legal food standards.

It is a very common sight to find either a halwain or a sweet shop in almost every street of a town or city being managed by the individuals on a cottage industry basis in the unorganized sector. These people prepare the milk based sweets of different varieties by collecting the milk from the local producers or by the milk vendors. In addition to

these people there are some branded sweets being manufactured and sold in the market in an organised manner. A few examples of these organisations have been listed below for information.

- Agarwal sweets - Delhi, Lucknow etc.
- Sri Krishna Sweets - Chennai, Pondicherry, Hyderabad
- G. Pulla Reddy Sweets - Hyderabad
- Bikaneri Sweets - Rajasthan, Panipat, Delhi.
- K.C. Das Sweets - Kolkatta, Delhi, Bangalore.

Similarly, milk and cream is used in the manufacture of Ice cream both in the organised and unorganised sector. These people have their own mechanism of collecting the milk for the manufacture of their products. Some of the private sector organisations who are manufacturing the branded ice cream in a large scale, having their own marketing outlets at many places in the country have been mentioned below :

- Vadilal Ice cream - Ahmedabad
- Kwality walls India - Delhi, Hyderabad
- Hatsun Arun Ice Cream - Chennai, Hyderabad
- Dinshaw Dairy Foods - Pune, Karnataka

In addition to the sweets and ice cream, milk is being used to some extent in the manufacture of some varieties of biscuits and confectionery industry. Some of the leading manufacturers of biscuits and the confectionery industries have been given hereunder.

Biscuit Industry :

Britania Industries Ltd.,	1892	Kolkata
Parle Products Pvt Ltd.,	1929	Mumbai, Bangalore
Surya Food & Agro Ltd.,		
Priya Gold Brand	1992	Noida, Delhi
I.T.C. Ltd., - Sunfeast Brand	2004	Chennai

Confectionary :

Cadbury India Ltd.,	1948	Thane, Mumbai
Nutriline	1952	Chittoor, A.P.